

# **Official Transcript of Proceedings**

## **NUCLEAR REGULATORY COMMISSION**

Title:                   Advisory Committee on Reactor Safeguards  
                              Plant License Renewal Subcommittee

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

PLANT LICENSE RENEWAL SUBCOMMITTEE

+ + + + +

TUESDAY

APRIL 8, 2014

+ + + + +

ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear  
Regulatory Commission, Two White Flint North, Room  
T2B1, 11545 Rockville Pike, at 8:30 a.m., Gordon  
Skillman, Chairman, presiding.

COMMITTEE MEMBERS:

GORDON R. SKILLMAN, Chairman  
HAROLD B. RAY, Member-at-Large  
DENNIS C. BLEY, Member  
CHARLES H. BROWN, JR. Member  
JOY REMPE, Member  
PETER RICCARDELLA, Member  
JOHN W. STETKAR, Member

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## ACRS CONSULTANT:

WILLIAM SHACK

## DESIGNATED FEDERAL OFFICIAL:

KENT HOWARD

## ALSO PRESENT:

VICTORIA ANDERSON, NEI

ALAN COX, Entergy

SHERRY BERNHOFT, EPRI

AL FULVIO, Exelon

RICHARD REISTER, DOE

JASON REMER, NEI

TOM ROSSEEL, DOE

## NRC STAFF:

ARACELI BILLOCH, NRR

BENNETT BRADY, NRR

WILLIAM BURTON, NRR

JERRY DOZIER, NRR/DRA

MIRELA GAVRILAS, RES

JOSEPH G. GITTER, NRR/DRA

JOHN LUBINSKI, NRR

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

(8:30 a.m.)

CHAIRMAN SKILLMAN: Good morning. This meeting will now come to order.

(Off the record comments)

CHAIRMAN SKILLMAN: The meeting has begun. Good morning, welcome. This meeting will come to order in this meeting of the Combined Plant License Renewal and Reliability in PRA Subcommittees. I will Chair the meeting. I'm Gordon Skillman, I'm Chairman of the Plant License Renewal Subcommittee.

ACRS members in attendance today are Charlie Brown, Joy Rempe, Harold Ray, Dennis Bley, and John Stetkar. Later in the meeting will come Mike Corradini, Mike Ryan, and Pete Riccardella. Our consultant, Bill Shack, is also in attendance today. Mr. Kent Howard of the ACRS staff is the designated Federal Official for this meeting.

Sixty days ago this topic was considered a future potential topic that the members of the ACRS might address sometime later in 2014 or 2015. In the past 60 days this topic has matured in importance to inviting and requiring ACRS's and other's attention

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1 today.

2 Affirming the importance of this topic we  
3 have with us, in addition to our ACRS Committee members  
4 and the NRC staff members, participants from NEI, EPRI,  
5 and DOE.

6 As we begin, therefore, I first want to  
7 recognize and thank the Leadership from the NRC staff,  
8 from NEI, EPRI, and DOE for their timely and  
9 enthusiastic preparation for and support of this topic  
10 and for this meeting.

11 I also want to recognize and thank our  
12 designated Federal Official, Kent Howard, for his  
13 efforts to organize and focus this meeting. The  
14 Subcommittee will review issues pertaining to  
15 SECY-14-0016, ongoing staff activities to assess  
16 regulatory considerations for a power reactor's  
17 subsequent license renewal.

18 In brief, the SECY address the potential for  
19 extended operation of power reactors beyond 60 years  
20 and also addresses the topic of the adequacy of the  
21 current regulatory framework for subsequent power  
22 reactor license renewal applications.

23 This morning we will hear presentations from  
24 the Division of License Renewal and Division of Risk

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1       Assessment.       In the afternoon we will hear  
2       presentations from the NEI, from EPRI, and from DOE,  
3       and we will then have a follow-up by the Division of  
4       License Renewal.

5               We have not received written comments or  
6       requests for time to make oral statements from members  
7       of the public regarding today's meeting. The entire  
8       meeting will be open to public attendance. The  
9       Subcommittee will gather information, analyze relevant  
10      issues and facts, formulate proposed positions and  
11      actions as appropriate for deliberation by the  
12      Committee.

13             The rules for participation in today's  
14      meeting have been announced as part of the notice of  
15      this meeting previously published in the Federal  
16      Register. A transcript of this meeting is being kept  
17      and will be made available as stated in the Federal  
18      Register Notice.

19             Therefore, I request that participants in  
20      this meeting please use the microphones located  
21      throughout the meeting room when addressing the  
22      Subcommittee.

23             The participants are requested to please  
24      identify themselves and speak with sufficient clarity

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1 and volume so that they can be readily heard. I also  
2 request that you silence your electronic devices while  
3 you are in the meeting room. Thank you.

4 We will now proceed with the meeting. I  
5 welcome and call upon John Lubinski to begin the  
6 presentation.

7 MR. LUBINSKI: Thank you. Good morning, my  
8 name is John Lubinski, I'm the Director of the Division  
9 of License Renewal in the Office of Nuclear Reactor  
10 Regulation.

11 For this briefing today we will provide the  
12 ACRS with an overview of the staff's efforts in  
13 preparing for subsequent license renewal. I would  
14 like to introduce some of the staff members at the table  
15 supporting the presentation today.

16 Starting at the left we have Dr. Mirela  
17 Gavrilas, Dr. Bennett Brady, Butch Burton, Araceli  
18 Billoch, and Bo Pham. Our goal today is to discuss with  
19 the ACRS the process we follow in performing a  
20 comprehensive assessment of both the regulatory and  
21 technical framework to support subsequent license  
22 renewal.

23 We seek the Committee's confidence in our  
24 process for identifying the appropriate focus areas

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1 needed for reasonable assurance during the operations  
2 beyond 60 years.

3 For subsequent license renewal the staff is  
4 addressing the regulatory framework and the technical  
5 frameworking parallel. We will discuss both during  
6 the briefing today.

7 In our presentation you will hear several  
8 themes repeated. First is, is the regulatory  
9 framework was provided by the staff to the Commission  
10 in SECY-14-0016. The SECY requests approval to  
11 address necessary enhancements through the established  
12 rulemaking process.

13 This will allow full stakeholder involvement  
14 in the decision whether to proceed with rulemaking and  
15 if so what the scope of that rulemaking should be.  
16 Based on its evaluations thus far the staff continues  
17 to believe that the two principles for the first license  
18 renewal continue to be appropriate for subsequent  
19 license renewal.

20 These principles are, number one, with the  
21 possible exception of the detrimental effects of aging  
22 of the functionality of certain plant systems,  
23 structures, and components, the current regulatory  
24 process is adequate to ensure that the licensing basis

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1 of all currently operating plants provides and  
2 maintains an acceptable level of safety.

3 And the second is that each plant's licensing  
4 basis must be maintained during the renewal term in part  
5 through management of age-related degradation.

6 The staff continues to believe that the  
7 existing regulatory process is both acceptable and  
8 appropriate for handling safety issues beyond aging.  
9 These include emerging safety issues, enhancement to  
10 safety, and design updates.

11 This is based in part on the continued  
12 changes to the plant's licensing basis as they occur  
13 over the first 60 years of operation. The staff safety  
14 review for subsequent license renewal will provide  
15 reasonable assurance that actions have been taken or  
16 will be taken to manage the aging of long-lived passive  
17 components important to safety throughout the period  
18 of extended operation.

19 We believe the framework proposed by the  
20 staff ensures and maintains safety during the period  
21 beyond 60 years. We also believe that the changes to  
22 the two principles I discussed earlier are what's  
23 proposed to the Commission and these matters are  
24 currently under consideration by the Commission.

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1           For the technical framework the staff is  
2           proceeding to determine, one, if subsequent license  
3           renewal is technically feasible with regard to aging  
4           management.

5           And, two, if it is feasible we will use the  
6           established process and that is an update of the Generic  
7           Aging Lessons Learned, GALL, and our SRP process to  
8           address these issues for subsequent license renewal.

9           I would like to note at this point we have  
10          not proposed any rulemaking to the Commission. What  
11          we have done in the SECY is request the Commission's  
12          approval to further engage stakeholders to address the  
13          regulatory issues identified as part of the rulemaking  
14          process.

15          Likewise, the staff has not completed its  
16          deliberation on the technical feasibility of  
17          subsequent license renewal at this point. We do intend  
18          to engage the Committee on the draft stage of publishing  
19          any technical basis documents.

20          As stated earlier, there were going to be  
21          briefings later in 2014 on these issues and we do not  
22          expect that this changes that path forward. We will  
23          be back in front of the ACRS at a future date to talk  
24          about the technical issues associated with subsequent

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1 license renewal.

2 If I can talk about the Agenda for the day.  
3 We've broken it up into two main parts for our  
4 presentation this morning. The first is the  
5 regulatory framework which addresses the process for  
6 subsequent license renewal and what's addressed in the  
7 SECY.

8 The second is the technical framework which  
9 is our effort to determine if subsequent license  
10 renewal is technically feasible. For the regulatory  
11 framework we believe it is important to discuss the  
12 regulatory processes that supported licensing for the  
13 first 40 years and how the process supported the  
14 principles of the first license renewal.

15 We will then discuss the first license  
16 renewal principles and processes and lessons learned  
17 from the first license renewals. We will then discuss  
18 the proposed regulatory framework for subsequent  
19 license renewal, the content of the SECY paper, and a  
20 non-concurrence that was issued regarding the paper.

21 For the technical framework we will discuss  
22 our process and the key issues that we've noted today.  
23 As I noted, we are still in the early process of  
24 identifying resolution of all of the technical issues.

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1 With that I will turn things over to our first  
2 presenter this morning, Ms. Billoch, who will begin the  
3 discussion of our regulatory framework activities.

4 MS. BILLOCH: Thank you. Good morning, my  
5 name is Araceli Billoch and I'll be providing you with  
6 a brief overview of the license renewal program. Next  
7 slide, please.

8 Let me start with the initial licensing  
9 process which provides the baseline to support our  
10 decision for first license renewal and subsequent  
11 license renewal.

12 We split our review into two parts, safety  
13 and environmental reviews. For the safety review the  
14 NRC staff reviews obligation for initial licensing for  
15 operating reactors to determine whether the plant  
16 design meets all applicable regulations.

17 The goal is to ensure adequate protection for  
18 the public health and safety and the environment  
19 through the current regulatory process and incident  
20 response.

21 For the environmental review, in accordance  
22 with the National Environmental Policy Act, the staff  
23 proposed an environmental review to evaluate the  
24 potential environmental impacts of the proposed plant.

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1 Next slide, please.

2 This slide illustrates the NRC's regulatory  
3 framework for the first 40 years of operation and the  
4 interactive and continuous nature of all the  
5 activities. The entire relationship between our  
6 regulations, licensing, and oversight activities  
7 provide for adequate protection of public health and  
8 safety at any point during the plant's operation.

9 The function of operating experience is  
10 important since we use this information to adjust our  
11 oversight activities and when necessary to change  
12 regulations or requirements on licensees. Next slide,  
13 please.

14 To ensure safety in operations the NRC relies  
15 on the current regulatory process. First, the  
16 requirements for operations are established in Title  
17 10 of the Code of Federal Regulations.

18 Second, after initial license is granted the  
19 licensee may amend or modify the license depending on  
20 the activities that affect the reactor during its  
21 operations.

22 Third, the oversight process through  
23 inspections monitor and evaluates plant safety.  
24 Finally, operating experience allows the staff to

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1 monitor safety focus areas. The regulatory process  
2 ensures that the NRC identifies and resolves generic  
3 safety issues that affect more than one licensed  
4 facility.

5 When a generic issue is identified the staff  
6 issues generic communications and engages with the  
7 industry. When the licensee responds the current  
8 licensing basis of the plant may be updated. An  
9 example is Generic Issue 191, Assessment of the  
10 Reaccumulation of for Pressurized Water Reactor Sumps.

11 For any plant regardless of time and vintage  
12 of its design, the NRC has found through its existing  
13 regulatory process that the plant's current licensing  
14 basis is adequate for it to operate safely.

15 This is often mistaken for the idea that we  
16 have stuck with allowing licensees to operate plants  
17 with 1960s design and there is no need for improvements.  
18 In fact, licensees undergo numerous changes to their  
19 current licensing basis.

20 Some are reviewed and approved by the Agency  
21 like fire protection license amendment, some are  
22 voluntarily done through, without need for approval,  
23 like the 50.59 process, and others may be mandated  
24 through NRC orders like, for example, the Fukushima

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1 near term task force orders. Next slide, please.

2 So far I have discussed the overall  
3 regulatory framework for licensing. However, this  
4 slide focused on one aspect of the initial licensing  
5 process, aging management. It is often mistakenly  
6 perceived that aging management is unique to license  
7 renewal.

8 Aging management is important during the  
9 initial licensing process and during the first four  
10 years of operations. It is primarily accomplished  
11 through an implementation of three regulations, the  
12 maintenance rule, the QA program, and the requirements  
13 of 10 CFR 50.55(a).

14 The maintenance rules focus on aging  
15 management of active components. It ensures proactive  
16 oversight and changes are based on results of the  
17 inspections. 10 CFR 50.55(a) focused on the  
18 implementation of industry standards like the ASME Code  
19 for both active and passive components.

20 It includes specific programs for inspection  
21 and testing as well as analysis of results to inform  
22 future licensee inspections. The QA program  
23 requirements ensure licensees implement the effective  
24 corrective actions based on operating experience

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1       gained from their inspection and testing.

2               These concepts are important as we start to  
3       discuss license renewal.   Next slide, please.   I would  
4       like now to discuss the requirements for license  
5       renewal.   Like initial licensing, licensing renewal  
6       includes both safety and environmental reviews.

7               The purpose of the safety review in the first  
8       license renewal is to provide reasonable assurance that  
9       actions have been or will taken to manage aging of  
10      long-lived passive components important to safety  
11      throughout the period of extended operation.   I will  
12      provide more details on the principles of the safety  
13      review in the next slide.

14              For the environmental review the NRC, in  
15      accordance with NEPA, looks at generic and specific  
16      environmental impacts to conclude whether the impacts  
17      may preclude license renewal.   Next slide, please.

18              CHAIRMAN SKILLMAN:   Could I ask you please  
19      to go back to your Slide 7?

20              MS. BILLOCH:   Yes.

21              CHAIRMAN SKILLMAN:   Please.   In this  
22      graphic you show the Maintenance Rule and you show  
23      Appendix B, Part 50, and you show 50.55(a).   What you  
24      do not show are the numerous programs that the licensees

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1 undertake and that the NRC inspects relative to plant  
2 health, plant performance, trip frequency, Maintenance  
3 Rule A-1 Systems, those types of metrics that all point  
4 to the fundamental health of the facility, and in my  
5 view that information is material to whether one might  
6 consider extending the life of a plant.

7 Do you have a different graphic that includes  
8 all of those other elements? You kind of point to it  
9 on your Slide 5 with operating experience, but I was  
10 just wondering if you see in existing regulatory  
11 process with a thicker magnifying glass many other  
12 critical elements that give confidence that the plant  
13 in its current licensing basis is healthy.

14 MR. PHAM: We don't have a more detailed  
15 description. This is meant to be a summary  
16 representation and I think some of the things you  
17 mentioned are covered in the Quality Assurance Program.

18 I mean, for example, the requirements of the  
19 Corrective Action Program stipulates a lot of different  
20 program-added activities from the licensee. And so  
21 what we meant to demonstrate here was that, you know,  
22 the general overarching requirements that licensees  
23 have to meet in order to maintain the plant operation  
24 is through the Maintenance Rule or the various

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1 activities in the Quality Assurance Program.

2 So I don't think we have left anything out  
3 in specific, except we might have kind of overly  
4 summarized it in the representation.

5 MR. LUBINSKI: If I could also add to that,  
6 Bo, is, and I think you really did explain Slide 5. The  
7 purpose of Slide 7 is to really talk about just the aging  
8 management aspects and to try to get the point across  
9 that, as Araceli had said, aging management is not  
10 unique to license renewal or subsequent license  
11 renewal.

12 It occurred starting from day one and that's  
13 the point of those regulations and we were trying to  
14 highlight on Slide 7. Slide 5 is that overview that  
15 you discussed where when you look at the overall plant  
16 health, the plant safety, the regulatory process  
17 working, this is what assures that the plant operation  
18 continues, that we believe the licensing basis is  
19 adequate, that we believe that the current process is  
20 adequate.

21 You had mentioned some of the indicators we  
22 would use. As you see on the left hand side of the  
23 graphic you have the operating experience, then  
24 assessment to the generic issues, and that would feed

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1 back into whether or not regulatory changes are needed  
2 at that point, whether it's a change to the regulation,  
3 whether it's a change to the licensing for a specific  
4 plant, or whether it's just a change to the oversight  
5 based on those indicators.

6 And I believe Araceli had said when talking  
7 about this slide this is what provides us the confidence  
8 that plants continue to operate safely today and these  
9 processes continue in effect through the license  
10 renewal period and continue to maintain that confidence  
11 that the plants are operating safely.

12 So Item 7 was only meant to be the snapshot  
13 to talk about getting the point across that aging  
14 management does occur during the first 40 years.

15 CHAIRMAN SKILLMAN: John, thank you. We're  
16 back to Slide 8. John, did you have a comment at eight?

17 MEMBER STETKAR: Yes.

18 CHAIRMAN SKILLMAN: Okay, John?

19 MEMBER STETKAR: Personally, and I don't,  
20 let me just bring this up here if you go to eight. You  
21 mentioned briefly the environmental review and we on  
22 the ACRS don't typically become very involved in that  
23 environmental review.

24 Except, there's one part of that

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1 environmental review and I still can't understand why  
2 it's part of the environmental review, but it's the --

3 MR. LUBINSKI: Yes.

4 MEMBER STETKAR: That's why I never got a law  
5 degree and I don't want one. It's the evaluation is  
6 severe accident mitigation alternative, the SAMA is.  
7 You mentioned in the SECY paper that you've approved  
8 so far 73 I think --

9 MS. BILLOCH: Yes, 73.

10 MEMBER STETKAR: -- renewed licenses. What  
11 I'd like to explore, and I don't know whether this is  
12 the appropriate time to do it or whether later, but  
13 sometime during the discussion I'd like to explore your  
14 experience in the quality of the supporting risk  
15 assessment information that's submitted and the depth  
16 of the review that's performed of that information as  
17 part of those SAMA analyses.

18 Because part of what we're going to be  
19 discussing today touches on the notion of perhaps the  
20 need for risk assessment going forward and I'm trying  
21 to bet a bigger picture looking backwards in terms of  
22 what your experience has been. So, Bo, I know you're  
23 the lead on that.

24 MR. PHAM: Yes, I don't --

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1           MEMBER STETKAR: I don't know whether you  
2 want to discuss that now or whether there's appropriate  
3 time later?

4           MR. PHAM: No, I think that I'm going to  
5 recommend that we defer that until later. We have a  
6 specific section talking about PRA.

7           MEMBER STETKAR: Okay.

8           MR. PHAM: And so we'll --

9           MEMBER STETKAR: That's good. I just  
10 wanted -- It's pumped in my memory because it was --

11          MR. PHAM: Yes.

12          MEMBER STETKAR: Thank you.

13          CHAIRMAN SKILLMAN: Okay?

14          MS. BILLOCH: Yes.

15          CHAIRMAN SKILLMAN: Okay, back to Slide 9,  
16 eight or nine?

17          MS. BILLOCH: Yes.

18          MALE PARTICIPANT: Nine.

19          CHAIRMAN SKILLMAN: Nine, okay.

20          MS. BILLOCH: This slide includes the  
21 fundamental principles that make license renewal  
22 review possible. First, that with the exception of  
23 detrimental effects of aging the existing regulatory  
24 process as I discussed in the previous slides is

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adequate for safe plant operations.

The second and equally important principle is that each plant's current licensing basis must be maintained during the renewal term in part through management of aging degradations. These principles were established during the development of the rulemaking for Part 54 and have carried us to where we are with respect to license renewal. Next slide, please.

This slide, it's meant to illustrate the overall regulatory process for safety during the license renewal period. The left side is the same as the slide we discussed before, that current regulatory process continues to be maintained and to be effective during the license renewal period.

The additional aging management box to the right represents the additional licensing basis requirements for license renewal. As you can see in the diagram the existing regulatory process observes the aging management aspect for license renewal.

First, the requirements were established during the development of specific regulations, 10 CFR, Part 54. Second, licensing ensures the implementation of both generic and plant-specific Aging Management

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1 Programs to ensure components continue to perform their  
2 intended safety functions.

3 Third, inspection programs verify licensee  
4 implementation of Aging Management Programs.  
5 Finally, operating experience reviews include  
6 knowledge gained through the implementation of Aging  
7 Management Programs.

8 All of these processes, lessons learned, are  
9 valuable and implemented both generically and on a  
10 plant-specific basis. Next slide, please.

11 CHAIRMAN SKILLMAN: Well let's go back to  
12 nine just a second, please.

13 MS. BILLOCH: Sure.

14 CHAIRMAN SKILLMAN: Yes, the way that bullet  
15 is presented it basically says the regulatory basis,  
16 or the regulatory process is adequate for everything  
17 but, potentially, detrimental effects, and on Slide 10  
18 you show the red or the pink add-in for the detrimental  
19 effects.

20 Is that what you're communicating on Slide  
21 9? You say everything but and this is the exception?

22 MS. BILLOCH: Yes.

23 CHAIRMAN SKILLMAN: And that is the add-in  
24 to your previous graphic?

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1 MS. BILLOCH: All right, yes.

2 CHAIRMAN SKILLMAN: Okay, thank you.

3 MR. PHAM: At the time of document 50.54  
4 initially the Commission was trying to, looking at  
5 anything that was otherwise unique, uniquely relevant  
6 to a period of extended operation and at the time the  
7 aging management, or passive long-lived components  
8 were in particular was that one piece.

9 And what we also try to demonstrate here in  
10 these next slides we haven't gotten to is the fact that,  
11 you know, part of the reason why that additional piece  
12 was identified was the fact that their possibility of  
13 the Maintenance Rule and the Quality Assurance Program  
14 focusing on components that were passed, you know.

15 The Quality Assurance Program certainly  
16 focuses on components that were more, indicators that  
17 were more readily available for active components and  
18 the concern with the Maintenance Rule at the time, it  
19 was fairly newly implemented, was the fact that  
20 long-lived components, like concrete structures, for  
21 example, could be screened out for being inherently  
22 stable or reliable.

23 CHAIRMAN SKILLMAN: Okay.

24 MEMBER REMPE: So I don't know if this is the

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1 place to bring it up but I'd like to bring it up while  
2 the staff's in front versus industry or other folks that  
3 will be presenting today.

4 We got a lot of background material to read  
5 for in preparation of this meeting and some of the  
6 background information conveyed that there was a lot  
7 of work that needed to be done in the aging management  
8 and materials degradation area.

9 Other information indicated that the staff  
10 and other organizations had looked through what needed  
11 to be addressed and you were getting the data you need.  
12 What's the staff's opinion?

13 Do you think that you have identified all of  
14 the issues and are these underway that will effectively  
15 answer your questions? Do you think the effort's  
16 underfunded that you need to be doing more? What's  
17 your opinion?

18 DR. GAVRILAS: I think we'll address that in  
19 the technical part of the presentation. We'll give you  
20 an overview of what has happened today and what is going  
21 on now including as far as we know a high-level overview  
22 of research activities both in the industry and at DOE  
23 as well as research activities in the Agency.

24 During that conversation, today we'll cover

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1       that at a high level because it would be a different  
2       panel that had to address this issue with you today if  
3       we were to dwell into any detail. But we'll give you  
4       that overview and we'll have a conversation then.

5               MEMBER REMPE: Yes, okay.

6               CHAIRMAN SKILLMAN: Thank you.

7               MS. BILLOCH: Next, yes. Like the last  
8       slide this slide demonstrates aging management  
9       requirements for the first 40 years with the inclusion  
10      of additional requirements for aging management of  
11      long-lived passive components expanded for license  
12      renewal.

13              This is demonstrated in the far right column  
14      and presented by the extended bar for passive  
15      components. The left side is the same as we discussed  
16      earlier. The programs established for aging  
17      management of passive components continue to be  
18      maintained and to be effective.

19              In license renewal some of the Aging  
20      Management Program from long-lived passive components  
21      continue to be maintained without change. Others may  
22      need to be enhanced and new aging management programs  
23      may need to be developed based on aging for long-term  
24      operations. Next slide, please.

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1 DR. SHACK: Just if I can ask a question.  
2 One of the strengths I think of the aging management  
3 is that, you know, there's this emphasis on operational  
4 experience and that's a good thing, it says we don't  
5 have to have perfect knowledge when we approve one of  
6 these aging management programs that if something goes  
7 wrong we'll fix it.

8 I was reading the Inspector General's report  
9 about whether these changes are backfits, then I read  
10 the RIS and I got confused. Are you going to still  
11 maintain the same flexibility in these aging management  
12 programs?

13 The changes to the Aging Management Program  
14 based on operational experience are not backfits,  
15 they're really, or there's a compliance exception that  
16 the requirement is that you maintain the structure, the  
17 details of how you do that get adjusted as you go along,  
18 is that still going to be true or is there some  
19 additional considerations?

20 MR. PHAM: Yes, I mean, part of what you see  
21 in our Recommendation 4, of Option IV for the SECY paper  
22 was to address that and our expectation is that a  
23 licensee will continue to maintain its CLB and part of  
24 that is if new operating experience is fed back into,

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1 allow them to make changes to the Aging Management  
2 Program, that's part of the maintenance of their  
3 current licensing basis.

4 However, that is not explicitly stated in any  
5 particular requirements of Part 54 and I think the  
6 confusion is that, you know, how far, you know, the  
7 deciding factor or when the NRC issued the license, the  
8 renewed license, based on what the explicit requirement  
9 or expectation was to a part of what we recommended to  
10 address, to identify, or assessing the effectiveness  
11 of aging management in Option IV, this paper was to  
12 address that.

13 DR. SHACK: But is that their real problem?  
14 I mean my impression is that as we've gone along in  
15 license renewal certainly we've gone through several  
16 now additions of GALL and, you know, the plants have  
17 basically changed some of those Aging Management  
18 Programs reflecting operating experience and so I don't  
19 see there's actually been a real problem in doing it.

20 MR. PHAM: Actually part of that we'll cover  
21 in Butch's portion of the presentation. Wherever we  
22 are right now is we really don't have the data to  
23 substantiate that.

24 MEMBER STETKAR: But, Bo, I mean look at what

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1 has evolved in GALL --

2 MR. PHAM: Yes.

3 MEMBER STETKAR: -- over the last five, six,  
4 eight years on issues like underground piping and  
5 issues like medium and low voltage cables. All of  
6 those evolved in GALL and indeed in the current license  
7 renewal process as a result of operating experience.

8 MR. PHAM: Yes.

9 MEMBER STETKAR: It wasn't as a result of  
10 research, it was a result of operating experience. And  
11 now the license renewals that are coming in need to  
12 conform to REV 2 of the GALL Report which reflects that  
13 operating experience. So I'm not sure --

14 DR. SHACK: But even more importantly the  
15 old ones sort of have upped their aging management  
16 programs --

17 MEMBER STETKAR: That's right, yes.

18 DR. SHACK: -- and it really hasn't gone  
19 through a backfit process to do that and, you know, I  
20 would hate to lose that flexibility because it said if  
21 you don't that means up front you have to have perfect  
22 knowledge of what's going to happen.

23 MEMBER STETKAR: That's right because  
24 people will say I'm required to do this and I do not

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1 need to do anything else.

2 MR. LUBINSKI: And if I could add here, Bo,  
3 if you don't mind. And I think the point you're getting  
4 to is exactly the reason that we were looking at Option  
5 IV to propose this as a requirement in the Rule, because  
6 as you said when we develop this operating experience  
7 there was a couple aspects of it.

8 Number one is plant-specific and, you know,  
9 we've not identified any issues from a plant-specific  
10 basis where they have not incorporated operating  
11 experience into their Aging Management Programs, but  
12 the broader step is then incorporating that across the  
13 industry.

14 Then when we've identified or become aware  
15 of the information that we've evaluated to make a  
16 determination whether to update our GALL and then we  
17 use that when we're assessing new plants. The issue  
18 is for the plants that already have their licenses and  
19 what are they doing from a plant-specific as well as  
20 a generic basis?

21 We believe the enhancement further supports,  
22 as you said, Dr. Shack, that we would want to continue  
23 to rely on those programs as they move forward with the  
24 understanding, with the belief, and even more

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1       importantly with an explicit requirement that they  
2       periodically consider the operating experience and go  
3       forward in assessing their aging management programs  
4       that they used as the basis for subsequent license  
5       renewal to verify that they're still adequate.

6               It'll be an explicit requirement, and we  
7       haven't gotten through the words yet because, again,  
8       we're just starting the process, but the intent would  
9       be that when these new issues are identified that the  
10      licensees would evaluate their own programs.

11             If they're the first, second, third plant  
12      that receives a license for subsequent license renewal  
13      we want to make sure down the road, five years later  
14      when this new experience comes from maybe another  
15      plant, that those plants explicitly look at their  
16      programs, evaluate their aging management programs,  
17      and make the appropriate changes.

18             And, as you said, the risks that we issued  
19      discusses the points of where we're looking at under  
20      our quality assurance Programs and where the  
21      requirements are in place. But that just says if it's  
22      identified they will do so something. We want the more  
23      proactive assessment of the aging management programs  
24      as they move forward.

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1                   So it actually, I think it supports more  
2                   where your concern is, that it's even enhancing that  
3                   more.

4                   CHAIRMAN SKILLMAN: Okay?

5                   MS. BILLOCH: Yes, next slide. Now I will  
6                   provide a brief of the license renewal status. First,  
7                   73 units have been re-licensed since 1998.  
8                   Thirty-eight of those units will be in the period of  
9                   extended operation and eligible for subsequent license  
10                  renewal by the end of this year.

11                  We have 18 additional units currently under  
12                  review and the industry has indicated that nine  
13                  additional units might come in for license renewal  
14                  between this year and 2018. Other plants will reach  
15                  the end of the period of extended operation by 2029.

16                  The industry has also indicated that the  
17                  first application for subsequent license renewal might  
18                  be submitted by 2018. Also, we always had understood  
19                  the role of economics that plays in any decision  
20                  regarding license renewal.

21                  Some plants had decided to shut down prior  
22                  to the end of that period of extended operation. Now,  
23                  Butch Burton will discuss the details for subsequent  
24                  license renewal.

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1 CHAIRMAN SKILLMAN: Before you change that  
2 slide --

3 MS. BILLOCH: Yes?

4 CHAIRMAN SKILLMAN: -- the next to the last  
5 bullet, the first SLR application expected in 2018, how  
6 many additional SLR applications do you anticipate?  
7 Are we talking about one or 20?

8 MR. PHAM: I think the industry is probably  
9 in a better place to answer that question, however, you  
10 know, we tried to do our best to kind of anticipate and  
11 engage with the industry on what some of the factors  
12 are and a lot of them are due to, go back to that last  
13 bullet there, is the economics situation.

14 I think you have factors that you do, from  
15 our perspective what we tried to look at is, you know,  
16 what the regulated market looks like out there and the  
17 other perspective is, you know, the plants that have  
18 decided to shut down early, for example, like Vermont  
19 and Yankee or Kewaunee are smaller units and sort of  
20 market on their own.

21 I think this concept of merchant plants  
22 having probably a harder time making the economic case  
23 would be sort of a telling indicator, you know, and we  
24 don't have a firm number, but based on our assessment

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1 of those factors we think there is a significant number  
2 of units that'll come in somewhere between the middle  
3 third of the total fleet out there, that warrants us  
4 to kind of propose going towards, on these issues on  
5 the rulemaking as opposed to just dealing with them on  
6 a plant-by-plant basis.

7 CHAIRMAN SKILLMAN: Okay, let me see if I  
8 can't repeat that back. I think what you said of  
9 approximately 100 current licensed plants maybe 30  
10 might come in for an SLR and because of that number that  
11 warrants your recommendation for Option IV of the SECY?

12 MR. PHAM: Yes.

13 CHAIRMAN SKILLMAN: Is that what you're  
14 saying?

15 MR. PHAM: Yes.

16 CHAIRMAN SKILLMAN: In other words --

17 MR. PHAM: I think that 30 will be sort of  
18 near the low end of it.

19 CHAIRMAN SKILLMAN: So you're saying the  
20 economics, at least from the staff position, are great  
21 enough to warrant Option IV, that is all of the changes  
22 that you are recommending in the SECY?

23 MR. PHAM: Yes.

24 CHAIRMAN SKILLMAN: Okay, let me just pause

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1 for a minute for my colleagues. Anybody wish to stop  
2 or halt or question? Okay, Araceli, thank you.

3 MS. BILLOCH: You're welcome.

4 CHAIRMAN SKILLMAN: And, Bo, thank you.  
5 Butch?

6 MR. BURTON: All right. Good morning. My  
7 name is Butch Burton, I'm a Project Manager in NRR's  
8 Division of License Renewal. From our review of the  
9 current regulatory framework we were able to confirm  
10 that the fundamental principles of license renewal have  
11 served us well.

12 You've already heard them but I'll just again  
13 mention that the first principle is that with the  
14 possible exception of aging our current processes are  
15 adequate to ensure that the licensing bases of current  
16 plans can be maintained in depth to ensure reasonable  
17 assurance of safe operation.

18 Second principle, licensing basis can be  
19 maintained in the same manner and to the same extent  
20 in the period of extended operation as it was in the  
21 initial operating period. Based on this approach  
22 we've been able to put the proper focus on aging effects  
23 that are unique to license renewal.

24 We put special emphasis on continuous

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1 learning throughout the license renewal program. As  
2 was mentioned we've learned many lessons from our  
3 reviews of the 73 units that have received renewed  
4 licenses over the past 14 or so years.

5 We're also continuing to learn lessons from  
6 the 18 applications that we're currently reviewing and  
7 we've captured many of these lessons in updates to our  
8 guidance documents, GALL and SRP primarily.

9 We've learned much from these interactions  
10 with stakeholders, from our interactions with  
11 stakeholders, including the ACRS. We're now learning  
12 how licensees are implementing the AMPs and using them  
13 on a day-to-day basis.

14 The first licensees have approximately five  
15 years of experience in their period of extended  
16 operation. There are many lessons to be learned ahead  
17 and we look forward to the knowledge that we gain and  
18 also the industry looks forward to that also.

19 Araceli has already provided you with an  
20 overview of the current regulatory framework and how  
21 it's been applied to the initial licensing term and to  
22 the first period of extended operation.

23 As you can see we followed our key principles  
24 for the license renewal program which has resulted in

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1       successful review in issuance of renewed licenses for  
2       the first license renewal period.

3               CHAIRMAN SKILLMAN: Butch, let me halt and  
4       ask you to back up one slide, please.

5               MR. BURTON: Sure, sure.

6               CHAIRMAN SKILLMAN: And I would like to ask  
7       about the second bullet, please, continuous learning  
8       in a license renewal. We've heard for the last few  
9       minutes about the technical issues, about GALL, about  
10      operating experience, about factoring that into  
11      decision-making for the future.

12              What is factored into the discussion today  
13      regarding foreign licensing renewal experience? What  
14      can you tell us about IAEA, what are the Europeans  
15      doing?

16              What is different about their approach to  
17      extending life versus the NRC's approach to extending  
18      life such that there may be some diamonds in their  
19      approach that we might overlooked unless we stop and  
20      talk about it? Okay.

21              MR. BURTON: Good question, and we do intend  
22      to talk about that. Dr. Brady in her presentation is  
23      going to go into that a little bit more. But, yes, we  
24      did look at the approaches from International

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1 perspectives and PSRs and some of those things and we  
2 did specifically take a look at that to see what  
3 insights could be gained from that, and Dr. Brady is  
4 going to actually talk about that and so --

5 (Simultaneous speaking,)

6 MR. LUBINSKI: Well before we go there --  
7 Excuse me, if I can provide a, just give kind of the  
8 high level overview --

9 MR. BURTON: That's fine.

10 MR. LUBINSKI: -- because Dr. Brady will  
11 discuss a little more of the details, but you talked  
12 about IAEA and then you also talked about the  
13 International experience around the world and let me  
14 state from the standpoint of IAEA, IAEA doesn't have  
15 any specific requirements, any specific standards,  
16 regarding what we would call license renewal.

17 And the reason for that is that different  
18 countries do it different ways, whether they license  
19 a plant for 20 years, 40 years, or have no expiration  
20 date. Where IAEA does get involved are two aspects  
21 that you could relate that are called long-term  
22 operation which is where IAEA puts their focus in the  
23 words long-term operation.

24 One is the periodic safety reviews and they

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1 look at having a requirement that periodic safety  
2 reviews or the equivalent of a periodic safety review  
3 every ten years. As part of that periodic safety  
4 review is first a compliance review and secondly it is  
5 a safety assessment, so there's the two components to  
6 that.

7 We believe in the United States that our  
8 current processes that we talked about back on Slide  
9 5 of the continued oversight and our continued  
10 identification of issues and handling them as they  
11 occur provide that equivalent in the U.S., so we are  
12 continually looking at the safety review, continually  
13 looking at compliance.

14 The second item that IAEA looks at is aging  
15 management. Just recently, when I say recently I don't  
16 believe they have issued a final document yet, but they  
17 had to the member States, issued an International  
18 generic aging lessons learned which puts aging  
19 management programs in place, or provides what would  
20 be adequate aging management programs.

21 That was heavily based on the U.S.'s GALL  
22 Report, the NRC's GALL, and we were active participants  
23 in development of those documents, so that's the two  
24 IAEA documents/requirements that are out there

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1 directly affecting long-term operation.

2 From the standpoint of what we've learned  
3 from International experience and how people are  
4 actually implementing it, as I said there's an  
5 inconsistency where some, you can't say that people are  
6 doing it all the same way, and what I mean by that is  
7 that, you know, some don't have expiration dates.

8 And then what they do is they used a PSR  
9 process to implement some of these additional  
10 requirements. So whether it's a 20 years, 30 years,  
11 40 years, 50 years, when they're doing that periodic  
12 safety review, which they require it every ten years,  
13 they may add an additional requirement that the safety  
14 assessment look at a comparison to new designs, new  
15 design standards, new safety enhancements.

16 And the best we've gathered at this point is  
17 that, because we haven't seen many go into that point  
18 beyond the 40 years and how they're actually  
19 implementing it, but the terminology they're using is  
20 that they would require any reasonable and practical  
21 changes to enhance safety be implemented at that  
22 timeframe.

23 And that's where you see the difference right  
24 now in our presentation versus what you're looking at

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1 in PSR space and the way they're looking at it  
2 Internationally. We believe the current process we  
3 have, during the first 40 years, during the years 40  
4 to 60, does enhance safety.

5 There have been changes to the licensing  
6 basis. As Araceli said it's not the same licensing  
7 basis that it was in day one because they made changes  
8 along the way for various reasons.

9 The International community is looking at  
10 doing that at the periodic safety reviews at the 10-year  
11 point and doing that evaluation with the intent of  
12 increasing safety. Our philosophy is the same as it  
13 was in the first license renewal. We're continuing to  
14 maintain the current level of safety.

15 What you'll hear from Dr. Brady later is that  
16 we did look at a select group of periodic safety reviews  
17 that were done to date. They were not done with a focus  
18 towards what I would call the equivalent of license  
19 renewal, but she will discuss some of the items that  
20 were identified in those reports and whether or not we  
21 believe those types of issues have already been handled  
22 under our current systems or how they relate to license  
23 renewal.

24 Does that help to answer?

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1 CHAIRMAN SKILLMAN: Thank you, John. Yes,  
2 sir.

3 MEMBER RAY: Yes, well let me now --

4 MR. BURTON: Sure.

5 MEMBER RAY: I will ask you a question.  
6 It's your position is it not that the continuous  
7 learning and license renewal applies to site hazards  
8 analysis? In other words, whereas at the time of  
9 license renewal we look at a lot of things, we don't  
10 specifically update the site hazards, seismic flooding  
11 and so on, correct?

12 MR. LUBINSKI: We do not, and we look at that  
13 as being part of the current process. When we're  
14 talking about continuous learning in license renewal  
15 the focus there has been on the aging management and  
16 what we're learning through aging management.

17 MEMBER RAY: Yes, I understand that. But  
18 still in all I just want to make the point that some  
19 things get focused attention at the time of license  
20 renewal but that does not include the site hazards  
21 because it's believed that the site hazards are kept  
22 current throughout the life.

23 MR. LUBINSKI: That is correct. And that's  
24 --

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1                   MEMBER RAY: All right. And that's really  
2 your position?

3                   MR. LUBINSKI: Yes, it is.

4                   MEMBER RAY: All right.

5                   MR. LUBINSKI: And we believe that if we were  
6 to identify that it was not kept up to date and was not  
7 kept current that that should be an action we take now,  
8 we don't wait until subsequent license renewal, we  
9 don't wait until the 60-year point to do that. Instead  
10 we would look at doing that today.

11                  MEMBER RAY: Well, you know, I would just say  
12 that --

13                  MR. LUBINSKI: And we have done that in  
14 response to the Fukushima event.

15                  MEMBER RAY: Okay, you brought up Fukushima,  
16 I didn't, but the point is it is an example that's  
17 relevant to this question.

18                  MR. LUBINSKI: Yes.

19                  MEMBER RAY: And the argument I would make  
20 is that, just like with aging, site hazards  
21 incrementally change over time. It's very, very hard  
22 to say today the hazard is now different and we have  
23 to reevaluate it and do something about a specific plant  
24 site.

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1           So, you know, I'm going to argue ultimately  
2           that the assumption that we keep the site hazards  
3           current throughout the life of the plant every day,  
4           every hour, is just not viable.

5           MR. LUBINSKI: And if I could just clarify,  
6           well let me start with, yes, I did bring up Fukushima,  
7           I took the bait on that one, yes, I brought that into  
8           the conversation and when I said up-to-date, yes, I'm  
9           going to use the work periodically.

10          Do plants every day look at every hazard?  
11          No. But as new information is developed, as new  
12          information evolves, yes, they do look at those  
13          external hazards and then when we become aware and  
14          believe that we need to take action generically across  
15          the board we do that and that was my reference to, in  
16          response to Fukushima.

17          That's an area where we've looked at and  
18          said, from a seismic issue, from a flooding issue, we  
19          want plants to go do a reassessment and that --

20          MEMBER RAY: Well that goes without saying,  
21          I think, but on the other hand I'm just pointing out  
22          this continuous learning issue. It just seems to me  
23          like we're not learning that things change over decades  
24          in terms of what the hazards are in ways that aren't

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1 triggering to the kind of review that you're talking  
2 about.

3 MR. LUBINSKI: And when Butch talks about  
4 Option IV in a few minutes we'll talk about from that  
5 standpoint why we believe it is important to keep that  
6 length to what the proposed rulemakings, or potential  
7 rulemakings are with respect, response to Fukushima,  
8 and if they're not addressed there then we would have  
9 to look at what we do for subsequent license renewals.

10 MEMBER RAY: Okay, but that's, you're making  
11 the point now I was hoping you would make --

12 MR. LUBINSKI: Yes.

13 MEMBER RAY: -- which is we haven't lost  
14 sight of this as an issue.

15 MR. LUBINSKI: Right. And we felt that was  
16 why it was important to put in the paper. We did not  
17 put in the paper to modify Part 54 for license renewal  
18 to require this review because we believe it's going  
19 to be adequately addressed in response to Fukushima.

20 If it is not, or it's not done in a timely  
21 manner, we will address it specifically for the first  
22 subsequent license renewal applications that come in  
23 until it is handled generically.

24 MEMBER RAY: And you would intend for that

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1 when this all over and done with to be explicit?

2 MR. LUBINSKI: Yes.

3 MEMBER RAY: In other words, it's not just  
4 something we talk about today and forget out a year from  
5 now?

6 MR. LUBINSKI: Our expectation is to be  
7 explicit in 10 CFR and probably in Part 50, not Part  
8 54.

9 MEMBER STETKAR: Can I ask something, and I  
10 detest this notion of making everything focus on  
11 Fukushima as if flooding and seismic events are going  
12 to --

13 DR. SHACK: Well GSI 199 was in place before.

14 MEMBER STETKAR: That's right. So, Butch,  
15 when you get to Option IV, I was going to wait until  
16 we get to Option IV, but it's mentioned in the context  
17 of Chapter 2, the Final Safety Analysis Report, and I'd  
18 like to keep it in that context because that doesn't  
19 have the word Fukushima in it, it has external hazards.

20 Plants are required to update their Final  
21 Safety Analysis Report I think sort of around every two  
22 years or so.

23 FEMALE PARTICIPANT: Yes.

24 MEMBER STETKAR: And part of this continuous

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1 learning and to kind of follow on in this notion of  
2 updating the state of knowledge, for example, in  
3 Chapter 2 there are assessments of the site  
4 meteorology.

5 Originally when plants were licensed back,  
6 oh, I don't know, 40 years ago, people took a snapshot  
7 of oh, maybe five years worth of rain data from oh,  
8 someplace that was 100 miles away and said we're going  
9 to use that as our meteorological data.

10 Do the plants periodically update that  
11 meteorological data and look at trends in that  
12 meteorological data as part of their updated Final  
13 Safety Analysis Report so that maybe if they only looked  
14 at five years worth of data at a meteorological station  
15 100 miles away because that's all they said they had,  
16 do we now have, maybe if a couple of hundred years, not  
17 a couple of hundred, let's say a hundred years worth  
18 of data because we can actually find that, from regional  
19 meteorological data and 40 years of accumulated data  
20 from the site itself?

21 Is that factored in as part of their process?  
22 And you can wait and answer that, if you want, in the  
23 context of Option IV or you can do it now.

24 MR. BURTON: Okay. Yes, actually when I

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1 talk about Option IV I'll be talking about issues that  
2 both of you have addressed.

3 MEMBER STETKAR: Good, okay. Good.

4 MR. BURTON: But if I forget --

5 MEMBER STETKAR: I'll remind you, don't  
6 worry. I have it written down here.

7 (Laughter)

8 MEMBER STETKAR: If I don't write it down  
9 I'll forget, but it's written down.

10 MR. BURTON: Yes. And I think we --

11 MEMBER STETKAR: But I did want to do in the  
12 context of the updated Final Safety Analysis Report,  
13 not in the context of whatever the lawyers are going  
14 to negotiate over the words Fukushima.

15 MR. BURTON: Understood.

16 CHAIRMAN SKILLMAN: I would like just to  
17 pause here. Thank you to Harold, talking about  
18 hazards. John, about safety report each two years.  
19 Bill, reminder of, what was it, 199? Colleagues, any  
20 other comments at this stage? Joy? Charlie? Pete?  
21 Thank you.

22 MR. BURTON: Okay.

23 CHAIRMAN SKILLMAN: Go ahead.

24 MR. BURTON: Picking up on Slide 14. We

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1 mentioned that we think our basic principles of license  
2 renewal have served us well, but now we're looking at  
3 licensing plants for 60 to 80 years.

4 What if anything needs to change for us to  
5 perform effective, safety-focused reviews on  
6 applications for the subsequent license renewal  
7 period? That was our key question.

8 To answer that, the staff is performing a  
9 comprehensive assessment of the current regulatory and  
10 technical frameworks to determine if they're adequate  
11 to support SLR. As John mentioned earlier our  
12 assessment is proceeding on two parallel tracks.

13 One to assess the regulatory framework and  
14 the other to assess the technical framework. I'll  
15 discuss the process we're using to assess the  
16 regulatory framework and Drs. Brady and Gavrilas will  
17 discuss the assessment of the technical framework.

18 The staff believes in the continued validity  
19 of the two principles that undergo the license renewal  
20 program, we've already mentioned them a couple of  
21 times.

22 The approach for SLR leverages these  
23 principles as well as the lessons learned from the first  
24 license renewal. The focus of the SECY paper is

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1 primarily on our work along the regulatory path.

2 The staff is continuing its assessment of the  
3 technical feasibility of SLR and we will, as mentioned  
4 before, we will engage the Committee at the draft stage  
5 of publishing our technical basis documents. Next  
6 slide, please.

7 In performing its review of the regulatory  
8 framework the staff identified over 60 issues it felt  
9 worthy of consideration. In disposition of these  
10 issues we set up several criteria. One was that the  
11 issue was outside the scope of license renewal and best  
12 addressed through other current regulatory processes.

13 For example, one of the things that we  
14 considered, should we include ISFSIs, Independent  
15 Spent Fuel Storage Installations, to be included within  
16 the scope of license renewal? We concluded that wasn't  
17 necessary, that was already covered under Part 72, but  
18 that was an example of some of the issues that we  
19 considered and we decided were outside the scope.

20 Another criteria was that we looked at issues  
21 and they were dispositioned because they were best  
22 addressed through guidance and you've seen that over  
23 the years with many of the ISGs that we've developed  
24 and we've incorporated into the GALL and the SRP.

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1           We also looked at such things as internal  
2           training of some of the staff on license renewal here  
3           in Headquarters and in the regions and obviously we  
4           didn't think that that rose to the level of any kind  
5           of requirement, but there were improvements that we can  
6           make there in terms of our training.

7           And then finally the last criteria was we  
8           felt that the issue was best addressed through a  
9           rulemaking and those are some of the proposals that you  
10          saw in the SECY papers, such as the incorporation of  
11          50.61(a) with regard to pressurized thermal shock as  
12          well as the incorporation of some, a requirement to  
13          ensure we had the SSCs in order to support 50.54(hh)(2),  
14          loss of large areas due to fire or explosions. Slide  
15          16 --

16          MR. PHAM: Can I just kind of make a note  
17          here? I know you're probably wondering what all the  
18          various issues are. I will say that, you know, when  
19          we started out this process we did really open the door  
20          wide open to all sorts of issues that came out, things  
21          that are, you know, more or less outside of the box.

22          PSR was one of the items that we looked at  
23          to say is there an alternative approach to the way we  
24          license right now and I can tell you that, you know,

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1 maybe the three bullets that you have on the slides they  
2 don't really tell the full story, but, you know, we  
3 tried our best to take all of these issues that were  
4 sometimes outside of the box and very abstract compared  
5 to what we do now and put it to the test of whether the  
6 existing regulatory process works to handle that.

7 And that's how we came up with the  
8 disposition of the issues and, frankly, I anticipate  
9 that if we do get the approval to go ahead and engage  
10 in rulemaking a lot of this stuff will come up as part  
11 of the regulatory basis that we'll have to develop and  
12 defend as part of that process.

13 MEMBER BLEY: Were the 60 plus issues  
14 identified under the regulatory framework different  
15 from the issues identified for technical or was it the  
16 same list of issues and then you looked at them from  
17 both points of view?

18 MR. PHAM: We threw anything and everything  
19 into the mix.

20 MEMBER BLEY: So it's one big list --

21 MR. PHAM: Right.

22 MEMBER BLEY: -- and then you decided  
23 whether it was a regulatory problem or technical or  
24 both?

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1 MR. PHAM: Yes.

2 FEMALE PARTICIPANT: Yes.

3 DR. SHACK: Well did you decide some of them  
4 really weren't a problem? I mean, you know, if you look  
5 at the flex equipment in the (hh)(2) would you screen  
6 them with the same rules you screen equipment now?

7 MR. PHAM: I think we, at the screening stage  
8 we didn't do a full blown in-depth regulatory analysis  
9 of that and so, for example, the (hh)(2) requirements,  
10 one of the things that we are proposing in Option II  
11 is to pursue that further as part of rulemaking to  
12 determine is there a framework that we can actually pull  
13 that into scope for license renewal.

14 And the other thing we looked at also is what  
15 about the equipment required for security? And, you  
16 know, like do the guard stations need to be age managed  
17 as well because they're relied on for safety, for  
18 security of the plant.

19 And I don't think we have all the answers for  
20 that at this point, but that's really, as Butch talked  
21 about, the process of how we put everything into the  
22 framework so we can further consider it.

23 So what we came out with is the options in  
24 the paper are the things that we thought was noteworthy

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1 and we needed to pursue further and get more, additional  
2 details on.

3 DR. SHACK: I see.

4 MR. LUBINSKI: Yes, if I could add to that,  
5 too, is, and going to the question of the over 60 issues  
6 from a technical standpoint. Yes, we believe that the  
7 issues that we felt needed further review such as the  
8 flex equipment is an example, we specifically called  
9 that out into looking at rulemaking.

10 Some of the other issues that we talked about  
11 such as, you know, the PSR issue, that's where I say  
12 from those issues we said we believe that we've done  
13 a thorough enough analysis that said no, we don't need  
14 to move further on there.

15 So the majority of those 60 issues that we've  
16 talked about are not being dispositioned through a  
17 rulemaking process or looking at them any further, you  
18 know, the security is an example there. EP, that would  
19 be one where we believe the current processes  
20 themselves and the current regulatory process is  
21 sufficient to continue to address that.

22 We specifically did call out those that we're  
23 going to put into the Rule, or put into consideration  
24 for the Rule, so I don't want to give the misperception

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1       that this is opening all those issues up to rulemaking,  
2       it's just those select few that we've identified.

3               CHAIRMAN SKILLMAN:   Okay, thank you.

4               MR. BURTON:   Okay, Slide 16.   You've seen  
5       this slide before.   This is an extension of Slide 10  
6       that Araceli discussed earlier for both initial  
7       licensing for the first 40 years as well as license  
8       renewal for 60 to 80 years.

9               Here we've added a box to illustrate the  
10       additional activities that we believe are needed to  
11       ensure that effective management can continue for the  
12       subsequent license renewal period.

13               As current processes continue to be as  
14       effective as they have been, our focus will be on the  
15       effectiveness of the AMPs as they are being implemented  
16       across the operating fleet.   Next slide, please.  
17       Again, you saw this slide --

18               MEMBER BROWN:   Excuse me.   If you just said  
19       I saw that in your paper, have you defined what you mean  
20       by effectiveness of the AMPs or have you laid out  
21       criteria yet for that or is that still something to come  
22       based on further thought processes on what you're  
23       trying to do?

24               MR. BURTON:   Yes, good question.   We

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1 discussed that, what is an effective AMP, what does  
2 effectiveness mean? And what we envision is that,  
3 again, if we get approval from the Commission to move  
4 forward with this as part of the development of the  
5 regulatory basis to support a decision to move forward  
6 with rulemaking what we envision is a series of  
7 questions that we'll go out and discuss with  
8 stakeholders and that would be one of them, to start  
9 to begin to interact with those who are on the ground  
10 dealing with this to try and gain an understanding of  
11 what does effective mean.

12 At this point we don't have any written, firm  
13 description or definition of it, but I think that is  
14 something that in moving forward to subsequent license  
15 renewal we are going to have to get alignment all the  
16 way around with all our stakeholders on what that means.

17 So that is one of the things that we talked  
18 about and we anticipate having discussions about.

19 MEMBER BROWN: Okay, just one thought on it.  
20 I mean there's kind of two ways based on the way you  
21 all normally do things. Is your thought process that  
22 it's going to be process-oriented effectiveness  
23 determination or will it embrace or include what I would  
24 call quantitative or technical qualitative-type

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1 attributes?

2 I mean process is process if somebody has a  
3 process to say hey, my program is effective. The other  
4 thing is do you actually establish some types of  
5 quantitative or what I, yes, I'd call qualitative-type  
6 technical attributes that somebody should address.

7 I know you haven't done them yet, but so many  
8 things fall into this just process only. They've got  
9 a procedure to do it, but we haven't given them any  
10 criteria against which they should be judged.

11 MALE PARTICIPANT: Yes.

12 MR. BURTON: Sure. I think it's a great  
13 question. It's actually a little bit abstract and it's  
14 going to be a mix of both we imagine. I think what we  
15 put into the SECY paper at this point are not explicit  
16 or a specific proposed rule.

17 But some general areas where we talk about  
18 how to look at the assessment, or the effectiveness of  
19 the Aging Management Program. One is, is there some  
20 method to, some systematic assessment method which is  
21 a process. Another is some process to report specific  
22 operating experience, that is specifically related to  
23 aging management, another process.

24 But out of that process there will be, we

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1 anticipate that the information that we get from the  
2 operating experience as well as the assessment analysis  
3 will feed into the update of our guidance document like  
4 the GALL, for example.

5 And then the third piece is, you know,  
6 reporting, we envision some form of reporting of  
7 changes to the Aging Management Program. Bill, you had  
8 asked earlier what, does the system currently work?

9 It does to the extent that the staff has  
10 identified a lot of issues like buried piping,  
11 inspection of manhole covers for the electrical  
12 cabling. However, we need, what we're looking for is  
13 the plants that are implementing these programs  
14 themselves are the ones that should be informing the  
15 process.

16 And so the three sort of general areas where  
17 we've talked about in Option IV with respect to  
18 assessment of effectiveness of aging management, it is,  
19 you know, one, is we have to identify what that process  
20 is and then out of that process it should feed into the  
21 technical updates of the guidance document and known  
22 information from a technical or bonded perspective.

23 MEMBER BROWN: All right.

24 DR. SHACK: And on that sort of -- I notice

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1 for the buried piping, which the industry has taken  
2 fairly strong action on, they actually have a program  
3 that sort of is pretty mandated about reporting  
4 operating experience to the EPIX database.

5 Do you have access to that kind of  
6 information? Is that --

7 MR. BURTON: EPIX, yes, we do.

8 DR. SHACK: Okay, so you have access to that,  
9 but you don't think that is adequate to reflect  
10 operating experience and you need additional specific  
11 requirements?

12 MR. PHAM: I think, William, you might want  
13 to chime in on this, but I think our access of EPIX and  
14 our use of the information at this point is not  
15 specifically fed into the license renewal process.

16 DR. SHACK: Okay.

17 MR. PHAM: So there is aspect of refining  
18 that process.

19 DR. SHACK: But that may be your problem --

20 MR. LUBINSKI: But if I could also add,  
21 maybe, as stated there's a pretty strong voluntary  
22 requirement, sounds like an oxymoron, but using the  
23 industry language it's a voluntary industry program  
24 that each plant states as a requirement for themselves,

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1 but it's not an NRC requirement and there may be strong  
2 --

3 DR. SHACK: Well it's also not clear that it  
4 applies to anything except buried piping.

5 MR. LUBINSKI: That was going to be my next  
6 point. From that standpoint is it's not across the  
7 board with respect to all of the Aging Management  
8 Programs that are being incorporated from license  
9 renewal and we've engaged with the industry several  
10 times and continue in this dialogue of what they're  
11 doing with that program, are they continuing to get more  
12 information on aging management into that program or  
13 not.

14 So there's not that strong tie, that strong  
15 necklace to say that all of the learnings that are  
16 developed with respect to the Aging Management Programs  
17 and the effectiveness of those are being reviewed in  
18 a comprehensive manner across the industry.

19 And then secondly, as I said, it is voluntary  
20 from that reporting standpoint. So we would, even if  
21 we were to rely on EPIX to look at the data we may not  
22 be getting all of the data we need.

23 MR. BURTON: And I just wanted to chime in  
24 on one aspect of what you were saying was that in these

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1 discussions as we try to weigh process versus technical  
2 and things like that we do not want to be overly  
3 prescriptive, again, to speak to some of the issues you  
4 were talking about before.

5 And so that's an important balance that we're  
6 going to have to try to find as we go into the  
7 development of the regulatory basis, but that's one of  
8 the goals. What we hope to come out of that is to  
9 hopefully find that right balance as the result of the  
10 dialogue we have with the industry. So, okay.

11 CHAIRMAN SKILLMAN: Let's move ahead.

12 MR. BURTON: It's Slide 17, oh --

13 CHAIRMAN SKILLMAN: Eighteen.

14 MR. BURTON: Eighteen, sorry.

15 CHAIRMAN SKILLMAN: That's all right, okay.

16 MR. BURTON: Okay. The SECY paper proposes  
17 recommendations to explore various topics that the  
18 staff believes would enhance the efficiency,  
19 effectiveness, transparency, and regulatory stability  
20 of staff and licensee activities in preparing and  
21 reviewing SLR applications, also in implementing aging  
22 management activities and in providing inspection and  
23 oversight of the aging management activities in the SLR  
24 period.

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1           We believe our suggestions for rulemaking  
2 directly contribute to three of the NRCs principles of  
3 good regulation, those highlighted specifically,  
4 openness, efficiency, and clarity. The goal is to  
5 reach a decision whether to move forward with a rule  
6 revision and develop a sound, regulatory basis for  
7 doing so. Next slide, please.

8           The SECY paper contains four options for the  
9 Commission to consider. Each successive option  
10 includes the implementation of the previous options.  
11 Option I offers no changes to the current Rule. Option  
12 II describes minor changes to update the Rule to conform  
13 with other regulations and to clarify existing  
14 regulations.

15           Option III expands the scope of license  
16 renewal to include SSCs for new regulations and to  
17 clarify staff expectations for complying with existing  
18 regulations.

19           And finally, Option IV explores rulemaking  
20 for SLR to address the areas that could substantially  
21 improve the effectiveness and the efficiency in  
22 preparing and reviewing subsequent license renewal  
23 applications and provide information for the NRC to  
24 more effectively oversee aging management activities

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1 in the SLR period.

2 And it also discusses the staff's approach  
3 for addressing Part 50 activities related to potential  
4 changes to the CLB by coordinating with the ongoing  
5 Fukushima activities, which we touched on a little bit  
6 earlier and we'll go more into.

7 At this point I'll give a brief overview of  
8 each of the staff's suggested changes to the regulatory  
9 framework for subsequent license renewal followed by  
10 a discussion of the non-concurrence that accompanied  
11 the SECY paper.

12 MEMBER STETKAR: Butch, before you do that,  
13 because you're going to skip to Option II. In the  
14 discussion in the SECY paper under the disadvantages  
15 of Option I there's a statement that got my attention.

16 It said "If the current license renewal rules  
17 are not changed certain issues would have to be  
18 addressed on a case-by-case basis when they're  
19 identified during the subsequent license renewal  
20 review."

21 Are those certain issues the, explicitly the  
22 ones that are addressed in the other three options,  
23 Options II, III, and IV, or are there other things that  
24 you were thinking about?

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1 MR. BURTON: Well when we put that together  
2 we were thinking specifically about some of the items  
3 in the other options.

4 MEMBER STETKAR: Okay.

5 MR. BURTON: What we anticipate is that --

6 MEMBER STETKAR: So what I'm trying to  
7 understand is if I read the other three options and  
8 think about the issues that are raised in those other  
9 three options, those embody the universe of the certain  
10 issues that would have to be addressed on a case-by-case  
11 basis which is part of the disadvantages of Option I,  
12 is that correct or is there something else hovering out  
13 there in another world that hasn't been explicitly  
14 addressed in the SECY paper?

15 MR. PHAM: Yes, I think -- We agree with your  
16 statement.

17 MEMBER STETKAR: Okay.

18 MR. PHAM: Just to give some flavor to what  
19 we're talking about, a potential issue, you know, we're  
20 talking about the (hh)(2) requirement --

21 MEMBER STETKAR: As long as you say every,  
22 those certain issues that are a disadvantage is every  
23 are --

24 MALE PARTICIPANT: In II, III, and IV.

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1 MEMBER STETKAR: -- in total addressed by  
2 II, III, and IV. I'm okay, I understand.

3 MR. PHAM: Okay.

4 MEMBER STETKAR: Thank you.

5 CHAIRMAN SKILLMAN: So they are?

6 MR. PHAM: Say it again?

7 CHAIRMAN SKILLMAN: John's question is the  
8 option out, the disadvantage of I --

9 MR. PHAM: Yes.

10 CHAIRMAN SKILLMAN: Have all been included  
11 in II, III, and IV, that's the way that's written?

12 MR. LUBINSKI: The answer is yes.

13 MEMBER STETKAR: The answer, okay, thanks.

14 CHAIRMAN SKILLMAN: Thank you.

15 MEMBER STETKAR: I just wanted to make sure  
16 there wasn't something else that I wasn't quite  
17 understanding within the scope of the paper.

18 MR. BURTON: And just to be clear, you know,  
19 again, what we anticipated was that otherwise we would  
20 have to develop RAIs, questions to give to each  
21 applicant --

22 MALE PARTICIPANT: Right. Yes.

23 MR. BURTON: -- and all of the  
24 inefficiencies that may come with that. So that's what

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1 we were thinking.

2 MEMBER STETKAR: Thank you, Butch.

3 MR. BURTON: Okay. So, yes, so at this  
4 point I'll give a brief overview of each of the staff's  
5 suggested changes to the regulatory framework and then  
6 talk about the non-concurrence. Yes, next slide,  
7 thank you.

8 First, under Option II, 10 CFR 50.61(a)  
9 provides alternative requirements to ensure protection  
10 against pressurized thermal shock, which is currently  
11 under 50.61 and is identified as being within the scope  
12 of license renewal.

13 The recommendation in the SECY paper  
14 suggests that 50.61(a) be included as a regulated  
15 activity for license renewal. As such, the SSCs needed  
16 to ensure compliance with this regulation would be  
17 included in the scope of license renewal and aging of  
18 passive, long-lived structures and components would be  
19 managed.

20 We believe it's inconsistent for one  
21 applicant to adhere to 50.61 and be required to bring  
22 the relevant SSCs within scope and manage while another  
23 applicant who chooses the 50.61(a) alternative to meet  
24 the same PTS requirement not be required to scope in

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1 and age manage the relevant SSCs.

2 Again, the details of what should be included  
3 in those requirements would be discussed as part of our  
4 outreach and development of the regulatory basis to  
5 support a proposed rule.

6 MEMBER BROWN: I guess I don't understand.  
7 If the rules are already out there don't they already  
8 apply to licensees?

9 MR. BURTON: Well --

10 MEMBER BROWN: You make this rather fine  
11 delineation between 50.61, which I'm not sure exactly  
12 what that is other than it must have to do with fracture  
13 toughness of some kind --

14 DR. SHACK: Pressurized thermal shock.

15 MEMBER BROWN: PTS?

16 DR. SHACK: Yes.

17 MEMBER BROWN: Okay. And 50.61(a) --

18 DR. SHACK: To some people there is nothing  
19 else in the world except PTS, to other people there's  
20 nothing else in the world than digital INC --

21 (Laughter)

22 DR. SHACK: -- or the independence of  
23 digital, sorry.

24 MEMBER BROWN: Okay, let's get down to the

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1 nitty-gritty here. It would seem to me if the rules  
2 are out there I mean why don't, don't they have to comply  
3 with these anyway? Why do you have to make them part  
4 of license renewal, of some other rule or modify some  
5 other rule if they're already in place? I mean I --

6 DR. SHACK: Yes.

7 MEMBER BROWN: We've been talking about PTS.  
8 I've been on the Committee now for six years and it  
9 seems, you know, you get deluged with PTS meetings just  
10 to explain all the new nuances that are going on with  
11 that, where it's like sucking blood out of rocks trying  
12 to get anybody to pay attention to INC.

13 (Laughter)

14 MEMBER BROWN: I just said that with a wink.  
15 We had to have a little humor here moving along.

16 MALE PARTICIPANT: Charlie? Charlie?

17 MEMBER BROWN: I just don't understand why  
18 that doesn't come under the licensee, they don't all  
19 have to comply with this. Why do you have to bury it  
20 now, reference it in the existing 50.54 whatever  
21 (a)(3).

22 MR. PHAM: Because it's not explicit right  
23 now. Basically, and this is why it's under Option II,  
24 we've considered them a fairly straightforward

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1 rulemaking, is that the current Rule references, the  
2 current Rule in Part 54 references how a licensee has  
3 to address, it's the scope and equipment that's related  
4 to meeting the requirements of 50.61.

5 But 50.61(a) provides that a voluntary  
6 approach, or an alternative approach, to 51 and without  
7 that specific reference to it in the Rule, and like I  
8 said it's a very straightforward proposal and we're  
9 saying one could always make the legal argument that  
10 the Rule in Part 54 requires compliance with 50.61, not  
11 50.51(a), so that's a worst case scenario.

12 MEMBER BROWN: Okay.

13 MR. BURTON: And it is true that, you know,  
14 and we do specifically call out those regulated events  
15 in that portion of the Rule. Not just PTS, but also  
16 a station blackout, anticipated transit without scram,  
17 a number of things, fire protection, EQ.

18 This would just add to the clarity just as  
19 those other ones were. So that's really what was  
20 behind that.

21 MEMBER STETKAR: I'd like to raise something  
22 and, unfortunately, I'm going to have to duck out in  
23 about five minutes and going to miss most of the meet  
24 so I'd like to get this on the table and you just gave

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1 me a good entree to it.

2 MR. BURTON: Okay.

3 MEMBER STETKAR: In both Options II and III  
4 we just discussed PTS and the nuances of that. In  
5 Option III you mentioned well we better get the 50.55  
6 whatever it is (hh), 50.54(hh)(2) --

7 MALE PARTICIPANT: (b)(5)(b) stuff.

8 MEMBER STETKAR: Oh, and we better make sure  
9 that we leave ourselves some flexibility to get in to  
10 the Rule something that might be identified as part of  
11 Fukushima that we don't know about yet.

12 And we had that long laundry list of ATWS  
13 stuff and SBO stuff and other stuff that are all very  
14 specific and very important, we better put it in the  
15 Rule.

16 It strikes me that what we're really trying  
17 to say is that aging management should address SSCs that  
18 are important to safety and by, you know, you're  
19 proposing changes to rules to put in well, we need to  
20 look at this specific thing over here for everybody and  
21 we need to look at this specific thing over here because  
22 we didn't think about it before.

23 And now we need to look at this specific thing  
24 because we wrote another rule that didn't necessarily

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1 capture something to the specificity that you think you  
2 need in this rule. Why don't we just say everything  
3 that's important to safety is in the scope of license  
4 renewal?

5 Now the question is what's important to  
6 safety, but it's not this piecemeal, pick and choose.  
7 For some plants ATWS may not be important to safety.

8 MR. BURTON: That's true.

9 MEMBER STETKAR: Okay.

10 MR. BURTON: Okay.

11 MEMBER STETKAR: So why is it in the Rule in  
12 a regulation for everybody and why do we have to write  
13 our rules with so much specificity in the rule that when  
14 it comes time to look at the rule again we need to revise  
15 the rule because we need to add yet another sub-bullet  
16 of specificity to it?

17 MR. LUBINSKI: Yes, let me, if I --

18 MEMBER STETKAR: Why can't we do this in  
19 guidance is what I'm saying?

20 MR. LUBINSKI: Yes, I'd like to comment --

21 MEMBER STETKAR: Yes.

22 MR. LUBINSKI: -- and what I'd say is that,  
23 you know, that's something we need to think about in  
24 moving forward because when we looked at it we were

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1       trying to follow it with the established process  
2       already and that's the way the first license renewal  
3       was set up.

4               But you bring a good point is now we're  
5       re-looking at this and should we be a little more, I  
6       don't want to use the word generic, but a little more  
7       broad in that statement of those items that are  
8       important to safety that --

9               MEMBER STETKAR: In the rulemaking --

10              MR. LUBINSKI: Right, in the rulemaking  
11       process, yes, that's what I'm saying. Because again  
12       we haven't put the final words to paper yet and I think  
13       this is a good point for us to keep in mind as we do  
14       that.

15              As we go to the subsequent license renewal  
16       maybe we could change that process, that philosophy  
17       from our scoping, because this all has to do with the  
18       scoping, what scopes into for aging management.

19              MEMBER STETKAR: That's exactly right.

20              MR. LUBINSKI: And maybe that would make it  
21       much clearer because the process before was always  
22       established that you did this, you put it in place, and  
23       then when you did those other rulemakings you made a  
24       conforming amendment to Part 51 to include that.

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1           And we're looking at these areas and saying  
2           that's where we may have missed something in the  
3           process, we didn't do that conforming amendment. So  
4           what I'd like to do is take that as a comment as we're  
5           developing our rule language and our statements of  
6           consideration if we're given approval to go forward in  
7           addressing, I'd say Option II and part of Option  
8           III-type requirements to, can we do that more broadly  
9           so that it facilitates a more efficient use of resources  
10          of rulemaking in the future.

11           MEMBER STETKAR: Yes, not only for this  
12          update, but --

13           MR. LUBINSKI: For future --

14           MEMBER STETKAR: If there is an update now,  
15          but even going forward into the future.

16           MR. LUBINSKI: We do know there'll be other  
17          changes to Part 50 in the future. We don't know what  
18          they're going to be but they will be, and rather than  
19          question scoping them in at that time make this broad  
20          enough that it captures that, we'll consider that.

21           CHAIRMAN SKILLMAN: Let me make a comment  
22          before John scoots. The thing that I've been waiting  
23          to hear is what is it that is critical at a plant that  
24          is presently in its PEO for 20 additional years that

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1 on the 59th year, 11th month, 31st day, 2359, the bell  
2 goes bing and the component or device is not good for  
3 the first day of the next 20 years which is the second  
4 PEO?

5 It seems to me that that is the question that  
6 John's asking. It's about the devices, it's about the  
7 SSCs, and at some greater level the process that gets  
8 us there, but this seems to be focused on the licensing  
9 engines that are going to get spun up in order to get  
10 us into the second PEO when in reality the trigger for  
11 this should be what are the structure system's  
12 components that are critical for safety for that second  
13 PEO that begins on the first day of the 60th year?

14 And to me that's a much keener edge for our  
15 consideration. Right now this is a very broad, almost  
16 such a multi-faceted question that it's hard to pick  
17 out the beans from the peas.

18 MR. LUBINSKI: Right.

19 CHAIRMAN SKILLMAN: But it might be more  
20 clearly stated if in the technical considerations we  
21 identify what are the real issues on the first day of  
22 the 60th year.

23 MR. LUBINSKI: I think you bring up a good  
24 point and I'd say maybe that's part of our, where we

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1 could better communicate in the paper and definitely  
2 need to, if we go forward with the rulemaking, to ask  
3 to clarify that because if you look at a lot of what's  
4 in Option II and III would we do these if we were not  
5 doing the additional issues that are in Option IV and  
6 the answer is no.

7 Because from an efficiency standpoint it  
8 would not make sense and we would continue to do that  
9 through our current processes and current guidance  
10 capturing the 50.61 on a case-specific basis, capturing  
11 the (b)(5)(b) on a case-specific basis, so an answer  
12 to that question of we're doing that today, we would  
13 continue to do that during the current license renewal  
14 and the subsequent license renewal.

15 This would provide since we, if we go to the  
16 rulemaking for Option IV, a basis to just codify it in  
17 the rule and make it more clear and I like John's comment  
18 about a way to do that from the standpoint of what's  
19 important to safety.

20 A couple of the other issues you can't do  
21 because they are changes in scoping and we believe they  
22 are important for going beyond 60. And as you said,  
23 you know, if you look at 60 and then 60 plus a day what's  
24 the difference?

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1           And this gets to Dr. Shack's comment about,  
2           number one is the, looking at the effectiveness of aging  
3           management programs. We believe, because it's about  
4           aging and there's going to be more concern with aging  
5           when you get beyond 60 versus beyond 40, we think that  
6           we need to make sure that we have a robust requirement  
7           in place for licensees to look at the effectiveness of  
8           aging management programs.

9           Another option is, that you're going to hear  
10          about in a few minutes and why is it important to 60  
11          is the data. Right now plants can come in 20 years  
12          before their expiration date to request a license.

13          We're putting out do we really want people  
14          coming in that early or do we want them to gather more  
15          data so that we have more information on their Aging  
16          Management Programs that are important beyond 60.

17          Those two requirements we're looking at as  
18          being requirements that would open up the rulemaking.  
19          They would change the scope, so therefore we need to  
20          go to rulemaking for those. Are they magic at the age,  
21          at 60?

22          No, but at some point in time as you continue  
23          to move forward they become more important and it  
24          happens to be that we're looking at renewal of the

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1 license at 60 years at that point so we believe it's  
2 important to address those at that time.

3 So I hope that helps to answer the question.  
4 Some of these you could argue that would they apply to  
5 the current fleet, or current license renewal, and the  
6 answer is yes.

7 The other one we'll talk about in a few  
8 minutes is timely renewal and that's something that  
9 we're looking at as whether that would apply in this  
10 rulemaking to the current license renewal period as  
11 well to assure, again, their safe operation beyond 40  
12 not just beyond 60.

13 MR. PHAM: Yes. And, Chairman, I think you  
14 brought up the basic question, what is that uniquely  
15 relevant issue starting from day one of 60-year? And  
16 I think the hardest thing is trying, you know, that was  
17 probably one of the first questions that we asked  
18 ourselves embarking on this.

19 What John mentioned is basically, and what  
20 we try to embody in Option IV may not look and feel like  
21 that tangible, specific piece, but I think what we are  
22 concerned, the staff's concerned about is what do we  
23 lack data in?

24 And that's what I think Option IV really is

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1       trying to drive us towards a place where we can get the  
2       information that we need to be assured that we can get  
3       going beyond 60 years, but that particular component  
4       or specific issue for day one of 60 years we don't have  
5       that concrete evidence right now.

6               CHAIRMAN SKILLMAN:   Okay, let's move on.

7               MR. BURTON:       Okay.     Okay, next slide.  
8       Section 54.37 provides requirements on retaining  
9       records and information needed to document compliance  
10      with Part 54, including how long this information must  
11      remain on file.

12              Subpart (b) of 54.37 states that any SSCs  
13      installed before the renewed license was issued but  
14      should've been included within the scope of license  
15      renewal and made subject to aging management review or  
16      a time limited aging analysis but were not must be  
17      included in the next update of the FSAR and describe  
18      how the effects of aging will be managed during the  
19      period of extended operation.

20              Several applicants were confused about this  
21      requirement thinking that this might constitute a  
22      backfit and requested clarification.   In response the  
23      staff issued Regulator Issue Summary, or RIS 2007-16,  
24      and a revision to it, to clarify the requirements.

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1           However, we continue to get feedback that  
2 further clarification was needed. The suggested rule  
3 change will provide this additional clarify and  
4 clarifies the population of SSCs that we're talking  
5 about.

6           First of all we are talking about SSCs that  
7 are already installed at the plant, that were already  
8 installed before the renewed license was issued,  
9 should've been included within scope and subject to  
10 aging management review, but were not, and this may have  
11 been due to a couple of things, an initial oversight  
12 in the initial scoping and screening or a change in the  
13 licensing basis later on that would bring those SSCs  
14 within scope.

15           We acknowledge that the suggested revisions  
16 by themselves are probably not worth the resources to  
17 do a revision to the rule as we mentioned before, and  
18 we stated as such in the paper, so that's this  
19 particular suggested revision. Next slide, please.

20           DR. SHACK: Well why do you have Options II  
21 and III then?

22           MR. BURTON: Yes.

23           DR. SHACK: You say they're worthless.

24           MR. BURTON: Well -- Okay, go ahead.

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1 MR. PHAM: Just to give you the process of  
2 how we came up with this paper is that we had a lot of  
3 issues just in one bucket initially and then we looked  
4 at the pros and cons of each of the issues basically.

5 We put them as options to the Commission to  
6 provide them with options as far as a resource  
7 commitment perspective, but at the same time when we  
8 issued the paper we recommended to get approval for  
9 Option IV meaning it'll encompass, implement, going  
10 forward with Options II and III as well.

11 But it's a way to get the, to provide to the  
12 Commission, you know, just a flavor of the level of  
13 disparity or differences between the different  
14 gradation of options out there.

15 MR. LUBINSKI: And I think your question is  
16 really not between, I think your question was between  
17 Options II and III, why wasn't II and III just combined  
18 together and I think what we were trying to, to get the  
19 point across is we felt that the options in Option II  
20 were much more minor.

21 Whereas Option III with some of the scoping  
22 of the equipment as well as the timely renewal issue  
23 was more significant, yes, it's a little more than  
24 minor, so that's why we wanted to draw a distinction

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1       between those two.

2               MR. BURTON: Okay. Next slide. Okay. As  
3       part of Option III during the subsequent license  
4       renewal period SSCs need to be brought within the scope  
5       of the rule and aging of structures and components age  
6       managed to ensure compliance with (hh)(2).

7               This is to ensure continued functioning of  
8       core and spent fuel pool cooling containment functions  
9       during loss of large areas of the plant to due to fires  
10      and explosions. These maintain that functionality  
11      during the subsequent license renewal period.

12              And as with everything else, details of what  
13      SSCs if any should be brought into scope would be  
14      discussed during this initial development of the  
15      regulatory basis to support a proposed rule. Next  
16      slide.

17              With regard to timely renewal, 10 CFR 2.109,  
18      under that requirement applicants who submit their  
19      license renewal applications no later than five years  
20      before the expiration of their current license are  
21      allowed to continue operation past license expiration  
22      date until the staff has made its safety determination.

23              At the same time aging management activity  
24      is necessary for the period of extended operation are

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1 required to be implemented only after a renewed license  
2 is issued. This creates a situation where a unit can  
3 enter its period of extended operation without a  
4 renewed license and without a requirement to have the  
5 aging management programs in place.

6 To address this conflict the staff proposes  
7 to clarify that licensees must have the AMPs in place  
8 before entering the period of extended operation and  
9 maintain these AMPs until a final licensing decision  
10 is made.

11 This rule clarification would ensure that  
12 safety is maintained during presumably the short  
13 timeframe between expiration of the current license and  
14 the staff's final determination on the application.  
15 Next slide.

16 CHAIRMAN SKILLMAN: Butch, if I can ask?

17 MR. BURTON: Yes.

18 CHAIRMAN SKILLMAN: Why does it take the  
19 discussion around subsequent life renewal to require  
20 these changes today?

21 MR. BURTON: We have had this situation as  
22 you all probably know with Indian Point, so it's a  
23 legitimate question that you ask. The question is, I  
24 think Araceli mentioned before, we have just a few more

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1 applications to come in for the first license renewal.

2 We think that we have probably put together  
3 enough guidance based on the Indian Point experience  
4 that we could probably, should that come up again, and  
5 we acknowledge that's a rare occurrence, hopefully it  
6 won't happen again, but it was resource intensive I'll  
7 say that.

8 And so we had to make a decision. We think  
9 that this is something that's worth clarifying at the  
10 rule level, at the level of a rule, but to insist on  
11 the few remaining people coming in and putting  
12 requirements on them now, particularly given where they  
13 are in the development of their applications and stuff,  
14 we had to kind of make a, I would say a judgement call  
15 as to whether it was worth trying to impose that on the  
16 current --

17 MR. LUBINSKI: And from a timing standpoint  
18 since we are looking at subsequent license renewal and  
19 looking at opening up the rule for subsequent license  
20 renewal, it's the appropriate time and this would be  
21 something that would apply in the first license renewal  
22 period as well.

23 And that would be what we would be exploring.  
24 Why haven't we done it before now? We had always had

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1 a process where we believed we were going to make  
2 licenses decisions before we hit that 40-year mark and  
3 the timely renewal was not going to be significant  
4 issue.

5 It just so happened that it became an issue  
6 at the same time we're looking at subsequent license  
7 renewals, so it just, the timing of such and opening  
8 up the rule at the same time seemed to be compatible.

9 CHAIRMAN SKILLMAN: Okay, thank you.

10 MR. BURTON: Okay. Now we're starting on  
11 the Option IV considerations and we expect a  
12 considerable amount of dialogue with stakeholders on  
13 the items in Option IV.

14 As we said before Option IV includes the  
15 considerations in Options II and III plus suggestions  
16 to include revisions specifically applicable to  
17 subsequent license renewal.

18 These include requirements to take actions  
19 to ensure that the effectiveness of Aging Management  
20 Programs is maintained through the SLR period and to  
21 consider reducing the time before an SLR application  
22 can be submitted for a review.

23 The details of what should be required would  
24 be discussed, again, as part of the development of the

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1 regulatory basis to support a proposed rule. This  
2 option also discusses the staff's approach to ensuring  
3 that current activities that could impact the CLB are  
4 properly coordinated with SLR activities.

5 This first suggestion was driven in part from  
6 the findings from the staff's AMP effectiveness audits,  
7 which Dr. Brady will discuss in a few minutes. The  
8 staff proposed a requirement for licensees to take  
9 actions to ensure that AMPs remain effective and these  
10 actions, there are actually three actions.

11 We are suggesting that applicants, or  
12 licensees require AMP effectiveness self-assessments,  
13 that they report to the NRC age-related degradation,  
14 and report to the NRC changes to their aging management  
15 activities.

16 We believe these requirements will ensure a  
17 consistent and timely feedback mechanism to alert both  
18 the NRC and the industry of changes and lessons learned  
19 in aging and in the aging management activities.

20 Providing this information is critical to  
21 the staff and our ability to have reasonable assurance  
22 of adequate protection in the 60 to 80-year period. It  
23 ensures continuous focus on aging management and its  
24 safety impacts, it improves the effectiveness and

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1 efficiency of NRC oversight and inspection activities  
2 while reducing the resources applied to these  
3 activities, and it provides an enforceable mechanism  
4 to ensure aging effectiveness is maintained at a high  
5 level throughout the period of extended operation.

6 It should be noted that the staff drafted a  
7 risk that acknowledges that the current rule does not  
8 explicitly require that aging effectiveness be  
9 maintained in the PEO and reinforces staff expectations  
10 that AMP effectiveness should be maintained.

11 I'll go a little more in depth into each one  
12 of the components of this suggested rule change, so if  
13 we can go to the next slide. The first component of  
14 this suggested change is for SLR licensees to perform  
15 AMP effectiveness and assessments.

16 This suggested requirement is not without  
17 precedent and NRC currently requires similar  
18 self-assessments for maintenance, fire protection, and  
19 emergency preparedness.

20 These self-assessments have provided  
21 important information to the staff in preparing or  
22 revising guidance and in making decisions that have the  
23 correct focus and we expect similar benefits for  
24 license renewal.

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1           Information that can be gained from licensee  
2           self-assessments will provide valuable information to  
3           the licensee, to the industry, and to the NRC to assess  
4           the effectiveness of the programs and inform changes  
5           and improvements for --

6           DR. SHACK:    Now I'm reading the audit  
7           report, I mean they're always talking about they're  
8           doing health reports on their programs, which I assume  
9           is this self-assessment, what's different from what you  
10          want here to what they appear to be doing now?

11          DR. BRADY:   Well we found when we went on the  
12          audits that they do do health reports for certain  
13          systems and these INPO -- the systems that they will  
14          do their health reports on, it does not cover all of  
15          the Aging Management Programs, but they are doing  
16          self-assessments and that's a good thing.

17          MR. BURTON:   Yes.   Well what, and, again  
18          just to piggyback on what Dr. Brady said, what we found  
19          as part of the audits and you can correct me if I'm  
20          wrong, that in implementing the programs what they did  
21          was they incorporated them into their current onsite  
22          procedures.

23                 And one of the things that we found when we  
24          went out to do the audits is that it wasn't obvious that

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1 they were in the procedures identifying that when there  
2 were issues they were in fact aging and it was difficult  
3 for us to pull from those procedures and the findings  
4 from those procedures as they were implemented, exactly  
5 the information we needed to make an assessment of how  
6 well this is actually being done.

7 So I think those were some of the insights  
8 and Dr. Brady's going to talk about that a little bit  
9 more, but we found that there were areas where the  
10 information gathering and exchange could be improved  
11 and that was one of the drivers for this particular --

12 DR. SHACK: Well I'd be shocked if you didn't  
13 find that.

14 CHAIRMAN SKILLMAN: What I think I heard you  
15 say, and that Dr. Brady will explain this or speak about  
16 this a little later, is that in reviewing the system  
17 health reports, while you've found a lot of  
18 information, you did not find a connection specifically  
19 to age-related degradation.

20 DR. BRADY: Exactly. These will cover  
21 everything about the system and just to tell you a bit  
22 more about what Butch was explaining, when we went to  
23 the plants we found their program basis documents.

24 These were large reports that were done at

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1 the time of license renewal. They were put on a shelf  
2 in the backroom and essentially had not changed since  
3 they got their license.

4 We did see how they had taken their Aging  
5 Management Programs, they had incorporated them into  
6 the plant operating procedures, large numbers of  
7 procedures and that often when they were license  
8 renewal implementation procedures they were locked so  
9 that they could not be changed without the approval of  
10 the license renewal manager.

11 When we looked at the procedures we see that  
12 there had been revisions, maybe eight revisions of a  
13 particular procedure, but when we looked at it we could  
14 not find any indication that this change was apart from  
15 operating experience or a change from lessons learned,  
16 from the implementation of their procedures, or from  
17 NRC guidance.

18 We could not see how lessons learned from  
19 operating experience, from NRC guidance, were being fed  
20 back into the Aging Management Program and how the Aging  
21 Management Program was revolving and capturing the  
22 feedback and, as we're saying, we think that Aging  
23 Management Programs need to be living programs that are  
24 constantly reviewing and taking feedback from

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1 operating experience.

2 CHAIRMAN SKILLMAN: Okay, thank you.

3 DR. BRADY: Yes.

4 CHAIRMAN SKILLMAN: Thank you.

5 MR. BURTON: Okay. Yes, next slide, okay.

6 The second component of this suggested rule change  
7 requires reporting of age-related degradation to the  
8 NRC.

9 We believe this would ensure that licensee  
10 self-assessments consider all relevant aging concerns,  
11 whether generic or plant-specific and will help the  
12 staff and industry stay abreast of relevant operating  
13 experience.

14 This knowledge is essential for NRC to  
15 effectively regulate and oversee aging management in  
16 the SLR period. Next slide. The last of the three  
17 components of this suggested revision is the  
18 requirement to report certain changes to SLR aging  
19 management activities.

20 Again, this would ensure that the staff is  
21 aware of significant changes to aging management  
22 activities during the SLR period and we believe these  
23 changes would be subject to 50.59 requirements and the  
24 staff is assessing the effectiveness of 50.59 processes

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1 for this purpose including determining the correct  
2 level of detail in the FSAR supplement that's included  
3 as part of the license renewal application.

4 Next slide, please. The next suggested  
5 consideration in Option IV was the timing of SLR  
6 applications. The current requirements allow  
7 applicants for SLR to submit an application at the same  
8 time that it's entering its first period of extended  
9 operation.

10 The current timing does not allow sufficient  
11 time to implement and assess Aging Management Programs  
12 and gain knowledge and experience in the effectiveness  
13 of the programs.

14 For the staff to access the effectiveness of  
15 aging management activities in the second license  
16 renewal period sufficient information from aging  
17 management activities from the first license renewal  
18 period must be available to review.

19 The staff suggests a revision to reduce time  
20 before an SLR application can be submitted. We believe  
21 it provides more operating experience with the AMPs in  
22 the first period of extended operation. Next slide.  
23 Okay.

24 This is the last issue in the paper. We

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1 didn't want to identify it as a suggested rule change,  
2 but more a description of how we are going to be  
3 coordinating our activities with the Japan lessons  
4 learned directorate that's currently working on some  
5 of the Fukushima stuff.

6 The staff recognizes that the outcomes of the  
7 JLD work will impact on subsequent license renewal.  
8 Currently the JLD is tasked with addressing the  
9 recommendations from the near term task force on  
10 Fukushima and is currently focused on seismic and  
11 flooding issues and will consider other external  
12 hazards in the future, that is our understanding.

13 The suggested consideration in the paper  
14 recognizes that the environment around operating  
15 plants, changes in ground water, changes in nearby  
16 industrial facilities, may have changed since they were  
17 first built and may have impacted the design or  
18 licensing bases.

19 Verification of changes to the surrounding  
20 environment will be important in the staff's ability  
21 to have reasonable assurance that plants can operate  
22 effectively in the subsequent license renewal period.

23 The impacts of these activities on  
24 subsequent license renewal are being considered as the

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1 NRC continues its work. Any changes to a plant's  
2 licensing bases as a result of new regulations in this  
3 area will be carried forward into the subsequent  
4 license renewal period.

5 However, because of the timing of any new  
6 requirements that they may impact SLR re-licensing the  
7 staff intends to continue to coordinate these  
8 activities for subsequent license renewal, getting it  
9 --

10 MEMBER RAY: Well, yes, but I mean I could  
11 read that as saying a decision is made under, the  
12 post-Fukushima order one way whereas perhaps a  
13 different decision would be made for the post-60-year  
14 period of subsequent license renewal.

15 I'm talking about external hazards, for  
16 example. And, in other words, regulatory stability  
17 arguments could argue against doing a site update every  
18 ten years as proposed and that might prevail.

19 But operating into the post-60-year period  
20 might have a different answer and that's why I ask are  
21 you going to make it explicit, addressing this issue  
22 if it's not made moot by what's decided post-Fukushima,  
23 that's basically the question.

24 MR. LUBINSKI: And as Butch said in the

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1 coordination effort our expectation is that when we're  
2 looking at this issue with, and I'll call it a Part 50  
3 issue right now, as we're looking at that in response  
4 to Fukushima and we're looking at flooding, seismic,  
5 and beyond that, the rainfalls, ground water, any, you  
6 know, snow packs, other things that could impact the  
7 design basis is that as part of that analysis to  
8 determine whether or not it goes into Part 54 is also  
9 not just looking at every ten years, but looking at the  
10 longer term in subsequent license renewal, what about  
11 beyond 60 years, beyond 70 years, even beyond 80 years,  
12 how does that requirement play?

13 And we think as part of that decision you  
14 would make that decision at the same time. So that  
15 decision could come out when a Part 50 states, that  
16 says, because, and I'm not trying to prejudge, that we  
17 don't do it or we do it at longer time periods, but it  
18 would consider subsequent license renewal as part of  
19 that.

20 If it does not and wants to punt it back to  
21 us we will make sure that we have mechanisms in place  
22 to consider that.

23 MEMBER RAY: Well, you know, I've run hydro  
24 facilities that are 100 years old and I can tell you

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1       that it's when the re-licensing comes up, not any other  
2       time, that issues of downstream flooding and integrity,  
3       and so on and so forth really get addressed.

4               And I think the same thing applies here  
5       because there's such a slow change in, I'll call it the  
6       scientific understanding of the environment that there  
7       isn't any one time during the tenure of the license that  
8       you hold on a hydro facility, for example, or something  
9       so substantial arises that you'd say oh, well we're  
10      keeping track of that routinely during the course of  
11      the licensing. You do it really when you re-license  
12      a hydro facility.

13             MR. LUBINSKI: And I think in response to  
14      that I believe our current processes are more effective  
15      in that manner and I think it is even more important  
16      because we're still looking right now, I mean we have  
17      a current application under review for a new license.

18             If we were to make a decision to issue that  
19      license and allow the plant to start to operate I would  
20      not want to wait till 60 years to have them do this  
21      requirement to readdress, or even at 40 years, because  
22      what we're learning, our continuous learning in this  
23      area from the standpoint of the safety basis is we want  
24      to have them address that when the issue comes up, if

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1 a new report's issued about a new seismic fault, if we  
2 get new information about rainfall, about flooding, I  
3 don't want to wait until the 60-year mark to have that  
4 plant look at it.

5 I would like to have a requirement in place  
6 to look at it sooner.

7 MEMBER RAY: I understand the motivations,  
8 but I also understand how the system works and I'm just  
9 saying that if you've done it before fine, then it's  
10 trivial to acknowledge at the 60-year point updating  
11 it if there's any update to it.

12 But to leave it aside and say it shouldn't  
13 be addressed at that point is something I'm skeptical  
14 about.

15 MR. LUBINSKI: Yes, I can appreciate the  
16 skepticism, but I think that's more of a comment on the  
17 current process not on what we're addressing in  
18 subsequent license renewal and if that's an issue that  
19 needs to be addressed in the current process I think  
20 we wouldn't want to look at that.

21 MEMBER RAY: No, I see it differently. I  
22 mean I think, again, maybe it's my experience in other  
23 regime, but there's a period of time when you don't have  
24 to question every time somebody issues a technical

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1 paper on something.

2 But then there's an accumulation over  
3 decades and I think 60 years is the appropriate point  
4 here perhaps when you say wait a minute, we've got to  
5 look back and see, have we been keeping this up-to-date  
6 over this very long period of time.

7 It spans many, many generations of reviewers  
8 and so on. It's just not so easy to say oh, we've kept  
9 it up-to-date throughout and therefore it's up-to-date  
10 by definition.

11 MR. LUBINSKI: And I agree that, yes, we  
12 probably have a difference in the way we view that, but  
13 I think where we would agree hopefully is the fact that  
14 we think it is important to keep as something as we're  
15 looking forward in subsequent license renewal to  
16 continue to coordinate and monitor and take appropriate  
17 actions with respect to these two issues.

18 And that's why we felt it was important to  
19 put in this paper. We didn't want the Commission to  
20 think we didn't look at it at all. We wanted them to  
21 be aware that we did look at this issue and made a  
22 conscience decision that we want to continue to address  
23 it with respect to the current licensing.

24 DR. SHACK: Somehow out of this whole

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1 discussion though I still don't get an answer to John's  
2 question of what is addressed in the update to the FSAR  
3 with relation to this?

4 MR. LUBINSKI: Yes, and from that standpoint  
5 is there a specific requirement in place that requires  
6 them to do the analysis, the answer is no. When they  
7 do become aware of information they will look at the  
8 information and provide it in an update to the FSAR at  
9 that time.

10 But this would put more clarity and more  
11 transparency to what the requirement is as well as  
12 looking at what frequency in which they would do those  
13 reviews.

14 DR. SHACK: Yes.

15 MR. LUBINSKI: We have had plants identify  
16 previously, whether it's new flooding information,  
17 seismic information, rainfall, and they have updated  
18 that as they became aware of it and done that analysis  
19 and that was well prior to March of 2011 when they were  
20 doing those types of updates, but there was not an  
21 explicit requirement somewhere that would require them  
22 to do that in any frequency.

23 MR. PHAM: Yes, the 50.71 requirement for  
24 updating the FASR is more or less a reporting

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1 requirement. The content of what is updated is driven  
2 by other aspects, for example, GSI 199 if it's an  
3 applicable plant or other --

4 DR. SHACK: Well I mean I can understand GSI,  
5 you know, but that's a bid deal thing. I think John  
6 was more worried about incorporating sort of, you know,  
7 you don't find new faults or, you know, USGS doesn't  
8 sort of change their thing, but you get weather data  
9 all the time and is that updated or not? I mean --

10 MEMBER BROWN: Well how about Fort Calhoun  
11 almost, didn't they challenge their current licensing  
12 basis with the flooding they own? Has the FSAR been  
13 revised to take that into account and reevaluate their  
14 defenses against that flooding event?

15 I mean that's been what, a year and a half.  
16 I forgot, was it last, I've forgotten the timeframe,  
17 it was at least a year ago I think.

18 MALE PARTICIPANT: 2011.

19 MEMBER BROWN: And that was -- Okay, it was  
20 oh, two or three years ago. And I mean you could, you  
21 saw the pictures of it, I mean. Now based on what  
22 you're saying if our current process covers this they  
23 should have gone and said hold it, we almost violated  
24 our current licensing basis and got flooded out, what

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1 do we have to do? We redo our FSAR and get on with it.

2 MR. PHAM: Yes.

3 MEMBER BROWN: So I guess my question is have  
4 you seen a revision to their FSAR to take into account  
5 the fact they almost violated their licensing basis?

6 MR. PHAM: Well as I understand it that is  
7 what the efforts of the JLD, folks looking at seismic  
8 and flooding right now is trying to address is there  
9 --

10 MEMBER BROWN: Well but this is the  
11 licensee, forget what the JLD and the NRC, the licensee  
12 had a problem. He came close to flooding out.

13 MR. PHAM: Yes, right.

14 MEMBER BROWN: Now that means his original  
15 design, his original analysis said well, gee, we're  
16 good, this is the meteorological -- Yes, I'll get his  
17 out -- the rainfall and other upstream effects are  
18 always going to be in this particular realm and we're  
19 okay because we've got margin based on our analysis.

20 FEMALE PARTICIPANT: No margin.

21 MEMBER BROWN: Well we can argue whether  
22 they had margin or not since they had, you know, mucho  
23 quantities of sandbags trying to keep the water from  
24 getting into critical parts of the plants.

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1                   So has the FSAR been done? It's been three  
2 years ago.

3                   MR. LUBINSKI: The direct answer to your  
4 question with respect to Calhoun, I can't answer what  
5 was changed in the FSAR and what the update was, but  
6 the more general answer is, is there an explicit  
7 requirement in the regulation that requires them do  
8 that? The answer is no, there is not an explicit  
9 requirement.

10                  As Bo was saying is if they were to take  
11 action, identify that they were challenged or had new  
12 information and then changed their licensing basis,  
13 which we got across earlier, the fact that the licensing  
14 basis does change, that would be reported to us and the  
15 FSAR would be the place we'd get that information.

16                  They could do that and they change their  
17 licensing basis based on a voluntary basis and once it's  
18 incorporated into the FSAR it becomes part of their  
19 licensing basis, but there's not an explicit  
20 requirement that requires them to look at the rainfall  
21 every year or every six months, every five years, and  
22 that's why --

23                  MEMBER BROWN: I'm just looking for  
24 something that takes action on a current event, not that

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1       you have some long-term evaluation overall, I mean  
2       that's a specific event that show they were vulnerable.

3               MR. LUBINSKI:   With respect to a current  
4       event if they were to identify that issue the NRC would  
5       look at what actions that are taken.  There's not a  
6       specific requirement that says this is your new  
7       licensing basis.  They would do the analysis.

8               MEMBER BROWN:   I understand that.

9               MR. LUBINSKI:   Then if we do not believe as  
10      part of oversight program they took appropriate action  
11      we can order them to change their licensing basis to  
12      that new requirement and make the changes, so we handle  
13      it on a case-by-case basis and answering your question  
14      I can't respond --

15              MALE PARTICIPANT:   Yes.

16              MR. LUBINSKI:   -- into details, we can come  
17      back and have other folks respond what happened in Fort  
18      Calhoun, but I'm talking from a process standpoint.

19              If we do not believe the licensee has handled  
20      that information and made the appropriate changes and  
21      it was a safety issue we would issue an order and take  
22      appropriate action.

23              MEMBER BROWN:   Yes, but --

24              MR.    LUBINSKI:       If   they   have   taken

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1 appropriate action it becomes part of their licensing  
2 basis and then we would continue to monitor that moving  
3 forward.

4 MR. BURTON: Yes, and let me piggyback on  
5 that a little bit, okay. First of all, and this is  
6 specifically for Fort Calhoun, it already has its  
7 renewed license. In fact, Fort Calhoun was the very  
8 first plant to institute at that time was a new process  
9 called GALL.

10 But let's say Fort Calhoun did not have its  
11 renewed license yet. The way that the current process  
12 works is that they would address the flooding and they  
13 would make whatever changes to their licensing basis  
14 they needed to make in response to that, either through,  
15 you know, if there were orders or requirements or  
16 whatever it is that we had them do.

17 When that becomes part of their current  
18 licensing basis from a license renewal perspective that  
19 CLB carries forward into the extended operating term.  
20 So when we deal with what I call right now problems,  
21 which is kind of what you're describing, we deal with  
22 that with our processes right now.

23 And whatever ultimate changes occur to the  
24 licensing basis that's what gets carried forward. So

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1 from a license renewal perspective that's how the  
2 process works. I don't know if that gets closer to what  
3 you were asking or not.

4 MEMBER RAY: Well, look, both Fort Calhoun  
5 and Fukushima would update their safety analysis to  
6 reflect something different than what they had before  
7 the event.

8 We're talking about trying to avoid events  
9 like Fort Calhoun or like Fukushima, that's what we're  
10 talking about here. Anyway, I think we've said enough.

11 MR. PHAM: Yes, I'm finished you can go on.

12 CHAIRMAN SKILLMAN: Let's move.

13 MR. BURTON: All right. Yes, okay, now  
14 we're going to talk about the non-concurrence that was  
15 filed with the SECY. The non-concurrence requests  
16 that the staff provide to the Commission an option in  
17 the paper that requires applicants for subsequent  
18 license renewal to include an upgraded probabilistic  
19 risk assessment in the SLR application.

20 The request was based on a belief that having  
21 an upgraded PRA for SLR applicants would be consistent  
22 with the Commission policy on the use of PRA, would  
23 provide an opportunity to establish consistent PRA  
24 requirements for the current operating fleet and future

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1 combined license holders who seek renewed licenses, and  
2 would better focus resources on risk insights, smart  
3 inspections, aging susceptibility and integrated plant  
4 consequences, some of the items mentioned in the  
5 non-concurrence.

6 Next slide. There may be benefits to the  
7 risk insights that can be provided by a PRA. However,  
8 the staff decided not to include this option in the SECY  
9 paper for several reasons.

10 First, the non-concurrence, rather than  
11 resolving an inconsistency between the use of PRAs  
12 between new and operating reactors instead highlights  
13 inconsistencies between the use of upgraded PRAs for  
14 subsequent license renewal versus other operating  
15 periods.

16 No justification was provided for why the  
17 proposal was unique to the 60 to 80-year operating  
18 period versus other operating periods, but --

19 MEMBER BLEY: Can I interrupt you --

20 MR. BURTON: Oh. Sure.

21 MEMBER BLEY: -- right at that point because  
22 I got a little memory of a few minutes ago we were  
23 talking about putting things in to supplemental license  
24 renewal to make sure we've covered the things that are

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1 kind of scattered around and might not be all the way  
2 up to date.

3 I see a real similarity here. Just go ahead,  
4 but I --

5 MR. BURTON: Oh, okay. Okay, well --

6 MEMBER BLEY: It seems to me the same kind  
7 of thing.

8 MR. BURTON: And I think the next thing that  
9 I'm going to speak of may start to hit at that issue.

10 MEMBER BLEY: Okay.

11 MR. BURTON: We think that these are  
12 important questions and important considerations and  
13 they should be considered, but they need to be  
14 considered in the proper venue.

15 And we wouldn't consider PRAs and risk  
16 insights that require a more holistic framework to look  
17 at to be appropriate specifically for subsequent  
18 license renewal.

19 A more holistic assessment and consistent  
20 approach to the use of PRAs across all the NRC's  
21 regulated activities we feel is a better means of  
22 addressing the topic than the narrow SLR focus that's  
23 proposed in the non-concurrence.

24 NRC, as you all know, has initiated

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1 activities to develop options to look at more holistic  
2 risk management regulatory framework to adopt a more  
3 comprehensive risk-informed performance-based  
4 regulatory approach to all of NRC's activities.

5 The current processes, and we think these  
6 current processes are a better means to vent these  
7 issues than specifically through subsequent license  
8 renewal.

9 The final reason that we didn't include it  
10 in the SECY paper is that current license renewal  
11 applicants can use risk insights in developing and  
12 implementing their Aging Management Programs right  
13 now.

14 The non-concurrence stated as such in  
15 referring to the statements of consideration for the  
16 current license renewal rule where it says that PRA  
17 methods and techniques would focus regulations and  
18 programs on those items most important to safety by  
19 eliminating unnecessary conservatism or by supporting  
20 additional regulatory requirements.

21 So we feel like there is already an  
22 opportunity to consider risk insights in the  
23 development and implementation of Aging Management  
24 Programs. And, to go further, at this point we think

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1 we'd be to some extent bypassing the processes that are  
2 already in place to consider PRA on a wider basis --

3 MEMBER BLEY: Just a couple of comments.

4 MR. BURTON: Yes.

5 MEMBER BLEY: That's certainly true. The  
6 opportunity is there. The non-concurrence also  
7 pointed out that under Part 52 the new licensees coming  
8 that route have to have a PRA and that this would make  
9 things more consistent.

10 The other thing is, to me, a lot of these  
11 issues beyond 60 years have a real probabilistic  
12 underpinning. Now you've addressed that through the  
13 use of expert panels and that sort of thing to some  
14 extent and the formalization of that might offer some  
15 advantages, so I just wanted to put those comments out  
16 first.

17 MR. BURTON: Okay.

18 MR. LUBINSKI: If I could, if you don't mind,  
19 Bo, if I could add this, and this gets back to your  
20 earlier comment about distinguishing the difference  
21 between what we're looking at and Options II, III, and  
22 IV versus why the PRA wasn't included there.

23 When we looked at the options under II, III,  
24 and IV we went with the premise of we were focusing on

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1 those issues related to aging. So the majority of  
2 those issues associated either with license renewal or  
3 aging or time-sensitive information when we talk about  
4 changes to the CLB.

5 When you look at the PRA, and I'll call it  
6 a PRA requirement, if there was a requirement to have  
7 an updated PRA maintained and submitted to the NRC at  
8 the time of subsequent license renewal where do you see  
9 the benefits of that?

10 And I would say that the larger benefits that  
11 you're going to see are either in the active component  
12 area or in the design change area. Areas that we said  
13 from looking at subsequent license renewal would not  
14 be in the scope of changes we'd be looking for in  
15 subsequent license renewal.

16 So if we were to keep that same philosophy  
17 on what insights could we gain from the PRA related to  
18 subsequent license renewal it would only be those  
19 related to the aging management issues involved.

20 So that's where we looked at the benefits  
21 from having the updated PRA to be something that were  
22 more applicable and more beneficial to areas outside  
23 the scope of subsequent license renewal.

24 And if that was the basis that is something

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1 that should be handled outside of subsequent license  
2 renewal in the current forms that we're looking at and  
3 Butch had mentioned of areas where we could benefit from  
4 PRAs. If we're trying to draw consistency with Part  
5 52, again, waiting until 60 years to do that doesn't  
6 seem to be the timeframe.

7 Instead, having some other timeframe  
8 established to do that, whether it's, you know, a graded  
9 approach over time where licensees adopt this or at some  
10 point in the future because again it gets to the point  
11 of what's magic about 60 years at that point? And with  
12 respect to PRAs, the benefits, we don't see that benefit  
13 right there where we would see it across the board and  
14 we'd see it today.

15 So we're not saying there are not benefits  
16 to PRA, we think there are benefits, and if we're trying  
17 to look towards a consistency we should look at it in  
18 another venue, not tying it to subsequent license  
19 renewal and tying it to the 60-year point. So that's  
20 the --

21 MEMBER BLEY: I guess for me my definition  
22 of PRA is a little more broad than what we usually see  
23 in Reg Guide 1.200 and if I were to lean toward wanting  
24 a PRA to support subsequent license renewal it would

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1 be one that would include some kind of probabilistic  
2 treatment of some of the aging of older structures and  
3 equipment.

4 And somewhere along the line recently I saw  
5 somebody say nobody knows how to do that, but there's  
6 been a lot of work in probabilistic treatment of these  
7 sorts of things for the last 30 years or more and I think  
8 there could be a real benefit if that were the focus.

9 Now the way, John, you presented it, it  
10 wasn't that kind of a look and I'm not sure if the  
11 non-concurrence raised that issue with any clarity, but  
12 it seems to me that's a place it could be --

13 MR. LUBINSKI: And I wouldn't disagree with  
14 that and I would even go further to say if someone were  
15 to look towards putting that as a requirement for  
16 subsequent license renewal to have the PRA and to look  
17 at it from the aging management, could there be benefits  
18 from an aging management, and the answer is yes.

19 I would also say if we were doing that though  
20 we would take a step back and have to re-scope what we're  
21 looking at in subsequent license renewal. Are we then  
22 saying that we would require people to also make design  
23 changes based on the PRA to have design enhancements?

24 Would we be requiring them to make other

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1 changes to active components which are not part, right  
2 now scoped into subsequent license renewal? So I think  
3 if you look --

4 MEMBER BLEY: Well I guess in some of the  
5 license renewals we've seen come across not subsequent  
6 are the one's we've already seen. There have been  
7 design changes to make sure the plants could extend  
8 their life.

9 MR. LUBINSKI: They made design changes and  
10 they normally made that not part of license renewal,  
11 but that's been part of their current operating and they  
12 just carry forward into license renewal. And I'm going  
13 to, I know John had to leave, but he asked a question  
14 about the quality of the --

15 MEMBER BLEY: Yes.

16 MR. LUBINSKI: -- risk assessments with  
17 respect to SAMA, and let me use that as an example is,  
18 again that's a NEPA requirement to do the SAMAs. I'm  
19 not going to get into the legal issues associated with  
20 that, but let me talk from the standpoint of when those  
21 SAMAs are submitted to us and we look at them.

22 We look at it from the standpoint are there  
23 any cost beneficial changes associated with the Aging  
24 Management Programs. In doing that they do a cost

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1 benefit analysis across the board to those that are  
2 related to the non-aging programs.

3 There is not a requirement that they enhance  
4 those, or implement those cost beneficial  
5 enhancements. So, again, from the standpoint of  
6 license renewal that's been a philosophy we have  
7 followed that said they're not required to.

8 So carrying forward into subsequent license  
9 renewal that would be a change to the basic premise to  
10 say now you are requiring those cost beneficial  
11 enhancements and if you were to do that, put PRA in  
12 place, I would say that you'd have to look again at that  
13 same philosophy.

14 Are we requiring cost beneficial  
15 enhancements to be performed as a result of SAMA or the  
16 new PRAs and make it an explicit requirement? Because  
17 PRAs, great information, the question is what do you  
18 do with it and what do you require to be done with it?

19 And that's the next of that. It's not just  
20 require someone to submit a PRA, but I think you need  
21 to look at what are you going to require them to do when  
22 the information comes in? What are the expectations  
23 and what are the requirements for changes to the plant?

24 And I would say that, from the quality of the

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1 reviews that are done, I know that during our next panel  
2 folks from the Division of Risk Assessment will be  
3 talking and if, you know, I'm sure they can be able to  
4 answer questions in SAMA space as far as the quality  
5 of the risk assessments that they look at there.

6 DR. SHACK: Well John wouldn't be happy with  
7 the quality of the risk assessments, that I can pretty  
8 much assure you. But it is interesting that many of  
9 those non-cost beneficial things are showing up in, as  
10 adequate protection elements of mitigation.

11 MR. LUBINSKI: And from that standpoint, you  
12 know, again, from the standpoint of cost beneficial  
13 versus adequate protection and that's a different  
14 issue, the two are different.

15 CHAIRMAN SKILLMAN: Thank you. Butch?

16 MR. BURTON: Okay, with that I'll turn  
17 things over to Dr. Bennett Brady who will begin the  
18 discussion of the staff's review on the license renewal  
19 technical framework. Thank you.

20 CHAIRMAN SKILLMAN: Dr. Brady, before you  
21 begin, may I ask this question please? Would you or  
22 would anyone like to take a 15-minute break now before  
23 --

24 DR. SHACK: Yes.

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1 CHAIRMAN SKILLMAN: -- we enter the next  
2 section?

3 (Laughter)

4 CHAIRMAN SKILLMAN: I'm going to declare a  
5 15-minute break. Please come back at five minutes to  
6 11.

7 (Simultaneous speaking,)

8 CHAIRMAN SKILLMAN: At five minutes to 11 on  
9 that clock.

10 (Whereupon, the foregoing matter went off  
11 the record at 10:37 a.m. and went back on the record  
12 at 10:55 a.m.)

13 CHAIRMAN SKILLMAN: We are back in session.  
14 Dr. Brady.

15 DR. BRADY: Thank you. I'm Bennett Brady.  
16 I'm a Project Manager in the Division of License  
17 Renewal, and I'm Butch's counterpart on the technical  
18 side.

19 For the briefing today, our goal is to  
20 provide you an overview of the development of the  
21 framework for subsequent license renewal. And as John  
22 has mentioned, Butch has mentioned, the development of  
23 the technical framework is proceeding in a parallel  
24 path while we are developing the regulatory framework.

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1           We don't have to wait for a decision on the  
2 regulatory side to begin looking at all the technical  
3 issues. And our goal is to determine if it is feasibly  
4 possible to develop a GALL for subsequent license  
5 renewal that will address the aging management programs  
6 for us beyond 60 years.

7           Currently we use the GALL as, it's like a  
8 topical report for the license renewal process. We  
9 found that our current framework for subsequent license  
10 renewal has worked well for us, so we expect that our  
11 GALL for subsequent license renewal in the SRP, for  
12 subsequent license renewal will be very much alike the  
13 current GALL, GALL 2, and SRP 2.

14           However it will expand on those two  
15 documents. And we're using the GALL 2 and the SRP 2  
16 as a starting point and template for subsequent license  
17 renewal. Next slide please.

18           We've developed a very what we consider  
19 disciplined, rigorous process in developing the  
20 technical issues. First of all, we've tried to  
21 identify all the sources where we might find  
22 recommendations, issues, comments for changes to our  
23 license renewal guidance.

24           And we've collected a lot of issues.

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1 Second, we also developed a technical issues database  
2 in which we have collected all the issues that we could  
3 find on the technical side.

4 In this database we have cataloged all the  
5 issues according to the section of the GALL, AMPs, or  
6 the line items, or sections of the SRP, where there  
7 would be changes if we decide to disposition and accept  
8 the recommendation.

9 The third thing, we have set up around 90  
10 expert panels from NRC staff, from my division,  
11 Division of License Renewal, other divisions, two  
12 divisions from the Office of Nuclear Regulatory  
13 Research, and from all four regions.

14 And these are staff, they've been selected  
15 because of their technical expertise in the particular  
16 issues we will be addressing, and also folks by their  
17 teammates selected. These are people that they think  
18 will work well in a team environment.

19 We are just now beginning our deliberation  
20 of these, and about a week and a half ago we began  
21 holding our expert panel meetings to disposition these  
22 issues. We've also developed under contract what we  
23 call the SLR GALL production tool.

24 It's not an automated method, but it's a way

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1 of linking the issues in our database to where they go,  
2 where they would be a revision in our GALL and SRP for  
3 subsequent license renewal.

4 And we will use this tool when we get ready  
5 to develop the draft GALL and draft SRP, and then long  
6 after that the technical issues, technical bases, and  
7 response to public comments document.

8 As mentioned earlier, industry says that  
9 they expect to come in with the first application for  
10 subsequent license renewal in 2018. And we estimate  
11 it will take about two years for an applicant to develop  
12 their application for subsequent license renewal.

13 Thus we have to complete, and have in place,  
14 our guidance documents by 2016 which means working  
15 backwards that we should have our draft guidance out  
16 in 2015 is also mentioned. We will be coming to the  
17 HRS to tell you about our findings before then.

18 CHAIRMAN SKILLMAN: If I could ask this  
19 question please? Is there anything in the present  
20 consideration for your effort where at some point the  
21 collective leadership simply says, you know what, there  
22 isn't enough substance here to warrant --

23 DR. BRADY: Yes.

24 CHAIRMAN SKILLMAN: -- a new GALL. Let's

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1 stop. Let's stick with what we've got.

2 DR. BRADY: Yes, we recognize that that  
3 could happen, and that's why I mentioned we were looking  
4 at the feasibility. We may come to a point where we  
5 say that just, like by coming today sir, is there too  
6 many open items?

7 Plus to come at this point, we may say that  
8 there's too many technical issues. Maybe we should put  
9 it aside until there's more technical basis.

10 And that kind of begs that I should mention  
11 that, it is industries responsibility to provide us the  
12 technical basis to show that we can manage aging beyond  
13 60 years.

14 CHAIRMAN SKILLMAN: What I was referring to  
15 though wasn't so much let's quit or it's too big, we  
16 can't handle it. But rather the tools that we have now  
17 are adequate. We really don't need new tools. Is  
18 there something in the decision making that will permit  
19 that route?

20 MR. PHAM: When you say tools, are you  
21 referring to the GALL?

22 CHAIRMAN SKILLMAN: The GALL. Yes.

23 MR. PHAM: Yes.

24 CHAIRMAN SKILLMAN: You see, you know what?

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1 The present GALL's great. We don't really need an  
2 update, or we just need a minor adjustment here, and  
3 a minor adjustment here. But all the rest is just fine.  
4 Let's stop.

5 It sounds like 90 expert panels, that's going  
6 to take a lot of time and energy. It's going to take  
7 people's lives, it's going to take them away from other  
8 activities. It may be greatly productive, but it might  
9 not be. And it could be very distracting.

10 MR. PHAM: I think, you know, and at least  
11 understanding or having an understanding, or lacking  
12 of an understanding, in some of the material issues that  
13 we know of today, and long term operation, I think we  
14 probably, I think we're open to that.

15 But I personally just don't anticipate a  
16 situation where we say, well we know enough about this  
17 that we can continue to carry on.

18 And so I think the decision that we are  
19 prepared to make, if we need to, is to go through this  
20 process to determine what changes need to occur on the  
21 other side.

22 And I think the likelihood if an outcome is  
23 to pull the plug, or whether to proceed or not on  
24 finishing up the technical framework is to say, do we

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1 really have enough information to make the call on  
2 whether we can go forward.

3 You know personally, but we need to follow  
4 the process, but personally I'm doubtful that we get  
5 to the point where we say, ah, we don't really need more  
6 information than what we have right now.

7 CHAIRMAN SKILLMAN: Well, I don't have an  
8 orientation. I'm just asking the question, if somehow  
9 the collective leadership were to say, you know what?  
10 We have what we need already. We really don't need to  
11 go through this extended effort. Could you halt?  
12 Could you say enough's enough? We've got what we need.

13 MR. PHAM: And I would --

14 DR. BRADY: That could happen, and then I  
15 expect that for some of our aging management programs,  
16 they will say the same. We've got the problem now,  
17 we'll have it in the future, we'll have it in 60, and  
18 what we're doing is adequate.

19 Right now we have a lot of questions and we  
20 need to do the due diligence to say can these questions  
21 be answered? Can we move on with a reasonable  
22 assurance that this we will operate safely after 60  
23 years?

24 MR. BURTON: Yes, and I'll add that

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1 ultimately what's coming out of these panels is going  
2 to be a determination for each of the AMPs.

3 Either it's good as is, or again, in order  
4 to be adequate for 60 to 80 years, good as is, good with  
5 some tweaks, you know, so maybe some changes, or there  
6 is nothing currently here that can address this and  
7 there may need to be a development in the new aging  
8 management program.

9 And again, if there is, there has to be the  
10 technical basis supporting each one of these decisions.  
11 So, that's what we hope to get out of these expert  
12 panels.

13 CHAIRMAN SKILLMAN: Okay, so, is there one  
14 expert panel for each --

15 DR. BRADY: There is one expert panel --

16 CHAIRMAN SKILLMAN: -- AMP --

17 DR. BRADY: -- for each AMP, correctly. And  
18 for one each section of SRP and each up on the line  
19 items.

20 CHAIRMAN SKILLMAN: Okay, Thank you.

21 DR. BRADY: Yes.

22 CHAIRMAN SKILLMAN: Thanks.

23 DR. BRADY: And I would just mention that  
24 there are two sort of categories of not knowing enough.

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1 That maybe we don't know enough about the aging from  
2 60 to 80, but we can develop a balance.

3 We can increase inspections and sort of what  
4 we'd call a bounding AMP. And then there may be other  
5 AMP's for which we just say we don't know, we have to  
6 stop and get more information.

7 CHAIRMAN SKILLMAN: Okay.

8 DR. BRADY: Where we need to do due diligence  
9 to address these issues.

10 CHAIRMAN SKILLMAN: Okay, thank you.

11 DR. BRADY: Next slide.

12 MEMBER BLEY: Let me just throw in an odd  
13 question to you. I know it's many, many years off, but  
14 still quite a few years before we have a passive plant  
15 actually operating.

16 But as you went through thinking about all  
17 these possible things that might be issues, did you go  
18 through any of the thought for what you might need to  
19 worry about specifically for passive plants sometime  
20 in the future? Or has that just not even arisen yet?

21 MR. LUBINSKI: Yes, I would say the direct  
22 answer is, is no we didn't consider from that  
23 perspective. However, we do believe in what we're  
24 looking at, and the way the answer is set up, you're

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1 looking at it from components and degradation  
2 mechanisms.

3 And we believe that a lot of this would be  
4 directly applicable when you start to look at the  
5 passive plants because of the knowledge gained in the  
6 experience of operation, because what you're looking  
7 at is your looking at --

8 MEMBER BLEY: The balance just might be a lot  
9 more delicate, so you might --

10 MR. LUBINSKI: I'm sorry?

11 MEMBER BLEY: -- the balance just might be  
12 a lot more delicate.

13 MR. LUBINSKI: That's true, but the point is  
14 that, you know, you're talking about materials.  
15 You're talking about the environments they're in, and  
16 you're talking about the degradation mechanisms.

17 MEMBER BLEY: Absolutely.

18 MR. LUBINSKI: And how this will time in the  
19 aging impact that, so I think we can get what I'll call  
20 more the raw data out of this that would help us  
21 determine from the standpoint of the passive plants how  
22 to address this.

23 CHAIRMAN SKILLMAN: Thanks.

24 MR. LUBINSKI: Thank you.

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1 DR. BRADY: As I mentioned, we've identified  
2 a large number of technical issues, and we also, when  
3 we were considering where we might get issues, we  
4 conducted several studies and activities to find more  
5 of the issues and be sure that we were inclusive.

6 The first of these was the Aging Management  
7 Program affect. We saw this, which we've mentioned,  
8 I'll talk a little bit more about that. The Periodic  
9 Safety Review Summer Reports, I'll speak some more on  
10 that.

11 We've also looked at relevant domestic and  
12 international operating experience databases that we  
13 have here to look at international and national  
14 operating experience.

15 And lastly, the Expanded Materials  
16 Degradation Assessment. Dr. Gavrilas will tell you  
17 more about this, but there was a question, Chairman,  
18 that you had earlier about have you identified the most  
19 significant technical issues, components of subsequent  
20 license renewal, and this was a major study that did  
21 do that, identified the major degradation mechanisms  
22 and those for which we have little knowledge.

23 CHAIRMAN SKILLMAN: Thank you. I'll look  
24 forward to hearing that. Thanks.

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1 DR. BRADY: Next slide. We also talked  
2 about the AMP Effectiveness Audits. We went to three  
3 plants that are already in their PEO. The purpose was  
4 to learn about how they have implemented their aging  
5 management programs, doing the PEO.

6 It was also, the second purpose was to look  
7 at how these aging management programs have evolved in  
8 response to operating experience and the revisions of  
9 the GALL.

10 These three audits were very productive in  
11 identifying a lot more issues and recommendations that  
12 we'll be considering. The expert panels have, as Butch  
13 had mentioned, they did raise a concern that we did not  
14 see.

15 The aging management programs evolving,  
16 taking insights from their inspections, from the  
17 changes that we are making to our revisions, to our GALL  
18 documents and operating experience.

19 We found that the program basis documents,  
20 the documents that they developed for license renewal  
21 were back in a back room and had not changed. And this  
22 reaffirmed our feeling that the option for, to look at  
23 the effectiveness of aging management is really a  
24 requirement for subsequent license renewal.

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1           Next slide. We did a limited scope review  
2           of 14 periodic safety reviews summary reports. And  
3           from this we have, the main focus of this was to look  
4           and see if there were technical issues, new aging  
5           degradation mechanisms, or new components that are not  
6           in GALL that we should be considering for inclusion in  
7           our GALL.

8           However, to answer the questions that you  
9           asked before about the PSR, we did look at their  
10          regulatory process to see if findings that they were  
11          getting from the PSR reports would have been captured  
12          in an NRC's regulatory framework.

13          CHAIRMAN SKILLMAN: Could I interrupt you  
14          please?

15          DR. BRADY: Yes.

16          CHAIRMAN SKILLMAN: May I ask you to please  
17          describe what is the breadth of those PSRs. Are they  
18          from primarily French plants, or German plants, or a  
19          wide swath of European plants?

20          DR. BRADY: They were from nine different  
21          countries, and these were not the PSR reports  
22          themselves. These were the summary reports that the  
23          regulator prepares after this.

24          CHAIRMAN SKILLMAN: Yes.

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1 DR. BRADY: So, it was limited. We can't  
2 make any conclusion to say we should go to a PSR  
3 framework or not. But it was, we did look at all these  
4 things that we see in these PSR reports, would they be  
5 captured in the NRC regulatory framework.

6 And for some things we found yes, there is  
7 a direct correspondence, for some it's a little  
8 different. But we did not find a, I think what you call  
9 a jewels, that this is something that we should consider  
10 for improving our regulatory process.

11 MR. PHAM: And they were, the breadth is  
12 there are several different countries. I mean, I can  
13 name a few, Korea, South Korea was definitely in there.  
14 There was some few French plants, Finnish, UK, and Czech  
15 Republic, I think.

16 And so it was, we base it around the  
17 availability of these reports, and you know how the ones  
18 that we did have translated versions to.

19 CHAIRMAN SKILLMAN: Okay. You had also,  
20 from the timing standpoint, these reports span  
21 different time frames, well plants that operated from  
22 10 years up to 30 years? Is that right?

23 MR. PHAM: Yes. I've got to get --

24 CHAIRMAN SKILLMAN: Don't know that?

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1 MR. PHAM: -- the summary numbers for that.

2 Yes.

3 CHAIRMAN SKILLMAN: Thank you. Let's  
4 proceed.

5 DR. BRADY: As I've mentioned, we also  
6 reviewed domestic and international operating  
7 experience with the NRC databases to look to see if  
8 there were any new insights, aging failures that we  
9 should be considering.

10 And we did collect some new operating  
11 experience that had not been considered since GALL-2.

12 CHAIRMAN SKILLMAN: Could you expand on that  
13 please?

14 DR. BRADY: Well, one thing we found that  
15 there was a failure of a steam isolation valve due to  
16 the weakening of permanent magnets. Another one was  
17 we saw aging related and relevant emergency diesel  
18 generators.

19 CHAIRMAN SKILLMAN: Yes, thank you.

20 DR. BRADY: We did not find a lot of new  
21 experience, yes.

22 MR. PHAM: And we did, we tried to develop  
23 conservative in our best understanding of the context  
24 of the technical content, I mean, because sometimes the

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1 equipment referenced in the report may not, and by  
2 nomenclature, may not be translated directly, as  
3 applicable to the U.S. fleet.

4 But we tried our best to read into the context  
5 of what was captured in the reports, and when in doubt  
6 we basically put it into the technical issues database  
7 to further consider.

8 CHAIRMAN SKILLMAN: Okay, thank you.

9 DR. BRADY: This ends my presentation. If  
10 you have no questions Dr. Gavrilas will tell you about  
11 the Expanded Materials Degradation Assessment, and  
12 some of the key technical issues that we identified from  
13 that large expert elicitation.

14 DR. GAVRILAS: I'm Mirela Gavrilas. I am  
15 the Branch Key for Corrosion and Metallurgy in the  
16 Office of Research, and I'll step back just a little  
17 bit to discuss our role in the entire SLR process.

18 One of the most important roles that the  
19 Office of Research staff has is in canvassing the  
20 knowledge and collecting the state of the art for  
21 information.

22 In other words, we do the review of journals,  
23 we participate in meetings, when the topic warrants it  
24 we organize workshops. And a couple of years ago we

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1 co-sponsored with the Department of Energy, the third  
2 IAEA meeting on LTO, it's called PLIM.

3 In addition to that, we have routine  
4 interactions with the Department of Energy staff on  
5 light water reactors, sustainability, and we interact  
6 with EPRI staff as well on their programs, on their LTO  
7 program.

8 We have memoranda of understanding with both  
9 entities, separate ones. And the one with DOE will  
10 come into play because they were the co-sponsor for the  
11 EMDA that I will discuss in greater depth.

12 The EMDA, you'll hear us refer to it  
13 sometimes as the Expanded Materials Degradation  
14 Assessment, sometimes as the Extended Materials  
15 Degradation Assessment, because it actually did two  
16 things.

17 It extends the assessment operation. We had  
18 a precursor to it and some of you are very familiar with  
19 it. It was called the Proactive Materials Degradation  
20 Assessment, the new reg that was issued in 2007.

21 It covered piping and reactor vessel  
22 internals. So in the Extended or Expanded Materials  
23 Degradation Assessment, what we did is we took the  
24 findings and extended them for a window of time, 60 to

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1 80 years.

2 We also broadened the scope to not include  
3 just piping and reactor vessel internals, but we looked  
4 at the reactor pressure vessel, we looked at structures  
5 and cable aging. Next slide please.

6 I'm going to discuss the issues in the order  
7 that EMDA, when it's going to be issued will have four  
8 volumes, and this is nearly the maiden voyage for these  
9 slides.

10 We gave one presentation to Commissioner  
11 Ostendorff last week, but it's the first time that we're  
12 summarizing the information in the way in which you see  
13 it today.

14 And I'm categorizing the degradation  
15 mechanism according to susceptibility, high  
16 susceptibility high level of knowledge, and the second,  
17 very different category, high susceptibility low level  
18 of knowledge.

19 In the reports themselves of course you'll  
20 see intermediate and low for both susceptibility and  
21 level of knowledge. But for the purpose of this  
22 discussion I thought that this is appropriate.

23 So let's start with volume one. And for your  
24 information the EMDA values are undergoing technical

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1 editing now, and we anticipate that next week we'll have  
2 them 99 percent done. At that stage we will be  
3 comfortable sharing it with the Committee, should you  
4 wish.

5 MEMBER BLEY: Is this essentially an update  
6 on 6923 or is it --

7 DR. GAVRILAS: Yes. An update on 69 --

8 MEMBER BLEY: Twenty three.

9 DR. GAVRILAS: Thank you. That has --

10 MEMBER BLEY: Looking at it. That's how I  
11 can remember.

12 DR. GAVRILAS: -- that has three extra  
13 volumes.

14 MEMBER BLEY: Yes.

15 DR. GAVRILAS: The reactor vessel, the  
16 concrete structures, and the cables. And that focus  
17 is on degradation mechanisms that can occur between 60  
18 and 80 years.

19 So the key technical findings in the area of  
20 piping and internals are things that we've known, back  
21 up please. The previous slide. Thank you. High  
22 susceptibility high knowledge, these are things that  
23 we know how to deal with, broadly.

24 Inspection, maintenance, repair, replace,

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1 and what you see there are things that are very well  
2 studied. Stress corrosion cracking of 600 and its weld  
3 alloys, irrigation creep of stainless steel, fatigue  
4 of small bore welds.

5 What requires more thought on the staff's  
6 part and the industry's part of course, are the high  
7 susceptibility low knowledge scenarios. And the first  
8 one here is the one that I consider probably most  
9 daunting of everything that you're going to see.

10 It has to do with irradiation assisted  
11 degradation of vessel internals. And my view on that  
12 is, right now we have data to about 15 DPA, where DPA  
13 is a measure of fluence to the internals.

14 There are mappings that have been generated  
15 of the internals that show that at the end of 60 years,  
16 portions of the internals are receive, and are going  
17 to receive an excess of 100 DPA. So this is before it  
18 even enters the 60th year of operation.

19 What complicates things further is that  
20 there is a large variety of materials that are in these  
21 components, in various shapes, exposed to this broad  
22 gamut of radiation levels.

23 And from the staff's perspective, the  
24 programs to test what happens at these levels have a

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1 huge time lag. I mean, even with us going to the reader  
2 and harvesting materials, and we have a cooperative  
3 program where as I understand, which we are going to  
4 do just that.

5 So even if we go and harvest materials that  
6 have 50 DPA, we still want to put them in the ATR and  
7 give them additional bellows and test them, but those  
8 are long programs.

9 You know, because even with accelerated  
10 testing, real life they get about one DPA a year. I  
11 put it in the ATR, they get about four DPA a year. So  
12 it's a long time to go from 50 to where we'd like to  
13 be.

14 You asked, Dr. Skillman, in our telephone  
15 conversation in preparation for this meeting, you asked  
16 about the nexus between this research and the AMPs, and  
17 then the research program, so I prepared a bit of a  
18 summary.

19 This, the piping internals, the subject AMPs  
20 are the ones on BWR and PWR vessel internals, as you'd  
21 expect, and I hinted at the Zorita Program, that's a  
22 cooperation with EPRI, a cooperated element with EPRI.

23 We also know that there's work going on in  
24 the LWRS program on modeling, and simulation, and

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1 thermal aging. There's also work going on on crack  
2 initiation and nickle-based alloys.

3 And there's environmentally assisted  
4 cracking work that's also conducted by EPRI under the  
5 LTO program. I expect that you will hear more about  
6 all of these programs in the afternoon.

7 These are the programs that we know about  
8 because we're maintaining some level of cognizance of  
9 what's going on in them by various means. As far as  
10 NRC research is concerned, we have work on irradiation  
11 assisted stress corrosion cracking happening at both  
12 Argonne and Idaho National Laboratories, and again I'm  
13 mentioning the Zorita effort because it's so important  
14 to us. That's going on.

15 In the area of, and now we can go to the next  
16 slide please. Three of the degradation mechanisms  
17 that you see here are the top two, and the bottom left  
18 are all PWSCC.

19 In the area PWSCC, we have work going on at  
20 both Argonne and Pacific Northwest Laboratory, and  
21 we're exploring. The research programs that I'm going  
22 to talk about cover a spectrum.

23 Research that's been completed, or near  
24 completion, research that's ongoing, well on the way,

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1 and research that's in exploratory phases. And one of  
2 the research initiatives connected to PWSCC is we want  
3 to look at the initiation eventually, and that also we  
4 anticipate is going to be a collaborative effort with  
5 EPRI. Next slide please.

6 As far as the reactor vessel is concerned,  
7 I'll move you to the highlight of the slide. What you  
8 see there is a test reg, not a degradation mechanism.  
9 And that's because high probability low knowledge  
10 scenarios were not identified in this area.

11 We know about high susceptibility and high  
12 knowledge scenarios like embrittlement and stress  
13 corrosion cracking, and those have been looked at  
14 extensively in previous programs, and in the context  
15 of the PTS rule.

16 The intermediate, I added on this slide an  
17 intermediate susceptibility scenario. It has to do  
18 with a environmentally assisted fatigue low knowledge.  
19 Given how fresh the EMDA is, that it's just been  
20 finalized, this is an example of something that  
21 warrants further attention.

22 We're going to have to look at it and decide  
23 what we're going to do in terms of research, or what  
24 our expectations are going to be. Next slide please.

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1 In the area of cable degradation --

2 DR. SHACK: Did you have Bob Odette on that  
3 panel?

4 DR. GAVRILAS: Yes we did.

5 DR. SHACK: And he agreed with high  
6 knowledge?

7 DR. GAVRILAS: Apparently. Mark, would you  
8 like to take that? No --

9 MR. HURD: There was a diversity of opinion  
10 among the --

11 MALE PARTICIPANT: Please identify  
12 yourself.

13 MR. HURD: Oh, I'm sorry. Mark Hurd, Office  
14 of Research. Yes, Bob, Professor Odette was on the  
15 panel. And yes, there was a diversity of opinion  
16 regarding the maturity of our knowledge and the need  
17 for additional work. Thank you.

18 DR. GAVRILAS: Thank you. In the area of  
19 cable degradation, what you see here is the high  
20 probability high knowledge scenarios, thermal aging of  
21 neoprene and ethylene type materials, and long term  
22 irradiation damage.

23 Just because we know the mechanism, in this  
24 case, this is an example of something where just because

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1 we understand the mechanism doesn't mean we're done  
2 with the issue, because knowledge is lacking with  
3 regard to what exactly these cables have been exposed  
4 to as they were sitting in the plant.

5 And I know that the industry has efforts in  
6 the direction of actually trying to figure out what  
7 various components were exposed to. High probability  
8 low knowledge scenario is what happens to low and medium  
9 voltages when they're submerged for a long period of  
10 time.

11 And in both areas we have significant work  
12 going on as I mentioned. The industry is looking at  
13 trying to figure out what the actual service  
14 environment of the cables that are in service now has  
15 been, and industry is also looking at containment cable  
16 temperature and radiation levels for representative  
17 cables.

18 And as far as the staff is concerned, we have  
19 work at NIST and at the University of Maryland on cables  
20 harvested from Zion. We're going to verify condition  
21 monitored tests, and validate service life's  
22 prediction models that are being used.

23 We also have work at San Dia, and that work is  
24 nearing completion. That deals with cables and

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1 submerged environments. We expect a final report on  
2 that to be issued this year.

3 MEMBER BLEY: I'm just curious about the  
4 cables you've collected from Zion. Were they  
5 submerged for their whole lifetime or do you have a real  
6 history on wetting, and re-wetting --

7 DR. GAVRILAS: I have my lifelines in the  
8 audience, so Sheila Ray can take --

9 MEMBER BLEY: You get one.

10 DR. GAVRILAS: -- take the question.

11 MS. RAY: Hi, I'm Sheila Ray. I used to be  
12 in the Office of Research and work on cables, but the  
13 cables we are getting from Zion, we are not getting  
14 submerged cables at this time.

15 We know there are some cables that were  
16 submerged from the turbine building, but --

17 MEMBER BLEY: But these aren't the aren't  
18 the set you have?

19 MS. RAY: No.

20 MEMBER BLEY: The set you have been dry.

21 MS. RAY: We're more concerned with the  
22 cables in containment that were exposed to temperature  
23 and radiation environments.

24 MEMBER BLEY: And you have a temperature and

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1 radiation history on them of some sort?

2 MS. RAY: We have a range. We don't have the  
3 paperwork, but we have talked to some of the staff that  
4 used to work at Zion, and we have a range of temperature  
5 and radiation, which is good enough.

6 MEMBER BLEY: All right. Sorry, we have  
7 someone who knew it well.

8 DR. GAVRILAS: Thank you, Sheila.

9 MEMBER STETKAR: Mirela?

10 DR. GAVRILAS: If you have. I'm sorry.

11 MEMBER STETKAR: On the wetting, you  
12 characterized that as low knowledge, that also is based  
13 on everything that EPRI's done?

14 DR. GAVRILAS: That --

15 MEMBER STETKAR: For the wetted cables?

16 DR. GAVRILAS: The panels, this is one thing  
17 that I didn't mention about these panels. These panels  
18 were assembled to not only contain international  
19 expertise, but to be diverse in make up.

20 In other words, have people from the industry  
21 from the regulator from the academia. So we tried to  
22 assemble the panels so that we have the broadest reach  
23 possible in terms of technical subjects. So --

24 MEMBER STETKAR: You had representatives

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1 from EPRI on the cables in particular?

2 DR. GAVRILAS: You're making me look into my  
3 backup slides --

4 MEMBER STETKAR: Indeed.

5 DR. GAVRILAS: -- and --

6 MS. RAY: This is Sheila Ray, yes we did.

7 DR. GAVRILAS: -- yes there is.

8 MEMBER STETKAR: Thank you.

9 MS. RAY: Yes we did.

10 DR. GAVRILAS: Mr. Tummond was. Okay so  
11 --

12 DR. SHACK: It was a diversity of opinion,  
13 no doubt.

14 DR. GAVRILAS: Not as much as on the reactor  
15 --

16 MEMBER STETKAR: I'm just surprised that  
17 that's characterized as high knowledge, and this is  
18 characterized as low. That's all.

19 DR. GAVRILAS: We tried to be as systematic  
20 as possible. The panels where, and I think it depends  
21 on their individual experience, how much they were able  
22 to adhere to the PIRT process that we tried to have  
23 them follow.

24 And how much of a cultural sort of ingrained

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1 belief they brought to the table, and whether they could  
2 even look at it from a PIRT perspective. So you'll see  
3 variation.

4 I think that the piping panel had a great  
5 advantage because many of them had been through it  
6 before, but some other panels like the cables and  
7 concrete were not in the same position.

8 MEMBER BROWN: Could I ask one question --

9 DR. GAVRILAS: Yes please.

10 MEMBER BROWN: -- relative to the data on the  
11 cables? I mean, if you get temperature and irradiation  
12 data, that's one thing. But cables have a wide range  
13 of what I'd call internal currents that are generated.

14 So you have internal cable heating that can  
15 have a fairly strong, very strong impact on what the  
16 external environmental temperatures and radiation  
17 have. At least that's based on my past experience and  
18 --

19 DR. SHACK: It's true here too.

20 MEMBER BROWN: -- you don't consider, I  
21 mean, it seems to me you have to consider the  
22 application and how much cable heating you had to go  
23 along with that during its application.

24 DR. GAVRILAS: We have Sheila back to the

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1 microphone to answer the question, but I've --

2 MEMBER BROWN: I just wanted to know did they  
3 consider that? That's all.

4 DR. GAVRILAS: Okay.

5 MEMBER BROWN: I don't need to go into  
6 excruciating detail, but were the application, the  
7 current loading, cable heating incorporated as part of  
8 the evaluation?

9 MS. RAY: This is Sheila Ray, no we don't  
10 consider that because if the cable is designed  
11 properly, that is not an issue.

12 MEMBER BROWN: Okay. I would argue with  
13 you.

14 DR. GAVRILAS: Let me make an offer. As I  
15 mentioned at the very beginning of this meeting, if you  
16 want to hear more about the details of the EMDA report,  
17 this is not the right panel. I'd probably be sitting  
18 at that table and you would have Sheila and --

19 MEMBER BROWN: She answered my question.  
20 Okay, it's just --

21 DR. GAVRILAS: -- Mark, so --

22 MEMBER BROWN: -- I would just disagree with  
23 it based on cable testing that I did back in the 80s,  
24 okay. And in the 90s, when we were trying to assess

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1       whether we needed to replace cables in Navy ships, and  
2       particularly that stuff and the rats --

3               MALE PARTICIPANT:   Badly designed, what can  
4       I say.

5               MEMBER BROWN:    Let me tell you.   If you  
6       could have tested it without running 1,000 AMPs through  
7       it, it didn't, made a lot of difference.

8               DR. GAVRILAS:    So if you don't mind, we're  
9       going to approach you all after the meeting --

10              MEMBER BROWN:    No, no, no.   That's fine.  
11      You answered my question.   You didn't have it.

12              DR. GAVRILAS:    Okay, great.

13              MEMBER BLEY:    We'll see you on EMDA I guess,  
14      and --

15              MEMBER BROWN:    But I think that's one, you  
16      can rest assured we'll dig into a little.

17              MEMBER BLEY:    Yes.

18              MEMBER BROWN:    That smells really odd to me.

19              MR. LUBINSKI:    Yes, we really appreciate  
20      that comment because again --

21              MEMBER BROWN:    Worse than odd.

22              MR. LUBINSKI:    -- as we said, we'll be back  
23      to talk with you folks again in more detail.   And as  
24      Mirela says, we'll have a different panel here when we

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1 go through that discussion.

2 But you know, we're definitely, we  
3 appreciate hearing those questions and comments today  
4 so that we can make sure that we can appropriately  
5 address that to you at a later date.

6 CHAIRMAN SKILLMAN: Let me make a comment.  
7 I thank Bennett and Mirela for the effort that you've  
8 put in. We had a pre-call, as you all might understand.  
9 And the question I posed is, where's the data, where's  
10 the practical stuff, where's the foreign operating  
11 experience, how is that factored in?

12 And I said I'm comfortable my colleagues are  
13 going to ask questions about that, and you are providing  
14 the type of information that I was hoping that you  
15 would. And I thank you for doing that.

16 (Off microphone comments)

17 CHAIRMAN SKILLMAN: And I'm sure we're going  
18 to probably lead to another discussion, but these are  
19 the types of images that, at least in my mind, begin  
20 to set us into thinking about can we really take a plant  
21 that looks like this to the first day of the 61st year.

22 You know, what's with this plant? Is that  
23 stuff okay? And I think those are the types of  
24 questions this team needs to be asking. But thank you

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1 for your effort to bring this up here. Thank you.

2 MEMBER STETKAR: Mirela, one more thing on  
3 the cables though because you mentioned that you're  
4 trying to get information from Zion focusing on  
5 environmental conditions, radiation exposure,  
6 temperature inside the containment, location of the  
7 cable, things like that.

8 If indeed current loading of the cable was  
9 important, there are ways that you could mine that  
10 information too, knowing what it was. And if you're  
11 trying to get that information now, you might want to  
12 add that to your laundry list.

13 That's one of the reasons for having these  
14 conversations earlier rather than later after you say,  
15 well, we finished everything.

16 DR. GAVRILAS: I jotted it down as an action  
17 item for us to follow up on that. We can go into the  
18 next area, next slide please, which is the final volume  
19 of the EMDA that has to do with civil structures. And  
20 you will see under high probability high knowledge,  
21 you'll see the freeze thaw damage that we've seen in  
22 the '70s at Davis-Besse.

23 I understand that there's been a Canadian  
24 plant that had a similar experience about ten years ago.

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1 ASR is the second bullet over there, and they I saw as  
2 an example, you know I was talking to my colleagues in  
3 research during the break, is an example of something  
4 where we understand the mechanism of how the gel is  
5 formed, but we don't know what its impact is on the  
6 structure of properties of the structure.

7 So that's work in progress and I'll talk  
8 about that in a moment. And stress corrosion cracking  
9 of steel reinforcement bars and tendons, all those are  
10 high susceptibility high knowledge.

11 Under high susceptibility low knowledge,  
12 irradiation damage to concrete, we've treated  
13 temperature as a surrogate for irradiation. We're now  
14 wondering if that's appropriate.

15 Boric acid corrosion, I understand a crack  
16 developed in the liner of the Salem pool and the boric  
17 acid, the borated water that leaked into the concrete  
18 caused damage to the concrete.

19 And finally corrosion that initiates at the  
20 interface between the liner and the concrete. And  
21 that's an area that we studied, the staff studied in  
22 some detail.

23 So again, we understand the mechanism very  
24 well, we're linking it to the presence of a foreign

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1 object, but the lack of knowledge comes in, are there  
2 foreign objects out there. So, we don't know about  
3 those.

4 MALE PARTICIPANT: There's too many.

5 MEMBER BLEY: Yes. If we basing it, yes  
6 they are.

7 DR. GAVRILAS: We know they are because  
8 we've seen them at Beaver Valley, for example.

9 MALE PARTICIPANT: Yes.

10 DR. GAVRILAS: In terms of research going  
11 on, again I'm going to assume that you'll hear much more  
12 from DOE and EPRI on these programs in the afternoon,  
13 but we know that there's work done on NDE of concrete  
14 in the sustainability program at DOE.

15 And we know that there's work on the effects  
16 of boric acid and radiation damage that's done by EPRI.  
17 Our work is, we are having NIST look into the impact  
18 that ASR has on structural properties.

19 We just approved a long term research program  
20 that is looking to sort of examine the factors that go  
21 into evaluating what's the remaining service life of  
22 concrete structures. We anticipate that as being an  
23 important and involved effort.

24 It will include NDE. We're in the

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1 exploration phase on monitoring dry storage casks that  
2 will probably inform these efforts, and we have work  
3 at Oak Ridge National Lab and University of Houston that  
4 was completed in 2013 on irradiation effect strategies  
5 and remaining issues for LTO. And that concludes --

6 MEMBER BLEY: I'm just curious.

7 DR. GAVRILAS: -- my presentation.

8 MEMBER BLEY: Is there anything we learned  
9 from other industries? With other structures that  
10 have been out there for a long time?

11 DR. GAVRILAS: We have a head's up that this  
12 question may be asked. So if we have learned if --

13 MEMBER BLEY: I hadn't even thought of it  
14 until just now.

15 DR. GAVRILAS: Well, your colleagues know  
16 you well. We have, by assembling these panels the way  
17 we did, we are hoping that their expertise reached out  
18 into other industries and they brought their knowledge  
19 to the table in cases in which it was applicable.

20 MEMBER BLEY: The staff hasn't pursued that  
21 looking at other industries?

22 DR. GAVRILAS: Not outside of these panels,  
23 as far as I know. But there's another thing that in  
24 conclusion, if I may mention one other thing, it's that

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1       there were no surprises when you see the high  
2       susceptibility high knowledge, or high susceptibility  
3       low knowledge.

4               Nothing that we've seen came as a surprise  
5       to the staff. And we believe that is because the staff  
6       has been proactive in keeping abreast of what's going  
7       on in the industry and monitoring laboratory  
8       experiments, all the sources of information to have a  
9       basis for going forward. You have any additional  
10      questions? Yes?

11             MEMBER BLEY: Do they try to make any  
12      judgement as to whether the current aging management  
13      programs that one proposes for this would be able to  
14      deal with these problems, are they --

15             DR. GAVRILAS: These problems are now put  
16      into Bennett's database and they're going to be  
17      evaluated there. And if the staff should find that we  
18      need more information along those lines, we are going  
19      to reach out to experts again and try to --

20             MEMBER BLEY: Yes, at least the high  
21      susceptibility and high knowledge ones are problems  
22      that all civil structures --

23             DR. BRADY: We took two things out of the  
24      EMDAs. First was their prioritization. We have

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1 informed the expert panels, hey this was something that  
2 was high susceptibility low knowledge.

3 Just think up here, think hard on those  
4 things. We also read through all the background papers  
5 and reports of the EMDA to looking for suggestions for  
6 including aging management, and we have put that in our  
7 database for consideration.

8 MR. PHAM: Okay. I think you will also find  
9 that the industry may have a different perspective of  
10 what's their aging management program versus what the  
11 staff believes as well.

12 DR. SHACK: Right, I mean, and then there's  
13 a difference between understanding a mechanism and an  
14 aging management program.

15 DR. BRADY: Yes.

16 MR. PHAM: Yes.

17 DR. GAVRILAS: Yes.

18 MEMBER BLEY: That's right.

19 DR. GAVRILAS: Dr. Rempe, you had a  
20 question?

21 MEMBER REMPE: Yes. It's the same question  
22 I asked earlier. Again, it helps to have the  
23 perspective about the expert panels and the ongoing  
24 research. But again I guess I'd like, because I know

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1 we'll hear from other individuals later today, I'd like  
2 to hear your perspective with respect to the high  
3 priority items.

4 Is there research ongoing that will address  
5 it in a timely fashion? Are there some issues that you  
6 think no we just, you know, not enough's being done in  
7 time. And do you have any conclusions, summary type  
8 statements on that topic?

9 DR. GAVRILAS: I think that this is still  
10 early for any big conclusions, but I know that we have  
11 concerns. And I mentioned irradiation assisted  
12 degradation.

13 That's a concern that the staff has. There  
14 are others, but we're going to hear from, I assume that  
15 you'll hear from the industry. I know we had public  
16 meetings with them, so we know that they're working on  
17 it. And as more information becomes available, we'll  
18 know more about it.

19 DR. SHACK: Well, the final GALL in 2016  
20 doesn't give you a whole lot of time.

21 DR. GAVRILAS: So I'm going to quote John  
22 Lubinski the third time in three presentations on this  
23 topic. And I'm sure John will tell me if I'm misquoting  
24 him.

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1           At one point the question came up, so if this  
2           data's not available, he said that effectively we can  
3           proceed assuming that the component that's degraded  
4           will be replaced, and then revisit that decision once  
5           more data is gathered, and the component can be left  
6           to support leaving the component in service.

7           And I think that that's a pivotal  
8           philosophical approach. Did I misquote you? Am I in  
9           trouble?

10           MR. LUBINSKI:       Not misquote, good  
11           paraphrase.

12           CHAIRMAN SKILLMAN: I guess I would agree  
13           with that except that you certainly got my attention  
14           on the irradiation assisted degradation of the  
15           internals.

16           And the real issue there isn't the internals  
17           themselves, it is the support that they provide for the  
18           fuel assemblies. And if for any reason there should  
19           be a slump, or a failure, you may not be able to insert  
20           your rods.

21           And so it seems that within that window of  
22           consideration, there will be some components where we  
23           would say you can't take a bye on that component until  
24           you know that component is fit for duty for, in this

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1 particular case, so much more neutron fluence. You see  
2 the point I'm making?

3 DR. GAVRILAS: Yes.

4 CHAIRMAN SKILLMAN: Some of the stuff you  
5 can say, well just change them out. I mean, that's why  
6 you have a thermal shield to protect your reactor belts  
7 from fluence.

8 But in the internals themselves, if you get  
9 to a point where we would consider the fluence so great  
10 that there's a passive failure imminent, either on the  
11 bolting or on the structure, we can't have rods that  
12 can't fly. The rods got to go in.

13 And so there is probably a subset within that  
14 discussion where there cannot be a bye. There needs  
15 to be confirmation that the component's good for the  
16 next increment of duty.

17 DR. GAVRILAS: And that is dialogue that the  
18 staff certainly intends to engage the industry in. I  
19 mean, we've heard it, we've mentioned it to them,  
20 they'll confirm that they heard this message from us,  
21 but that's all --

22 CHAIRMAN SKILLMAN: And I say this knowing,  
23 I know one plant with a thermal shield did fail. It  
24 did fall. It did have to be righted and removed, and

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1 so there is a way for the utilities to handle this.

2 But that was the thermal shield. That  
3 wasn't a core support device. So, I think there is a  
4 sub-element within this discussion that we need to know  
5 that the devices are fit for duty for the next  
6 increment. Thank you.

7 DR. GAVRILAS: Thank you. Yes.

8 MEMBER BROWN: Because of that I just, I  
9 hadn't heard anything about it, but the thermal shield,  
10 isn't there an issue or a concern with the changes due  
11 to irradiation for the reference transition  
12 temperature, from a brittle fracture standpoint on the  
13 vessels? Or are these, is there just so much water --

14 DR. SHACK: That's the high knowledge high  
15 understanding.

16 DR. GAVRILAS: Right.

17 MEMBER BROWN: Yes but, you know, after 50  
18 or 60 years, I mean, I would expect your RTT to have  
19 come way down.

20 MEMBER RICCARDELLA: Yes, but that's  
21 monitored by ongoing programs. I mean there's --

22 MEMBER BROWN: Well could you --

23 MEMBER RICCARDELLA: -- surveillance  
24 programs that lead the vessel, and they're taking

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1 surveillance specimens out and testing them.

2 MEMBER BROWN: Wait, I remember seeing  
3 specimens that are stuck in, in one of our earlier --

4 DR. SHACK: Now the question might be  
5 whether we have enough specimens --

6 MEMBER BROWN: Yes, I was going to say --

7 DR. SHACK: -- to go this long. Since most  
8 of the people have used an awful lot of those already.

9 MEMBER BROWN: But I mean, is there any --

10 DR. SHACK: But the people are thinking  
11 about that.

12 MEMBER BROWN: Okay.

13 DR. SHACK: We haven't heard the answers  
14 yet.

15 MEMBER BROWN: Has anybody ever annealed a  
16 vessel in these programs?

17 MEMBER RICCARDELLA: Russia. They've done  
18 it in Russia.

19 MR. HAGGARTY: No.

20 MEMBER BROWN: Outside of the country where  
21 it happened?

22 MR. HAGGARTY: This is Ed Haggarty, sir.

23 CHAIRMAN SKILLMAN: Would you identify  
24 yourself, sir?

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1 MR. HAGGARTY: Ed Haggarty, sir. There is  
2 an annealing rule in the red guide though, Charlie.

3 MEMBER BROWN: Okay.

4 MR. HAGGARTY: But it's never been --

5 MEMBER BROWN: So it's never been ruled --

6 MR. HAGGARTY: -- exercised. So --

7 MEMBER BROWN: So you've never had, based on  
8 these samples and everything else, you've never  
9 approached where you didn't have enough margin --

10 MEMBER RICCARDELLA: No, we should have a  
11 plant or two because --

12 MEMBER BROWN: -- to handle the next --

13 MR. HAGGARTY: The Europeans and the  
14 Russians have done that to some of their vessels.

15 MR. HURD: Mark Hurd, Research. I mean  
16 right now, you know, like Pete said, the surveillance  
17 capsules monitor the vessel out to well beyond where  
18 they're currently operating.

19 And right now we're not projecting any, no  
20 plant's going to go beyond the PTS limit or the  
21 alternate PTS limit, which tend to be the most life  
22 limiting factors for the vessel, even within the first  
23 60 years.

24 So I guess I'd personally say I don't see that

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1 somebody would anneal when they have computational  
2 alternatives like the alternate PTS --

3 MEMBER BROWN: No, I understand that, as  
4 long as you have a good handle on the --

5 MR. HURD: Yes.

6 MEMBER BROWN: -- RTT. I understand that  
7 particular point. But you set out to 60 years and now  
8 we're talking another increment of 20 after that, and  
9 how --

10 MR. HURD: And there are efforts ongoing,  
11 and I think EPRI will be talking about it in the  
12 afternoon as part of the staff's review of Regulatory  
13 Guide 199 several years ago, and it's an ongoing thing.  
14 And that's the --

15 MEMBER BROWN: Thank you.

16 MALE PARTICIPANT: Very ongoing.

17 MR. HURD: And of course the, trying to do  
18 this straight --

19 (Laughter)

20 MR. HURD: -- that's the equations we use to  
21 predict the neutron embrittlement. We identified that  
22 there, while there's data out to high fluences, where  
23 high fluences here are talking in the six to eight E19  
24 range, the data starts to get to get sparks.

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1           So one of the things that our industry  
2 colleagues have done is they've taken that onboard, and  
3 they've implemented two surveillance programs.

4           One is to shift existing capsules out to  
5 higher fluences so that we get data, and the other is  
6 that to actually reinsert tested samples, and I think  
7 the EPRI representative will be talking about that this  
8 afternoon.

9           Additionally we've got ongoing efforts  
10 within ASTM Committee E10-02 on Nuclear Structural  
11 Materials to collect together a database not only of  
12 U.S. surveillance specimens, but also International  
13 surveillance specimens.

14           And since the international community is not  
15 constrained by the GALL guidance of removing their  
16 samples at 1.5 times EOL fluence, what you see in their  
17 data is that they've got data out, like in France, in  
18 Germany, and Japan and Korea, out to higher fluences  
19 than we do. We've compared the trends.

20           They're consistent, and so use of the  
21 international data through the ASTM code committees  
22 also provides us a mechanism for seeing where we're  
23 going.

24           MEMBER BROWN: Okay, thank you.

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1                   MEMBER REMPE:   Isn't the material in the  
2                   foreign vessels a little different than our --

3                   (Simultaneous speaking,)

4                   MR. HURD:   Not substantially, I mean when  
5                   you, well, it depends on what foreign country you wish  
6                   to talk about.  Countries of the former Soviet Union,  
7                   then yes, absolutely.

8                   But if you're talking about French vessels,  
9                   or predominantly old Westinghouse designs, German  
10                  vessels are predominantly B and W designs, the Koreans  
11                  follow our regulations.  Pardon?

12                  MEMBER REMPE:   I thought the material  
13                  composition, even in the French ones, was a bit  
14                  different.

15                  MR. HURD:       I'm not, not critically  
16                  different.  I mean, they have different, in Europe they  
17                  have a different specification.  They don't use ASTM  
18                  A508 or ASTM A533(b) --

19                  MEMBER REMPE:   Right.

20                  MR. HURD:       -- but if you compare the  
21                  chemistry tables, and compare the requirements,  
22                  they're very, very similar.

23                  MEMBER REMPE:   Okay.

24                  MEMBER RICCARDELLA:  And we have ways of

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1 adjusting for differences in chemistry --

2 MEMBER REMPE: Okay.

3 MEMBER RICCARDELLA: -- as well, when the  
4 critical comes.

5 MR. HURD: Yes, the embrittlement trend  
6 curve itself adjusts for the effects of chemistry. The  
7 main thing where you can't mix the different steels  
8 together, if you will, is when you get different  
9 embrittlement mechanisms controlling the shift in RT  
10 and ET.

11 And that's why one would treat the ex-Soviet  
12 steels differently than the western reactor steels,  
13 because they, in addition to the hardening mechanisms  
14 of copper-rich precipitation and matrix damage, they  
15 have an additional mechanism of non-hardening  
16 embrittlement through precipitation of, like,  
17 phosphorus and silicon at the grain boundaries.

18 So there you wouldn't want to mix and match,  
19 but the small differences in the spec between say, U.S.  
20 and Asian, and European steels and welds, is, we've done  
21 the work, and well, as Bill was laughing, the work is  
22 never done.

23 But we've done the comparisons within ASEM  
24 and actually found predictive equations that do, I'd

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1 say, an equally good job, or the more pessimistic might  
2 say, an equally bad job, on all of the different  
3 non-Soviet reactor countries.

4 CHAIRMAN SKILLMAN: Let's --

5 DR. GAVRILAS: I'm going to take --

6 CHAIRMAN SKILLMAN: -- proceed, okay?

7 DR. GAVRILAS: -- this opportunity to  
8 mention that this type of discussion, Mark is one of  
9 the people on the panels that we discussed. So these  
10 are the type of discussions that you can expect to  
11 happen in those panels.

12 CHAIRMAN SKILLMAN: Thank you. Let's move  
13 on please.

14 MR. LUBINSKI: Okay, thanks Mirela.  
15 Appreciate you finishing up the technical framework.  
16 So I'll just quickly go through a summary restating some  
17 of the things we've talked about already.

18 All the plans are required to meet their  
19 licensing basis during the initial licensing, during  
20 their first license renewal period, and will be  
21 required to do the same during the subsequent license  
22 renewal period.

23 We believe that the regulatory processes are  
24 effective for ensuring the licensing basis is met, and

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1 for identifying and resolving any new issues throughout  
2 plan operation. And as discussed, we know that during  
3 the first forty years as well as the first license  
4 renewal that the licensing basis does change and become  
5 enhanced.

6 And the aging management is reviewed during  
7 the initial licensing and it was expanded during the  
8 first license renewal. And we expect it to be further  
9 expanded during the subsequent license renewal period.

10 We believe that the suggested SLR framework  
11 we presented today creates a more efficient and  
12 effective process for the rule clarity for the  
13 subsequent license renewal.

14 We believe that the rule considerations in  
15 the SECY are not significant, but could produce  
16 significant improvements and efficiencies in licensing  
17 and implementation, and provide for clear  
18 demonstration for reasonable assurance.

19 We believe that adequate aging management of  
20 technical issues by the industry is critical to enable  
21 acceptable understanding of aging management  
22 degradation mechanisms and applications for subsequent  
23 license renewal.

24 The staff will continue to review and assess

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1 the technical issues, and intends to further engage the  
2 committee at a later date when we have gathered  
3 additional findings and conclusion based on our  
4 research and expert panels. And we will incorporate  
5 those as part of the established mechanisms for GALL  
6 and our SRP.

7 The staff believes that the current license  
8 renewal safety reviews are adequate and appropriate,  
9 and those principals should continue for subsequent  
10 license renewal.

11 They're listed here on the slide again.  
12 That is with the possible exceptions of detrimental  
13 effects of aging on the functionality of certain plant  
14 systems, structures, and components.

15 The regulatory process is adequate to ensure  
16 that the licensing basis for all plants provides and  
17 maintains an acceptable level of safety, and that each  
18 plant's licensing basis must be maintained during the  
19 renewal period, in part through management of age  
20 related degradation.

21 We also believe that a proposed framework by  
22 the staff ensures and maintains safety during the  
23 period beyond 60 years. And we believe that the  
24 principals and processes that we discussed with respect

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1 to the regulatory framework are policy matters, and  
2 they are currently under consideration by the  
3 Commission.

4 This concludes our presentation for the  
5 morning. As I stated at the beginning, our goal was  
6 to show you that we performed a comprehensive  
7 assessment of the current regulatory and technical  
8 framework to support subsequent license renewal.

9 And from our assessment, we believe we  
10 identified the correct focus areas that are needed for  
11 the staff to have reasonable assurance that plants can  
12 operate safely beyond 60 years.

13 I've appreciated all the questions and  
14 dialogue we've had this morning as part of our  
15 discussion. And the staff's available to answer any  
16 further questions or address any comments you have.

17 CHAIRMAN SKILLMAN: John, thank you. Let's  
18 pause here for a minute. To my colleagues, might you  
19 have any further questions for the team that's before  
20 us? On the phone line, is anybody there?

21 MALE PARTICIPANT: Is it open first?  
22 They're screaming at you, supposedly.

23 CHAIRMAN SKILLMAN: It was supposed to be  
24 open. Anybody there?

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1 MALE PARTICIPANT: It's not crackle and pop.

2 MALE PARTICIPANT: Yes, it was awful quiet  
3 for an open line.

4 MALE PARTICIPANT: It's too quiet to be  
5 open, unless nobody's there. But even there you get  
6 pops and crackles.

7 CHAIRMAN SKILLMAN: Good morning, is  
8 anybody on the bridge line, please?

9 MR. LEWIS: I'm on the phone line.

10 CHAIRMAN SKILLMAN: Oh, good morning. Who  
11 are you, please?

12 MR. LEWIS: My name is Marvin Lewis. I have  
13 been hollering at you for the last two minutes. But  
14 unhappily, just saying the phone lines are open doesn't  
15 mean the phone lines are open.

16 CHAIRMAN SKILLMAN: Marvin --

17 MR. LEWIS: But that's exactly my point.  
18 Exactly my point. I appreciate the staff and the ACRS  
19 going through these very complicated and impressive  
20 whatever.

21 But I asked you, and I ask you now very  
22 simply, have you looked into one, a repair tag blocking  
23 a warning light, or a romantic triangle causing an  
24 accident at Chalk River, or just simple things that

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1 might really screw things up?

2 I appreciate your looking at the more  
3 complicated things like stress corrosion, cracks, and  
4 what have you. But there's a lot of simple things that  
5 just about are never looked at.

6 For instance, you've just put out a FR,  
7 federal register notice on the point where it's marked  
8 concerning flags after the leases have asked for 40  
9 years. And it goes into a few other areas that I think  
10 are important.

11 Have you been trying to look into that as an  
12 every day process instead of trying to look at it  
13 probabilistically, in other words, just through  
14 looking at numbers and looking at chances?

15 Is there a chance that you're going to have  
16 blockage of your coolant? Or are you just going to look  
17 at it as an esoteric numerical exercise? Over and out.

18 CHAIRMAN SKILLMAN: Marvin, thank you. Are  
19 there any other individuals on the bridge line, please?  
20 Hearing none, would you close the bridge line? Are  
21 there any members of the public or in the audience that  
22 would like to make a comment, please? I see that there  
23 are none.

24 John, Bo, to each of you, thank you very much

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1 for your patience with us, for your good presentations  
2 for the last three and a half hours. It's been very  
3 informative. I thank you. And this portion of the  
4 meeting is ended.

5 (Off microphone comments)

6 CHAIRMAN SKILLMAN: Ladies and gentlemen,  
7 we are moving to a new pair of presenters. And we're  
8 inviting Joe Giitter and Jerry Dozier to the table,  
9 please. Ladies and gentlemen, we're still in session,  
10 we're just changing presentation teams.

11 We're still in order. And Joe Giitter,  
12 welcome. And Jerry Dozier, welcome.

13 MALE PARTICIPANT: All quiet, please.

14 CHAIRMAN SKILLMAN: Please, proceed.

15 MR. GIITTER: Okay thank you, Chairman. At  
16 first I would like to thank you for the opportunity to  
17 discuss why we believe that subsequent license renewal  
18 should be a consideration for rule making for PRA.

19 With me is Jerry Dozier. Jerry is a senior  
20 risk and reliability analyst in the division of risk  
21 assessment. But he previously worked in the division  
22 of license renewal and brings a lot of experience of  
23 license renewal with him.

24 Before we get started on the presentation,

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1 I wanted to emphasize that while the two divisions  
2 ultimately couldn't come to a compromise, that I  
3 believe both at the management and at the staff level,  
4 we've followed the NRC values. And I consider that to  
5 be very important.

6 So with the next slide, just kind of an  
7 overview. We believe there are a number of reasons why  
8 PRA should be a consideration for subsequent license  
9 renewal.

10 Fundamentally, we believe this is a policy  
11 issue. When the SECY paper came to my division for  
12 concurrence, and it did that because we are involved  
13 in doing the SAMA reviews for license renewal, what  
14 surprised me about it is there was absolutely no  
15 discussion of substance about PRA.

16 And I felt, you know, for such a major  
17 initiative, that that was inconsistent with the  
18 Commission policy statement on the use of PRA.

19 So that was fundamentally my first concern  
20 is for something as major as a regulatory process that  
21 would allow plants to operate from 60 to 80 years, to  
22 not even mention PRA, I think didn't meet the intent  
23 of what the Commission thought about in 1995 when they  
24 developed the Commission Policy Statement.

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1           We also believe that the consideration of a  
2           PRA requirement for subsequent license renewal is  
3           consistent with other regulations. And the one I would  
4           note, and I did note in the non-concurrence is the  
5           requirement for new reactors to develop and maintain  
6           a PRA for initial licensing, and then to upgrade their  
7           PRA for license renewal.

8           Jerry's going to talk about some of the  
9           reasons why inclusion of a PRA requirement also makes  
10          sense from a safety perspective, including the  
11          continued assurance that the safety goals are  
12          maintained as plants age beyond 60 years.

13          I believe it was discussed here earlier, the  
14          plant's risk isn't static. It changes as a function  
15          of time based on modifications that are made, based on  
16          aging of components, both passive and active.

17          And it's important that PRA's a tool that  
18          would allow you in an integrated way to be able to  
19          measure that risk profile as a function of time.

20          And then Jerry's also going to talk about the  
21          value of PRA as a tool to focus inspection and  
22          maintenance resources on those structure systems and  
23          components at greatest risk significance.

24          And I believe there was some discussion of

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1 that as well. We believe PRA, as part of a risk  
2 informed decision making process, is a valuable tool  
3 to do that.

4 MEMBER STETKAR: Joe? I apologize if this  
5 was covered when I was out of the room. But early on  
6 this morning I asked about the staff's experience in  
7 the, I have to be careful of the words I use here, let  
8 me just say the consistency of the PRAs and the staff's  
9 review of the PRAs that are performed to support the  
10 SAMA analyses. Was that discussed, or was that --

11 DR. SHACK: It was mentioned, but it would  
12 be interesting to hear, again, from the PRA point --

13 MEMBER STETKAR: Out of the 73 that you've  
14 looked at now --

15 MR. GIITTER: Yes, Jerry actually does the  
16 SAMA reviews, so I'll let him talk about that.

17 MEMBER STETKAR: Okay.

18 MR. DOZIER: Well actually, we use PNEL and  
19 the Center for Nuclear Waste to support us with the SAMA  
20 review.

21 MEMBER STETKAR: Okay. I'm a consultant,  
22 and the client eventually has to answer the questions.

23 MR. DOZIER: Okay. But it's a bigger  
24 question because when we get a SAMA review, we take the

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1 best available information. In other words, if they  
2 have a fire PRA, they are to use the fire PRA.

3 In SAMA space, realize we're talking  
4 environmental space at this point. We don't say go off  
5 and do a fire PRA. We basically have a multiplier  
6 within the SAMA to take into account of it.

7 What we don't ask though is we don't ask them  
8 to update any of the information, but to take the best  
9 available information.

10 MEMBER STETKAR: I'm asking in terms of --

11 MR. DOZIER: The quality of the PRA.

12 MEMBER STETKAR: -- if you look at the 73  
13 that you've looked at, is there a high degree of  
14 consistency in terms of the scope and the quality, or  
15 is there a low degree of consistency in the scope and  
16 quality. Or can you better qualify it than high or low?

17 MR. GIITTER: I would say that because we use  
18 the state of the art, as Jerry had indicated. I will  
19 answer that question more generally and not just in  
20 terms of SAMA reviews.

21 MEMBER STETKAR: Okay.

22 MR. GIITTER: But I would say that the  
23 quality of PRAs does vary within industry. And you  
24 know, I can say that based on our experience with doing

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1 risk informed license reviews.

2 Now for things like NFPA805, there is a  
3 quality standard, you know, that has to be met.  
4 Certainly Reg Guide 01-200 now has to be met. But I  
5 would say that there is a variation in quality within  
6 industry in PRA.

7 MEMBER STETKAR: And just to be clear, I  
8 don't like the term state of the art because I don't  
9 understand what it means. By state of the art you meant  
10 the state of whatever you're given because the state  
11 of the art, actually --

12 MR. GIITTER: Is not the state of the art.

13 MEMBER STETKAR: -- is state of the art,  
14 people know how to do fire PRA, flooding PRA, seismic  
15 PRA --

16 MR. GIITTER: Yes.

17 MEMBER STETKAR: -- and Level 2 PRA and  
18 shutdown PRA. So the state of the art is indeed a full  
19 scope Level 1, Level 2, all hazards PRA. That's what  
20 I would consider state of the art.

21 State of what you're given is what you're  
22 given. And what I'm asking you about is the  
23 variability in what you're given.

24 MR. GIITTER: Yes. And I would say, and we

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1 have people in here that I could get to chime in. But  
2 I think there is some variability. Steve? Is Steve  
3 Dinsmore here?

4 Maybe Steve could comment quickly because  
5 Steve does a lot of the risk informed licensing reviews  
6 and he could probably comment on that better than I can.

7 MR. DINSMORE: Yes, hi. My name's Steve  
8 Dinsmore. I'm a reliability and risk analyst in APLA,  
9 which is a branch in Joe's division. All I can say is  
10 that I agree with him, that there is quite a range.

11 MEMBER STETKAR: Okay.

12 MR. DINSMORE: It goes from, they seem to  
13 meet half of the ASME standards at Category 2 to they  
14 meet almost none of them. But they're slowly  
15 improving. It's a little hard to tell what's going on  
16 out there. But there is a wide range.

17 DR. SHACK: But in terms of scope, Steve, I  
18 think I've really only seen one where they've actually  
19 had an internal events, seismic, and fire. Most of the  
20 time, you're sort of making up the seismic and fire with  
21 a multiplier.

22 MEMBER STETKAR: And they're internal  
23 events at full power.

24 DR. SHACK: Internal events at full power.

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1 MR. GIITTER: Right. And right now there's  
2 no low power standard in place. So until that's in  
3 place, even the new reactors don't have to have --

4 DR. SHACK: So they're consistent in the  
5 sense that the scope is generally pretty restrictive.

6 MR. GIITTER: Yes. And I would say in  
7 general, there's been some improvement, you know, with  
8 NFPA 805. About half of the plants have fire PRAs.  
9 Fleet wide, Exelon for example, is doing fire PRAs  
10 because they want to take advantage of risk informed  
11 tech spec 4B.

12 And of course with site, you know, Fukushima  
13 NTF 2.1 will result in additional seismic PRAs. But  
14 it's in a state of flux.

15 MEMBER STETKAR: But that's today.

16 MR. GIITTER: That's today.

17 MEMBER STETKAR: Seventy three licenses  
18 have been renewed already. And the SAMA analyses have  
19 been reviewed for those 73.

20 MR. GIITTER: Right, yes. When you're  
21 doing a SAMA review, it's not as complete as a Level  
22 2 PRA. It's a, you know, it falls short of that.

23 MR. DOZIER: It's not a risk informed  
24 submittal.

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1                   MEMBER STETKAR: It's not a risk informed  
2                   submittal, but they rely pretty doggone heavily on the  
3                   PRA and the risk --

4                   (Simultaneous speaking,)

5                   MR. DOZIER: Oh, absolutely.

6                   MEMBER STETKAR: -- report, so --

7                   MR. DOZIER: What I'm saying is they don't  
8                   have to meet the standard and things like this. It's  
9                   when we talk about the -- oh, I'm sorry.

10                  MEMBER STETKAR: I understand the legal  
11                  nuances of risk informed. What I'm asking is in the  
12                  current license renewal process, people do use PRAs to  
13                  quite an extent.

14                  And those PRAs, at least from what we've  
15                  seen, are quite variable to justify one part of the  
16                  license renewal. Happens to be parked over in the  
17                  environmental review area, but it's indeed one part of  
18                  the license renewal process.

19                  And I'm trying to get a reading from the staff  
20                  in terms of the variability and the quality of the PRAs  
21                  that are used for that, and the level of detail that  
22                  the staff applies to look at those PRAs because they  
23                  are used to make decisions.

24                  MR. DOZIER: Right.

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1                   MEMBER STETKAR: Or they're used to justify  
2 no decisions, usually.

3                   MR. DOZIER: Yes, sir. And the last slide  
4 we have actually goes into the SAMA. And I'll explain  
5 kind of that process that we use and how we do that.  
6 Yes, sir.

7                   MR. GIITTER: So as I was saying, when the  
8 SECY paper came to us for concurrence, there was no  
9 discussion of substance on PRA and the role it might  
10 play in a rule making for subsequent license renewal.

11                   And of course, the PRA policy statement says  
12 that the use of PRA should be increased in all  
13 regulatory matters to the extent supported by the state  
14 of the art.

15                   And you know, I just wanted to point out  
16 briefly that when the Part 54 rule making originally  
17 was issued in 94, the PRA policy statement was still  
18 under development.

19                   But it did acknowledge in the Statement of  
20 Considerations for Part 54 that PRA methods would be  
21 useful on a plant specific basis to assess the  
22 importance of SSE subject to AG management.

23                   And I'll also note that the PRA policy  
24 statement used the term supported by the state of the

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1 art. And the state of the art of PRA has advanced  
2 considerably in 20 years.

3 So based on that, the conclusion was that,  
4 I believed anyway, that not really discussing PRA at  
5 all was an oversight in terms of the SECY paper. I felt  
6 it should have addressed that.

7 We also believe that the regulatory  
8 framework that would provide a technical basis for  
9 allowing reactors to operate for up to 80 years should  
10 at least consider risk. And so we were bothered by  
11 that.

12 We set up a number of meetings, both at the  
13 staff and the management level with the Division of  
14 License Renewal. And we were actually close to coming  
15 up with some compromise language that credited the use  
16 of risk assessment to measure the effectiveness of an  
17 aging management program.

18 But ultimately that was rejected. The  
19 compromise language was rejected because it was  
20 believed by the license renewal folks that it wasn't  
21 uniquely relevant to subsequent license renewal.

22 Next slide. So instead of looking back 20  
23 years to the time frame when the Part 54 rule was  
24 promulgated, what I'm really proposing is that we try

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1 to imagine what the future is 25 years from now.

2 Without any additional requirements for PRA,  
3 you could have a situation where passive reactors, say  
4 AP 1,000s or SMRs, have updated, high quality PRAs that  
5 are effectively used to manage risk.

6 In contrast, there would be reactors  
7 operating alongside that are operating for 60 plus  
8 years with outdated PRAs that may not necessarily  
9 reflect the risk of the plant.

10 And so fundamentally, does this make sense  
11 from a policy perspective when we know that the baseline  
12 risk for passive designs may be as much as two orders  
13 of magnitude lower than for operating reactors.

14 CHAIRMAN SKILLMAN: Is that first carrot  
15 really 50.71 or 52.71?

16 MR. GIITTER: It's actually 50.71.

17 CHAIRMAN SKILLMAN: It's 50.71?

18 MR. GIITTER: Yes, it's --

19 (Simultaneous speaking,)

20 MR. GIITTER: Don't ask me why. I can't  
21 give you the background. But it is --

22 (Simultaneous speaking,)

23 CHAIRMAN SKILLMAN: It's bizarre. That's  
24 the only place you can find it.

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1 MR. GIITTER: It's a good check, okay.

2 CHAIRMAN SKILLMAN: It's interesting  
3 because it's pointing to a coal for what is a Part 52  
4 license. Thank you. Okay.

5 MR. GIITTER: So I'm going to turn it over  
6 to Jerry at this point and he's going to talk about some  
7 of the technical rationale for why we believe that  
8 subsequent license renewal should consider PRA in the  
9 rule making effort.

10 MR. DOZIER: Good morning. This goes back  
11 to Dr. Stetkar's question that he asked during the  
12 license renewal portion. But before I get into this  
13 segment, I would like to talk about what happened with  
14 our risk informed initiatives in maintenance.

15 For example, the 1980's, basically what we  
16 had at that time was fixed frequency tasks done at  
17 standard intervals. And we had corrective  
18 maintenance. That's basically all we had.

19 When the early '90s came around, reliability  
20 centered maintenance started emerging, PRAs after the  
21 '88 time frame started becoming available and we got  
22 the PRA policy statement, then we got the maintenance  
23 rule. And this was after the license renewal rule in  
24 '95.

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1           This was the first risk informed,  
2 performance based rule in 1996. Okay, so what happened  
3 to our maintenance? And if you look at what really  
4 happened, in maintenance rule, we were looking for  
5 performance.

6           We wanted the system to be available. We  
7 wanted the system to have not too much, have little  
8 corrective maintenance. And so we monitored those,  
9 and we called it monitoring the effectiveness of  
10 maintenance at nuclear power plants.

11           So from that, industry started doing smarter  
12 risk informed maintenance. Instead of going out and  
13 overhauling a pump at a fixed frequency that the time  
14 or the calendar told you to do it, we use predictive  
15 technologies, predictive technologies to tell us, like  
16 LUVOL analysis, vibration analysis to tell us when the  
17 pump really needed to be done.

18           So then that was the important thing. This  
19 was predictive because it was risk informed. Also, we  
20 were considering what we took out of service, you know,  
21 how it affected the overall risk.

22           So we had, you know, on one side license  
23 renewal which was deterministic and still primarily is,  
24 to a risk informed strategy. So that kind of sets the

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1 framework for some of the differences that we'll be  
2 talking about here.

3 For example in this slide, the scope and  
4 consistency. Well basically, you know, for most of the  
5 initiatives that we've done so far like maintenance  
6 rule, we use a scoping that was risk informed.

7 Let's work on the important structures,  
8 systems, and components, and then things were low.  
9 Okay, now these were license renewal. And as they're  
10 adding, and one of the options they want to add, you  
11 know, other deterministic criteria to build on the  
12 scoping.

13 And license renewal is basically, and this  
14 is why we wanted an updated PRA, is so that we can look  
15 at all the changes to see what's important now. And so  
16 we believe that an updated, plant specific PRA could  
17 potentially identify vulnerabilities beyond the  
18 limited design base.

19 And I want to give you an example in the next  
20 slide. This was a pilot study that South Texas did.  
21 Basically, if we look on your right hand side, on the  
22 non-safety systems we see that, well let's go to safety  
23 systems because that's a little bit surprising.

24 You have your safety systems and 75 percent

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1 of them that were deterministically determined was  
2 really low safety significant, and only 25 percent were  
3 really highly safety significant.

4 Now on the other hand, what could we be  
5 missing? Well it identified that for non-safety  
6 systems, there's about one percent of those that could  
7 be safety significant. And so this was what the other  
8 side of the house was doing that was risk informed.

9 Surveillance and inspection. For  
10 inspection, also in the license renewal we talked about  
11 10 CFR 55, 55A dealing with codes and standards, ASME  
12 codes and standards. What did they do?

13 Basically, they became, you know, there was  
14 a new code case that actually risk informed. So what  
15 did risk informed ISI do? Risk informed ISI accounted  
16 for the risk significance from the PRA, and it also  
17 looked to the level of the susceptibility of  
18 degradation.

19 It went to the level of mechanisms. For  
20 example, stress, corrosion, cracking, that type of  
21 level, the mechanism level. So in here, now of course,  
22 PRA is a two edge sword, so a lot of deterministic people  
23 don't like to talk about PRA in that manner because we  
24 did focus resources in one area, and we did resources

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1 in the areas where there was very low susceptibility  
2 of that corrosion type, or they were unimportant.

3 Design input parameters. One of the options  
4 was to look to see if there was any design input  
5 parameters that we may look at. Well again, the PRA  
6 and an updated PRA can show you which design inputs are  
7 most important.

8 And sometimes those are kind of hard to  
9 identify from a deterministic method. One example is  
10 where that passive seals, basically, in an area could  
11 degrade and you could have internal flooding that  
12 affects the safety related components.

13 And it's hard to see that from a  
14 deterministic viewpoint. But the PRA can help us to  
15 identify those types of vulnerabilities.

16 MR. GIITTER: Yes. Just as an example,  
17 there was a PRA that was done back in the late '70s,  
18 early '80s that identified seal failures that resulted  
19 in turban building flooding and the plant in question  
20 had switch gear in the turban building. It was very  
21 high risk significance.

22 And so, you know, as Jerry indicated, those  
23 are the kind of things that if you model properly in  
24 a PRA, you can find vulnerabilities you might not

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1 otherwise find.

2 Now we did, and I've got Sunil Wernkkody  
3 here. We've had a record number of STPs resulting in  
4 greater than green findings based on NTTF 2.3 walkdowns  
5 where they found, you know, seals that weren't in place,  
6 missing at a number of plants.

7 Sunil, how many? Probably close to a dozen  
8 or so, something like that. Anyway, you know, it is  
9 a real phenomenon. And if you do the PRA right, you  
10 model it right, you can find vulnerabilities that you  
11 won't necessarily find taking a purely deterministic  
12 Chapter 15 accident analysis approach.

13 CHAIRMAN SKILLMAN: Joe, let me ask this.  
14 And I ask this without prejudice, just as an engineer  
15 and a 47 year nuke. I get it on your PRA discussion.  
16 I really do. I watched the industry change with the  
17 maintenance rule.

18 In my view, that was a single lightning bolt.  
19 That combined with the thick magnifying glass of INPO  
20 and the change from SELP to the current inspection  
21 basis, for changing how the plant health fundamentally  
22 changed. And I mean that for almost all the plants in  
23 the country.

24 That was, in my view, significant. The PRA

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1 approach helped that. I'm talking '90, '91 through  
2 about '96, '97. And so I'm a believer in your argument.  
3 My problem is connecting your argument to SLR.

4 So I am fully supportive of what you are  
5 communicating. But making this a component of SLR  
6 seems, to me, to not yet have the linkage that I think  
7 needs to be there. So that's what I would like to hear  
8 explained.

9 MR. GIITTER: Okay. I actually have that in  
10 a later slide. I can talk about it now if you like,  
11 or I can --

12 CHAIRMAN SKILLMAN: No, let's move on.  
13 We've got people from across the country. I would like  
14 to break by five minutes to 1:00 so we stay on our  
15 schedule.

16 MR. GIITTER: Sure.

17 CHAIRMAN SKILLMAN: Thank you.

18 MR. DOZIER: Okay, again on some of the risk  
19 informed initiatives. Of course our reactor oversight  
20 process is risk informed. So we have ways to measure  
21 effectiveness.

22 And I'm on the wrong slide. Option 4 that  
23 was mentioned discusses how the staff wanted to seek  
24 assurance that changes over time to cite parameters

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1 that may effect the CLB are understood.

2 Well, we have a region component design basis  
3 inspection verifies this. And then one of the first  
4 things that they do when they do that is they go and  
5 they look at PRA to identify the most important areas.  
6 So here again is where an updated PRA can help us in  
7 so many areas of our regulation.

8 And actually, you mentioned IMPO. And  
9 actually Dr. Shack, this question about do we have  
10 reporting of passive and active components within the  
11 maintenance rule, and yes we do.

12 I was also in the operating experience group.  
13 And October 17th of 2007, I did do a presentation to  
14 our executive team that looked at the EPIX database,  
15 passive and active components. And it did provide a  
16 lot of insights.

17 And so again, that was something because we  
18 let the industry go and we've made them be accountable  
19 for availability and reliability, but we let them do  
20 it in the manner that they wanted to do it, they went  
21 out as an industry to form this EPIX database that Dr.  
22 Shack mentioned earlier to provide that.

23 And that's what they do in maintenance rule  
24 now is they provide us with our higher level

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1 reportability requirements and our daily event  
2 reports, and also our licensee event reports.

3 The smaller level functional failures or  
4 maintenance preventable functional failures that they  
5 have, they report to IMPO. IMPO provides documents  
6 summarizing the lessons learned from that information.  
7 That was a little side note to, I'm sorry, to answer  
8 your question that you asked earlier.

9 Internationally, what's happening  
10 internationally, and also within our own division of  
11 our Office of Research? There's been a lot of things.  
12 Actually, just two weeks ago the Canadian regulators  
13 gave a workshop of what they were doing with aging and  
14 their PRA.

15 Our Office of Research also has done work.  
16 If you need a list, I have a list of papers that have  
17 been generated. But I do want to mention one, and it  
18 was new reg CR 5632 which was incorporating aging  
19 effects and a PRA, a feasibility study utilizing  
20 reliability physics models, it was published in 2001.

21 And a co-author on this new reg was  
22 Commissioner George Apostolakis. So the  
23 international community, our own research has looked  
24 into what happens when a plant ages.

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1           And you asked the question, well what's the  
2           magic thing that happens in 60 years? What is that?  
3           Well we hope that the current licensing basis will keep  
4           our failure rate at a constant rate as assumed in the  
5           PRA.

6           A common denominator of these aging PRA  
7           studies is basically, you know, as the bathtub curb goes  
8           up, your failure rate increases. What these PRAs  
9           primarily do is they look and see what this effect.

10          So these PRAs gives us, again, predictions  
11          of what we might could occur in the extended period.  
12          So is it magically anything happened? Well we want to  
13          use the PRA in an upgraded fashion to see what those  
14          vulnerabilities and sensitivities might be.

15          And we think that's even more important as  
16          we get beyond 60 years and get that wear out portion  
17          of the reliability curve.

18          MR. GIITTER: Is the next slide mine?

19          MR. DOZIER: No.

20          MR. GIITTER: Oh, yes SAM. Okay, go ahead.

21          MR. DOZIER: Okay, the next slide, as  
22          promised, is the Severe Accident Mitigation analysis.  
23          If I could just briefly describe what that process is.  
24          Basically, the SAM analysis is a simplified Level 3

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1 consequence analysis.

2 It's over in the environmental report  
3 because he's talking about the environmental effects  
4 of this. Although it kind of has a safety feature. It  
5 certainly does. It certainly has.

6 But it's performed to meet our NEPO requirements.  
7 Okay what the SAMA does, it identifies plant specific  
8 potential cost beneficial changes that can reduce the  
9 plant risk.

10 Most potentially cost beneficial SAMAs  
11 identify the analysis or procedure changes, training  
12 or minor design changes such as having a backup portable  
13 generator or small things like that.

14 Major design changes typically are not cost  
15 effective. Several plants have identified anywhere  
16 from one to 11 potentially cost beneficial SAMAs during  
17 the license renewal review.

18 Now of those cost beneficial items that they  
19 have, if they're not age related, we don't put them  
20 into, you know, the licensee don't make a commitment  
21 to go do them.

22 They have an incentive to do it because it  
23 reduces their risk number. And if they come in later  
24 for a risk informed initiative, they want to have their

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1 CDF low.

2 So there's incentive for them, a voluntary  
3 incentive for them to do those. But we do not require  
4 that. And if we do want to require them, we have to  
5 do go through the backfit process.

6 Now the license renewal or subsequent  
7 license renewal. What's the big difference that we'll  
8 have from 60 to 80? Okay, right now, and of course this  
9 I'm talking a Part 51 requirement, not 54, so I'm a  
10 little out of context, but this is still license  
11 renewal.

12 Basically, in subsequent license renewal, if  
13 they've already performed a SAMA one time, they don't  
14 have to do it again. That's in Part 51. Now it'll  
15 continue, and basically what I'm saying here is  
16 subsequent license renewal, DRA will be out of the  
17 picture as we stand right now.

18 But let's say we ask for this upgraded PRA,  
19 just like we did in generic letter 8820 with the high  
20 PE, IPEEE. Most of these cost beneficial things really  
21 come from the Level 1, Level 2, and the flooding,  
22 external event's PRAs.

23 We can still look at the importance measures  
24 to find how changes to the plant could benefit the risk.

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1 So we could still gain those benefits from an updated  
2 PRA.

3 MR. GIITTER: Okay. Chairman, I wanted to  
4 answer your questions. And I want to make sure, there  
5 is a number of reasons why I think subsequent license  
6 renewal is the time to consider this. I'll talk about  
7 some of the policy reasons.

8 But there's also, I think, technical reasons  
9 as well and I want to talk a little bit about that. And  
10 as we had indicated earlier, we already have the  
11 capability, in fact just about every plant operating  
12 in the United States has risk informed in-service  
13 inspection.

14 So we're already using PRA techniques to  
15 determine which, to do smart inspections of those  
16 passive components of greatest risk. So we already  
17 know how to do that.

18 And there is a lot of effort underway right  
19 now to be able to incorporate models that look at  
20 passive component aging into PRA. And certainly, I  
21 think by the time that the plants are looking at  
22 actually going into operation for greater than 60  
23 years, I think many of those methods will be mature.

24 But a lot of that work's going on outside the

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1 United States, as Jerry indicated.

2 MEMBER BLEY: Before you go forward, John,  
3 that's kind of the piece that I'm glad you're mentioning  
4 because everything else that I've read, and I don't  
5 think I got that in reading your paper, everything else  
6 I read was pretty much bringing plants licensed under  
7 Part 50 into kind of PRA state of the art with the newer  
8 plants.

9 But the idea that you can treat some of this  
10 passive equipment and structures probabilistically  
11 within the PRA seems to me the thing that might become  
12 very important.

13 And in fact, that's what the expert panels  
14 are kind of doing. And you haven't emphasized that  
15 until right here at the end.

16 MR. GIITTER: In the non-concurrence. And  
17 I have to say, I wrote the non-concurrence on a Saturday  
18 afternoon in between trips. So you know, it wasn't a  
19 lot of effort on my part.

20 But I did mention risk informed ISI. And I  
21 think that serves as, it's kind of a model for how we  
22 could do this, you know, for subsequent license  
23 renewal.

24 MEMBER RICCARDELLA: You know, I'm not by

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1 any means a PRA expert, but I've been heavily involved  
2 in the implementations of risk informed ISI and  
3 associated ASME code rules.

4 And really, the majority of that work did not  
5 consider a formal PRA in any sense at all. I mean, all  
6 we did was look at components to say what are high risk,  
7 what are medium risk, what are low risk, and then look  
8 at susceptibility, what are high risk, what are medium  
9 risk, what are low risk. And we ranked them and picked  
10 our inspections based on that.

11 And I think my understanding is the reason  
12 for that was that when you look at a PRA, its passive  
13 components really never turn out to be a significant  
14 contributor to the risk in a PRA. Correct me if I'm  
15 wrong, some of you PRA guys.

16 MEMBER BLEY: Only because we haven't been  
17 looking at long period of times where they might become.

18 MEMBER RICCARDELLA: Right.

19 MEMBER STETKAR: The argument has been that  
20 --

21 MEMBER BLEY: In the short term --

22 MEMBER STETKAR: The short term, they're  
23 not.

24 MEMBER BLEY: -- the state is everything

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1 else.

2 MEMBER RICCARDELLA: Yes, but because of  
3 that, my understanding is that most PRAs give very, very  
4 crude treatment to those types of --

5 MEMBER STETKAR: Most PRAs give essentially  
6 no treatment. Not crude.

7 MEMBER RICCARDELLA: Yes, they just make  
8 some assumptions. You know, and so I don't think  
9 there's anything going forward in this subsequent  
10 license renewal that keeps us from risk informing the  
11 process the way we did with risk informed ISI.

12 But that doesn't necessarily require a full  
13 blown PRA or an update to a PRA.

14 MR. GIITTER: Yes, well let me talk about  
15 some of the reasons why I think subsequent license  
16 renewal is probably the right place to do this. But  
17 to answer your question, the techniques, you know,  
18 there's still a lot of work to be done.

19 But I think that you can model passive  
20 systems. In fact, I would argue that for new reactors,  
21 they rely on passive systems for safety. So you know,  
22 it's certainly something you can consider in the risk  
23 model.

24 But as Jerry indicated, you know, there's a

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1 land to tile approximation unavailability, right? The  
2 failure rate times the mean time to repair. And that  
3 assumption is that failure rate is constant, right?

4 Well we know from experience from some of  
5 these age related degradation mechanisms we've talked  
6 about, whether they be thermal fatigue, high cycle  
7 fatigue, primary water stress corrosion cracking, that  
8 things can change.

9 And you know, as we get a better  
10 understanding of those, I think we'll be in a much  
11 better position to be able to, and operational  
12 experience, we'll be in a much better position to be  
13 able to model that in a risk assessment.

14 And moving forward, I think we'll be in a much  
15 better place to be able to characterize and understand  
16 the risk in a way that we may not be able to otherwise.  
17 But going back to why subsequent license renewal, first  
18 off, the PRA quality as you indicated John, it's not  
19 consistent right now within industry.

20 Where we have seen improvements in quality,  
21 it's been driven by voluntary initiatives, things like  
22 NFP 805, to a lesser extent 5069, risk informed tech  
23 spec 4B, you know, things where utility sees a benefit  
24 in upgrading their PRA.

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1           Without additional incentives, will  
2 licensees voluntarily update and maintain their PRAs?  
3 I'm not sure. But a PRA requirement at the subsequent  
4 license renewal is one way of ensuring that.

5           The response to the non-concurrence cited  
6 effort's under way. And I heard some of those  
7 discussed today in support of the Near Term Task Force  
8 Recommendation 1 and the risk management regulatory  
9 framework as a potential means of addressing a PRA  
10 requirement for operating reactors.

11           I have staff in my division that are  
12 supporting this effort, and I can tell you that I'm not  
13 confident this is going to be a case.

14           In fact, the working group on the Near Term  
15 Task Force Recommendation 1 did look at an approach  
16 modeled after the approach recommended by the Risk  
17 Management Task Force that required licensees to  
18 develop plan specific PRAs.

19           And based on the cost estimates developed by  
20 the staff and industry, it was concluded that the cost  
21 to existing Part 50 licensees was greater than the  
22 safety benefit. And that's part of because of the way  
23 we do cost benefit analysis.

24           But nonetheless, it was a situation that

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1 wouldn't pass the backfit rule. The bottom line is  
2 that rule making for subsequent license renewal  
3 provides that unique opportunity for the staff to  
4 explore the option of a PRA requirement.

5 And that was really my intent. It wasn't  
6 saying there absolutely has to be a PRA requirement.  
7 It's just this should be a consideration for the  
8 Commission to think about.

9 Yes, there are potential opportunities to  
10 require PRA outside of subsequent license renewal.  
11 But to use OGC phraseology, at least in my opinion,  
12 they're remote and speculative.

13 DR. SHACK: You think they won't raise the  
14 backfit argument if you put it in SLR?

15 MR. GIITTER: You don't have to do a backfit.

16 DR. SHACK: Pass a new rule, you probably  
17 will.

18 MR. LUBINSKI: John Lubinski, and I'm going  
19 to ask, I think we do have OGC in the room today. But  
20 if you look at the backfit criteria that we're talking  
21 about in current Part 50, it's different than what  
22 you're doing from the standpoint of a rule making.

23 You do have to do a cost benefit analysis as  
24 part of that. And you can make a determination that

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1       you would still go forward even if it would not pass  
2       the cost benefit analysis. It's a little different  
3       standard along the way.

4               DR. SHACK: But you don't have to do a 5109  
5       backfit analysis.

6               MR. GIITTER: So anyway, to kind of  
7       summarize, I appreciate the opportunity to express our  
8       views. And we believe that our proposal leverages risk  
9       insights based on plant specific risk profiles and our  
10      best understanding of age related phenomenon to help  
11      ensure that we make the best decisions about the future.

12              And the process laid out in the SECY relies  
13      on a deterministic, process driven approach for aging  
14      management that was established 20 years ago.

15              One final thought. In exploring the use of  
16      PRA in subsequent license renewal, I believe it would  
17      be important for us to look at resource benefits and  
18      using risk insights to focus resources on aspects of  
19      an aging management program of greatest risk  
20      significance.

21              Right now under the current concept of an  
22      aging management program, all age related structures,  
23      systems, and components are equally important.  
24      Really, what we're proposing here would result in a

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1 potential cost savings to the NRC and to the industry,  
2 and result in greater reduction of risk associated with  
3 aging components.

4 So should a PRA be a consideration for  
5 subsequent license renewal? Is it relevant at  
6 subsequent license renewal? I believe it is,  
7 absolutely. That concludes my remarks.

8 CHAIRMAN SKILLMAN: Joe, thank you. Let's  
9 take a pause here. To the members, any questions you  
10 would like to ask or any further clarification you might  
11 wish to have?

12 Joe and Jerry, thank you. Would you please  
13 make sure the bridge line's open?

14 (Off microphone comments)

15 CHAIRMAN SKILLMAN: Ladies and gentlemen, I  
16 want to make sure the bridge line is open to see if we  
17 have comments, and then we'll go to the audience as soon  
18 as we're done with that portion of our meeting.

19 Is there anybody on the bridge line, please?  
20 I ask again, anybody on the bridge line?

21 MR. LEWIS: No comment at this time.

22 CHAIRMAN SKILLMAN: Marvin, thank you,  
23 understand. Anybody else? Ladies and gentlemen of  
24 the audience, are there any comments, please?

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1                   MR. WERNKKODY: My name is Sunil Wernkkody.  
2                   I'm the Chief of the PRL Operations in the Human Factors  
3                   Branch in the regional risk assessment. One of my  
4                   primary responsibilities is to support the reactor site  
5                   process, primarily to relieve any findings that the  
6                   regions consider as potentially significant.

7                   What I want to do is make a couple of  
8                   statements. You know, Joe mentioned with respect to  
9                   some of the findings, with respect to flooding and how  
10                  they may relate to this particular issue.

11                  Last year, just to give you the context how  
12                  inspectors in a given year find maybe thousand  
13                  inspection findings, thousands. But a very small  
14                  fraction of that comes to us for the licensees.

15                  And under the licensees our regional analyst  
16                  conclude that they may be potentially significant.  
17                  During the last year, because of the Fukushima related  
18                  efforts, there was a significant focus on looking at  
19                  flooding and seismic kind of issues.

20                  And majority of our findings were with  
21                  respect to flooding. And one of the things that Joe  
22                  alluded to, and I can make a statement here, and if the  
23                  Committee decides to follow up with factual  
24                  information, was majority of them were related to flood

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1 related.

2 And more importantly, they were related to  
3 the passive components in that these issues became  
4 potentially significant and ended up being, number of  
5 them, either yellow or white, which is ended up being  
6 finally significant primarily because some of the  
7 passive components the licensee relied on did not,  
8 either failed to work or did not work properly.

9 This included sometimes things like the dams  
10 they plan to build, and sometimes this depend on some  
11 of the seals that they were relying on for flat  
12 protection.

13 Now, I am not expert like Jerry is on license  
14 renewal. But I do know that with respect to passive  
15 barriers, at the present time, these are not things that  
16 we necessarily pay a lot of attention to.

17 In my professional opinion, in an effort for  
18 subsequent license renewal, it's good for the agency  
19 to pay more attention on a going forward basis to such  
20 components.

21 Now how we do that, whether we're using PRA  
22 or otherwise, it's yet to be remain. But I firmly  
23 believe that it's good for the Commission to consider  
24 PRA as one of the options, because in my view it

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1 primarily enhances safety.

2 The second point I want to make is actually  
3 not based on my experience as a regulator, but going  
4 back to like 25 years ago when I was the supervisor at  
5 the facilities overseeing the operations at four  
6 plants.

7 For a while there, I was in charge of  
8 monitoring how we address the risk informed ISI. It's  
9 been, like, 25, 30 years ago, but I still remember when  
10 we did the initial efforts to come out and find out that  
11 we were testing certain very reliable components that  
12 don't age.

13 For example, the RCS pipes to death, you  
14 know, we found that we were testing them so frequently  
15 but never finding any problems with them. But at the  
16 same time not testing some of the key passive features  
17 such as service sewer pipes which are prone to  
18 degradation.

19 So at that point in time, I realized as a  
20 licensee how great it is if we could focus our resources  
21 to more risk significant components.

22 Now I can't, and I shouldn't speak for the  
23 licensees right now because it's been, like, 15 years  
24 I became a regulator, but at that time I realized that

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1 in any area that we been in risk informed thinking, it  
2 helps us be more in pro-safety and at the same time,  
3 reduce some of the unnecessary burdens. Thank you.

4 CHAIRMAN SKILLMAN: Thank you. Are there  
5 any other comments from the audience, please? Hearing  
6 none, we will break until 1400, 2:00 p.m. on that clock.

7 (Whereupon, the foregoing matter went off  
8 the record at 12:46 p.m. and went back on the record  
9 at 1:59 p.m.)

10 CHAIRMAN SKILLMAN: The meeting will now  
11 come to order. It is 2:00 p.m., 1400. And we will  
12 begin by hearing from Jason Remer from NEI. Jason, you  
13 got the floor.

14 MR. REMER: Thank you very much.

15 CHAIRMAN SKILLMAN: Yes, sir.

16 MR. REMER: I appreciate the time to come and  
17 speak with this body about subsequent license renewal.  
18 It's an issue that we've been very interested in over  
19 the last few years. To introduce myself, I worked at  
20 Arkansas Nuclear 1 for 18 years in the power plant. And  
21 probably should have stayed there. Rural Arkansas is  
22 pretty nice, pretty cheap, a pretty nice life.

23 MEMBER STETKAR: Hot springs.

24 MR. REMER: Yes, hot springs are nice.

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1       Where two thirds of the vehicles are pickup trucks.  
2       You know, it's hard to find a sedan down there near the  
3       plant. But kind of motivated me to become interested  
4       in this topic. Because it really does deal with what's  
5       going on where our plants are located.

6               So as far as an outline, what I want to cover  
7       this afternoon, factors supporting long term  
8       operation. The fact that we're , SLR is built on a  
9       successful license renewal program. How we're  
10      preparing for long term operations in SLR. And let's  
11      look at the aging management process a little bit.

12             I would like to go point by point on the SECY  
13      paper, and then provide a summary. You're going to see  
14      a couple of slides, and a couple of documents that  
15      you've seen before two or three times. So I'm going  
16      to take that to mean that it's probably on the mark.

17             So why are we here today? Well, we're here  
18      because nuclear generates a substantial portion of our  
19      electricity. And an even more substantial portion of  
20      our emissions free electricity. We expect that to  
21      continue. Sixty-one percent of the emissions free  
22      electricity is provided by nuclear.

23             I know you know that already. But  
24      electricity demand, even though it's slower than

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1 expected about ten years ago, it still is increasing  
2 by two percent a year. We've got a good news story with  
3 our nuclear facilities.

4 Even with a couple of big outages, and the  
5 fact that we had San Onofre 2 and 3 down, we still had  
6 a 90.9 percent availability factor in 2013. If you  
7 take those two out, you're at 92 percent. That's an  
8 all time high as far as reliability and productivity.

9 When you compare that a little bit with, coal  
10 is 55, gas 56, hydro 42, wind 31 and solar 27. So 92  
11 percent looks pretty good. That's 24 hour, seven days  
12 a week, 365 days a year and Christmas, you have nuclear  
13 power electricity.

14 I like to tell my kids, and I live in  
15 Virginia, you know, to look at the lights. And, you  
16 know, four out of those ten lights are powered by  
17 nuclear electricity. A lot of kids in grade school,  
18 you know, they think it's all from solar. No, it's a  
19 lot from nuclear. And some states more than others.

20 DR. SHACK: Come to Chicago.

21 MR. REMER: Yes. I don't know what the  
22 number for Chicago is.

23 DR. SHACK: Four out of five.

24 MR. REMER: Four out of five? Yes, I know

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1       it's big, big time.     So, availability is good,  
2       productivity is good.   Accident rate.   Again, you  
3       know, if you're at a nuclear plant and you're having  
4       industrial accidents, it's hard to spin for the  
5       regulators and say, we're operating safely.   You know,  
6       we're taking care of the core.

7                 But, you know, people are getting killed, and  
8       they're getting hurt at our plants.   And the few  
9       unfortunate events that do occur where you have  
10      fatalities are very unfortunate.   But overall, nuclear  
11      rates right up there, I think with insurance offices.  
12      Very safe place to work.

13                Here's a little graph that we just updated  
14      recently.   You've probably seen the one with 40 years  
15      of operation, and then 60 years of operation.   What I  
16      had our staff do is update this, showing with this line  
17      here, if 80 percent of the existing plants go to 80  
18      years, here's what you have.   You best have the area  
19      under the curve there.   If all of them go to 80 years  
20      you're talking about this green line here.

21                So, as you can see there, compared with all  
22      the previous nuclear generated electricity, with SLR  
23      you're talking about a very substantial amount of  
24      megawatt hours on the grid, safely, effectively,

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1 environmentally sensitively. That doesn't come  
2 without a price though.

3 We do spend a lot of money on our nuclear  
4 power plants. We invest heavily in various areas.  
5 Updates, and extended operation has been a big one in  
6 2012. This shows the spinning by year. Overall in  
7 2012 we spent as an industry 8.5 billion dollars in  
8 these areas. Fifty-one percent of it, upgrades,  
9 license renewal, making things better, better for the  
10 future. A lot of equipment replacements.

11 People think, okay, these are old plants.  
12 These are 50 year old plants. Well, they're really  
13 not. They're, the structure's there. Many things are  
14 that old. But many of the moving parts and the  
15 equipment, pumps, motors, valves, control systems,  
16 they're all new. And many of them are new for the  
17 second and third time.

18 And so if you walk, and I know you've been  
19 in a power plant. But if you walk in there, you see  
20 the electronic control systems for the feed water  
21 system. You see the INC upgrades. You see the brand  
22 new equipment. You see some old equipment that's been  
23 maintained very well though. And so, this comes  
24 because we spend a lot of money on capital expenses,

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1 as well as O&M.

2 CHAIRMAN SKILLMAN: Would you go back to the  
3 previous slide?

4 MR. REMER: Yes.

5 CHAIRMAN SKILLMAN: Back one more? In the  
6 red, blue and green lines, should we assume that you  
7 used the same capacity factors and outage rates as are  
8 represented by the present purple line?

9 MR. REMER: I believe so. Yes, I believe  
10 that to be accurate. We used the same availability  
11 lines, or assumptions.

12 CHAIRMAN SKILLMAN: Thank you.

13 MR. REMER: And certainly if you had other  
14 plants drop down, and you lose plants, the line would  
15 reduce.

16 CHAIRMAN SKILLMAN: Okay. So --

17 MR. REMER: And that's assuming  
18 improvements.

19 CHAIRMAN SKILLMAN: Okay. And so does that  
20 line include both San Onofre 2 and 3, and the Calhoun?

21 MR. REMER: Right now this includes  
22 everybody that has renewed licenses. And that would  
23 also probably include, and I have to check the data,  
24 those that have been shut down. And so I'm not sure

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1 about that. That might shift it slightly.

2 CHAIRMAN SKILLMAN: Okay. Thank you.

3 MR. REMER: Sure. Okay. That's in the  
4 long term. Of course it's not, if you lived in a small  
5 town like I did, in Russelville, Arkansas, what happens  
6 at the nuclear happens in the community, in the county,  
7 Polk County, you know. You know somebody that works  
8 at the power plant.

9 So when you have outages, that you increase  
10 the output of the plants, putting in power upgrades,  
11 extended power upgrades. You do maintenance. You do  
12 large outages. It pumps a lot of money into the local  
13 communities. People that live around nuclear plants  
14 are proud of their nuclear plant. They're not afraid  
15 of it.

16 I used to tell people at church, you know,  
17 hey, a bad storm comes, I want to go toward the plant.  
18 That's where I want to be. Because I know it's designed  
19 for those scenarios. So it affects, what we're talking  
20 about today affects many, many people in the  
21 communities the plants are sited.

22 Of course, emissions, you can see there, and  
23 you know this already. Nuclear, as far as life cycle  
24 emissions is right down there with hydro, geothermal,

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1 wind, solar, et cetera. So very, very low emissions.

2 If people think they can just replace the  
3 nuclear power with something like natural gas, you can  
4 immediately see we will increase the greenhouse gas  
5 emissions. And we will not meet the current  
6 President's requirements or desires for reduction. So  
7 nuclear has to play a big part if we're going to do this.

8 As far as people liking the idea of license  
9 renewal, you can see here, and this has just been  
10 updated last month, 82 percent of folks that were  
11 surveyed agree that we should renew nuclear power  
12 plants as long as they continue to meet federal safety  
13 standards. I couldn't say it better myself.

14 We have to continue to operate them safely.  
15 An unsafe plant, or a plant that's not operating well  
16 is not a plant that we want to be a part of. So, in  
17 summary, to give you -- I guess this is a little  
18 commercial maybe. Nuclear makes sense. We should  
19 consider it.

20 And it really, as I was thinking about this,  
21 it matters in generations. I mean, that's what we're  
22 talking about here. I started at Arkansas Nuclear 1  
23 in 1982. And I really fully expected to begin helping  
24 close down Unit 1. But that didn't happen.

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1           Unit 1 got a license renewal. It's still  
2           operating today. And so is Arkansas Nuclear 1, Unit  
3           2. And so it provides all these benefits to our nation  
4           and our local community.

5           Let's talk about license renewal. So we  
6           wouldn't be here audibly talking about subsequent  
7           renewal if we didn't have a very successful license  
8           renewal program. And I do commend the staff, John and  
9           his folks. They have done a fantastic job through the  
10          years of working this process, making it efficient,  
11          making it work, making it where we could interact with  
12          it on a reasonable basis for the most part.

13          There are exceptions. I'm mostly talking  
14          about things that happen outside of their control. And  
15          so, Atomic Energy Act anticipated and allowed for  
16          license renewal, so does Part 54 and Part 51. They  
17          both, right now, today, someone can turn in a subsequent  
18          renewal application.

19          There's nothing limiting to do that. You  
20          can turn it in, and it would be completely according  
21          to Part 54 today. We're not doing that yet. We want  
22          to work together and get us ready for that. But as far  
23          as the rule goes, it allows it today. The last 40 or  
24          more years, or 40 operating years, and then an

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1 additional 20 at a time.

2 Aging Management, we're going to be talking  
3 about that a little bit more. Two main areas of  
4 reviews. And you've heard this already, and you know  
5 this, because you see everything, safety and  
6 environmental.

7 And the public, a big point here. The public  
8 is offered an opportunity to request a hearing. Some  
9 of our plants in the various areas, there are really  
10 no public hearings, because everybody's really  
11 supportive. Others require a substantial amount of  
12 work in this hearing area. You've seen this before,  
13 so I'm not going to dwell on it.

14 These, we completely agree with the staff,  
15 these are the foundational principles by which we do  
16 license renewal, whether you call it subsequent or  
17 something after that. Existing design basis is  
18 required to be maintained in the same manner and same  
19 way as you did in the first licensing term.

20 This is very important. And it really, it  
21 says a lot. It's like, kind of like licensing poetry.  
22 It sums up a lot of information in these two principles.  
23 And we maintain these principles. And we totally agree  
24 with the staff that we want to continue to maintain

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1 these principles. I won't dwell on this.

2 This is just showing that the process by  
3 which we go through, it's a well developed process.  
4 It's been well tested, 73 applications have been  
5 approved, and more are on the way. It's a process we  
6 understand. It's a process we've worked with a long  
7 time.

8 Here's a, diving down into one of the  
9 elements of the integrated plant assessment, I want to  
10 draw your attention to this one item here about, is the  
11 component or system managed by existing activities?  
12 If it's no, then you modify or add a new program, a new  
13 AMP, a new Aging Management Program.

14 If you have an Aging Management Program that  
15 already exists, they you got to demonstrate that the  
16 effects of aging are adequately managed. That's the  
17 whole engine that drives this license renewal thing.

18 If you don't have Aging Management Programs  
19 that are effective, license renewal doesn't work. And  
20 so that's one of the main points I just want to get  
21 across here.

22 The process, and again, you know this. It's  
23 a long and expensive process to go forward with license  
24 renewal. That's why we want to make sure that whatever

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1 we come up with for subsequent renewal is predictable,  
2 and is understood. This process didn't just start in  
3 a day. We've been working on this thing for multiple,  
4 I don't know, 15 years or so.

5 And through the course of time we've gotten  
6 standards and guidelines and processes, throughout the  
7 industry and the NRC, that work well to make sure that  
8 when we turn an application in it represents the plant.  
9 All right. It's very costly. And this doesn't  
10 include any type of plant upgrades that you might want  
11 to do.

12 Another thing I'll say here, and I might say  
13 it later, is that when you have subsequent renewal and  
14 you have another 20 years of operation, you might be  
15 able to invest in some new equipment that you wouldn't  
16 be able to justify otherwise.

17 In other words, maybe you want a new turbine,  
18 but you've only got five years on the operating license.  
19 If you've got 25 years, then you can say, okay, I got  
20 25 years. I'm going to get a new turbine. I'm going  
21 to get a new motion separator re-heater. I'm going to  
22 replace the feedwater system.

23 Because you've got plenty of time to stretch  
24 out those payments. And so, you actually have an

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1 increase of availability and safety in some ways, by  
2 looking at subsequent renewal. Because you have a  
3 longer term stretch of time to spread these costs over.

4 History of license renewal. We've talked  
5 about this a little bit already. As you can see here,  
6 we started back in '92. We got a real, it needed some  
7 adjustments. So we revised it in '95. And then we  
8 issued, working with NRC, the GALL Report. It's a  
9 lessons learned report. It's a compilation, if you  
10 will, of things that we learned through the process.

11 That report has served us extremely well, and  
12 it really forms the backbone for our Aging Management  
13 Programs. We're up to GALL Rev. 2. And as you heard  
14 this morning from Bennett, we're working on the SLR  
15 GALL. And we'll continue rolling those things.

16 So here we are, thinking about, we've already  
17 said we intend to submit an application. Industry has  
18 indicated that already. So we will have one or more  
19 plants that we'll be submitting the application.  
20 Hopefully, we'll be announcing that, probably in early  
21 2015, who the plants are. And we would like to submit  
22 the application around 2018.

23 This next slide is really busy. That's for  
24 good reason. Just to show you all the things that, all

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1 the guideline documents, all the guides that have been  
2 issued and are being revised to guide and help us in  
3 this process. So a major change to this license  
4 renewal process.

5 I really would request to go back through a  
6 lot of the things that we've already gone through, and  
7 we've already become mature in our understanding and  
8 usage of them. Many of these processes are integrated  
9 into our systems, which we use to fill out our  
10 applications.

11 CHAIRMAN SKILLMAN: Jason, please go back --

12 MR. REMER: Yes.

13 CHAIRMAN SKILLMAN: -- one slide more.

14 MR. REMER: Okay.

15 CHAIRMAN SKILLMAN: You mentioned, in early  
16 2015 you might identify the SLR candidates.

17 MR. REMER: Yes.

18 MR. KRAFT: You used four.

19 MR. REMER: Yes. It will possibly be more  
20 than one. Likely to be more than one plant. We went  
21 in the first time with two plants, Oconee and Calvert.  
22 And so it's likely that we'll have at least two plants.  
23 There's a possibility that we might have three. But  
24 we definitely got one, and probably two.

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1                   CHAIRMAN SKILLMAN:    So what you're saying  
2                   is, this is not a drill.

3                   MR. REMER:    No.    We're going to do this.  
4                   People, for the industry and the utility to get far  
5                   enough along to say they're going to do this, they've  
6                   already done all their due diligence.   I'm aware of two  
7                   or three detailed economic studies that have gone  
8                   through to ask the question, does this make sense  
9                   economically to do?

10                  And the result has come back.   If the license  
11                  renewal process stays kind of about the same as we're  
12                  doing, as far as cost and time, then this makes good  
13                  sense.   And we're going to do it.

14                  CHAIRMAN SKILLMAN:   Explain that if.

15                  MR. REMER:    Well, if we decided to get a full  
16                  scope PRA for every application, and we wanted to go  
17                  back and do lots of other major changes, way outside  
18                  of what they're suggesting, this became very uncertain  
19                  on how long it would take, and how many millions of  
20                  dollars, then I would think that you would have to  
21                  pause.

22                  And you would have to ask yourself, does it  
23                  make sense economically?   Because at the end of the  
24                  day, you have safely operated plants today.   And it's

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1 a complete economic decision about whether to go  
2 forward on SLR or not. You're going to assume, you make  
3 the assumption because it's the fact.

4 The plant will be operated safely, or it's  
5 shut down. So you have a safely operated plant. Does  
6 it make economic sense to go on another 20 years? And  
7 a big piece of that calculus is, what's the process  
8 going to be for license renewal.

9 CHAIRMAN SKILLMAN: Thank you.

10 MR. REMER: Sure. Okay. Current  
11 situation, we've already been over historic times.  
12 Twenty-seven plants in the period of extended operation  
13 presently. This next graphic just gives you a sense  
14 of kind of the age our reactors in bulk.

15 And a little note here, by the end of this  
16 year 38 units will be in the PEO. So that's a very  
17 substantial number of plants. Today, we have  
18 accumulated about, a little over 40 reactor years of  
19 operation in the PEO. In other words, years times  
20 reactors. And I want to make a statement about having  
21 to operate in that period.

22 Most of these programs are mature plant  
23 programs that we use for Aging Management Programs.  
24 They've been in existence since the start of plant

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1 operation. And so to say that we have to operate in  
2 the PEO some years to get experience is not thinking  
3 about what we did back in the PEO today.

4 MEMBER STETKAR: Jason, let me ask you about  
5 that statement.

6 MR. REMER: Yes.

7 MEMBER STETKAR: Typically, if we look at  
8 license renewals, about a third of the AMPs are  
9 characterized as existing. And about maybe 40 to 50  
10 percent are new. And the remaining are plant specific,  
11 which are typically new.

12 MR. REMER: Okay.

13 MEMBER STETKAR: So when you characterize  
14 the Aging Management Programs as things that we've been  
15 doing throughout the life of the plant, how does that  
16 jive with the statistics on when you look at the license  
17 renewals, the number of new programs --

18 MR. REMER: Yes.

19 MEMBER STETKAR: -- or plant specific  
20 programs that are created? That's --

21 MR. REMER: I'm not opposed to the numbers.  
22 Because you do this for a living.

23 MEMBER STETKAR: And those are rough  
24 numbers.

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1 MR. REMER: Yes.

2 MEMBER STETKAR: It varies from plant to  
3 plant.

4 MR. REMER: I was thinking more two-thirds  
5 and one-third. But I've actually got a slide on here  
6 on this.

7 MEMBER STETKAR: Okay.

8 MR. REMER: But, you know, might as well talk  
9 about it now. Yes, there are new Aging Management  
10 Programs. And rightly so. I think what you're  
11 looking at here is the fact that if this plant just  
12 operated 40 years, there's --

13 When I started back in '82, there were just  
14 some components that you never paid attention to,  
15 because they were going to last for 40 years. You  
16 didn't need to look at them. And so with the thought  
17 of, hey, this thing is going on, it's not that it wasn't  
18 degrading, okay.

19 Age related degradation happens from day  
20 one. Everything is falling apart. This table's  
21 falling apart. Concrete's falling apart. Gold is  
22 falling apart. I mean, when I got into this license  
23 renewal thing, I just, I got depressed one day, almost  
24 like. It's all falling apart, everything.

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1           So it's not the question, does it age? And  
2           you have some degradation. It's how you're managing  
3           it. So the thought about new programs. I think some  
4           of our slice and dice, to come up with some. Others  
5           are brand new, like one time action.

6           MEMBER STETKAR: That's right.

7           MR. REMER: Brand new.

8           MEMBER STETKAR: Yes.

9           MR. REMER: And others, I just have to say  
10          it, we should have been doing some of it all along, okay.

11          MEMBER STETKAR: I just wanted to --

12          MR. REMER: I mean, really, we should have  
13          been watching.

14          MEMBER STETKAR: Okay.

15          MR. REMER: We weren't. And so, we've got  
16          Aging Management Programs now that hopefully cover the  
17          full spectrum. And we'll add some more.

18          MEMBER STETKAR: Thank you.

19          MR. REMER: Sure. This is John's slide  
20          here. This is his workload coming. Here's license  
21          expirations, 2023 through 2030. Here's 2031 through  
22          2049. If we do subsequent licensing renewal, there'll  
23          be a lot of plants coming in for license renewal. A  
24          lot of work.

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1 I don't know how to estimate how many plants  
2 we'll be. But I believe if we continue to operate  
3 plants safely, we can get through this economic tough  
4 time right now. We'll see probably a few more plants  
5 go down. Because they're not economic.

6 It's not that they're not safe. They're  
7 safe. They just can't make a dollar on selling  
8 electricity when you have some unfair market  
9 conditions. But that's probably for another day.

10 I would not be surprised if 80 percent of our  
11 plants come in for license renewal the second time  
12 around. So I think there's going to be a lot of work.  
13 I don't see any reason right now, based on our  
14 availability and the maintenance, and the safety  
15 improvements, why we can't roll into this and continue  
16 on with safely operating plants.

17 CHAIRMAN SKILLMAN: And your guess at 80  
18 percent. Is that truly a Jason guess? Or is that  
19 based on some work that's being done at NEI?

20 MR. REMER: No. We're not doing any  
21 detailed work. That's what EIA uses right now, Energy  
22 and Information Administration. They use 80 percent.  
23 We talked with them. We've had big meetings with them.  
24 They have analytical tools. And they're still using

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1 right at 80 percent.

2 CHAIRMAN SKILLMAN: Eighty percent will  
3 come in for a subsequent, right?

4 MR. REMER: That's right. Eighty percent  
5 of the ones that are still operating. You know, if we  
6 have some more shutdowns then obviously they won't make  
7 it.

8 CHAIRMAN SKILLMAN: Okay.

9 MR. REMER: So that's the number we're using  
10 for it. So John's got to get ready. Just put a beef  
11 in there from you for your staff there, John. Thought  
12 you'd appreciate that. Okay. And I didn't talk about  
13 this with him before, right.

14 MR. LUBINSKI: Since you brought that up,  
15 Jason, you had asked earlier on our estimate of how many  
16 plants would come in for licensure. And as Bo said,  
17 that's where we believe that Jason and the industry,  
18 they know.

19 But hearing from, you know, the fact that  
20 we're only talking four years from now is 2018, and  
21 we're really talking about at least three plants coming  
22 in, you know, that gives us belief that there are going  
23 to be a significant number coming in. We're in the  
24 early planning stages.

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1           You know, Jason's certainly talked about the  
2           workload and the op years there. And we'll address  
3           that as it comes. We have to make it through the first  
4           step though, of understanding what requirements are in  
5           place, and how do we handle the first couple, before  
6           we can move any further.

7           CHAIRMAN SKILLMAN: Thank you. Jason.

8           MR. REMER: This next slide just shows kind  
9           of to back up that point. We've had a very active  
10          industry presence with each other, and with DOE and  
11          EPRI, and the regulator in activities that have to do  
12          with license renewal and subsequent renewal. We have  
13          the NEI license renewal and SLR task force. We meet  
14          regularly with the NRC, on a quarterly basis. We're  
15          available to do industry peer reviews.

16          So when a plant comes in with a license  
17          renewal package, it's been through at least a couple  
18          of peer reviews from the industry. And that comes from  
19          this organization here. Out of that organization we  
20          have discipline working groups, mechanical,  
21          electrical, civil, implementation and SLR.

22          Those groups keep up to date and up to speed  
23          on all the technical issues that have to do with a  
24          license renewal and aging. So we have, this composes

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1       probably people that come and participate, maybe 80 or  
2       90, or 100 people. So it's the experts across the  
3       field. It's kind of like, license renewal sort of  
4       tailing off, and SLR sort of picking up.

5               And so the interest has kind of picked back  
6       up. And so we've seen a little different  
7       participation. It's picked back up now, because  
8       people are saying, hey, we need to get ready for SLR.  
9       So we also formed an executive working group, formed  
10      of vice presidents and above, that are interested in  
11      having their utilities consider license renewal.

12             Also, there's the ASME, a special working  
13      group, and a lot of other technical working groups that  
14      are considering this particular issue.

15             MEMBER RICCARDELLA: Is that under Section  
16      11, that ASME group?

17             MR. REMER: This is a particular group. I  
18      think, as far as I know they're trying to deal with the  
19      changes in Code that would be mandated because of going  
20      to 80 years. And so there's definitely a lot of other  
21      groups that are looking into this. But this particular  
22      one is -- Okay, Al, go ahead.

23             MR. FULVIO: Just that one.

24             MR. REMER: Oh, he knows about it. Because

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1 he just got back from the meeting.

2 MR. FULVIO: That one was with NRC. It's a  
3 Section 11 group.

4 MEMBER RICCARDELLA: Okay. Thanks.

5 MR. REMER: Okay. There you go. Okay.  
6 We're also closely coordinated with our associates  
7 you'll hear from in a little while. EPRI has got a very  
8 robust and accurate program. DOE also very well  
9 coordinated, coordinated with us, where we believe that  
10 they're working on research that needs to be done to  
11 support and help the industry go forward in this area.

12 We also have a variety of meetings. Some of  
13 them I've mentioned already, DOE and NRC sponsored, and  
14 two international conferences, really three. We've  
15 had a couple of long term operation forums. We've had  
16 significant NRC presence.

17 And it's been mentioned already, NRC and EPRI  
18 has also been working with IAEA on the development of  
19 our GALL, which basically should tell us something,  
20 when the international community basically takes our  
21 GALL and says, this is a great idea, and adapts it and  
22 uses it for their own benefit.

23 I mean, Al could, you can spend two hours  
24 talking about our GALL. So anyway, very substantial

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1 effort there. Here's just an example milestone  
2 schedule. Read this from the top to the bottom.

3 Our first license expires for the first plant  
4 that has license renewal at 2029. We want to get, you  
5 have to get the application in five years in advance  
6 to take advantage of timely renewal. That means you,  
7 by 2020 the license has to be approved by the NRC. Two  
8 years to do that. We need to get it in by 2018. Two  
9 years to prepare it, about 2016.

10 And you can tell, we're almost, we're behind.  
11 And that only leaves us four years of margin right up  
12 here. That's not very good. We're behind the first  
13 time we did license renewal, as far as our schedule.

14 So I present this just to show, you know, I  
15 used to think, oh, we've got a lot of time, 2029, you  
16 know. Some of us will be gone doing other things. But  
17 it's here. It's upon us. So these are current issues.  
18 Things, and again, I appreciate this opportunity to  
19 share this with this panel.

20 We had developed a rug map that that  
21 schedule's part of, that seeks to identify the actions  
22 and deliverables necessary to get us to that first plant  
23 application. All the players are identified.

24 And we're actually trying to set up a

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1 workshop right now to go through and get more industry  
2 feedback, and stakeholder feedback, so we make sure  
3 that we can get a plan that will take us to that first  
4 application. Again, we mentioned that 2015  
5 announcement, and the first application in 2018.  
6 Okay. So a little bit about -- Yes?

7 MEMBER STETKAR: On the previous slide, I  
8 was trying to look forward. And maybe you're going to  
9 cover it someplace, or maybe not. We had some  
10 discussion about, this morning, the technical issues  
11 --

12 MR. REMER: Yes.

13 MEMBER STETKAR: -- that have been  
14 identified for SLR. And you mentioned that, you know,  
15 that you're obviously involved with EPRI, DOE and the  
16 NRC in that research work. Do you feel that the issues,  
17 from NEI's perspective, do we at least have the right  
18 set of issues?

19 MR. REMER: We've spent, and this is,  
20 they're going to cover it really well.

21 MEMBER STETKAR: Okay. Okay.

22 MR. REMER: But in summary --

23 MEMBER STETKAR: I'll wait --

24 MR. REMER: I'll just say --

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1 MEMBER STETKAR: I'm asking NEI --

2 MR. REMER: I feel really good about where  
3 we're at.

4 MEMBER STETKAR: Yes.

5 MR. REMER: Because we, over a couple of  
6 years now we've combed through the data two or three  
7 times to try to dig out what are the most important  
8 pieces. And I believe you'll see from their  
9 presentation that we're fully integrated with where  
10 they're at and what they're doing.

11 MEMBER STETKAR: I was asking NEI, because  
12 sometimes the people who are the recipients of this have  
13 a different focus than the people who are getting paid  
14 to do research.

15 MR. REMER: Yes. I worked for DOE for a  
16 little while. And I understand the research never  
17 ends. Kathy's back there making faces at me. Yes.  
18 Research will never end, it will never be done.

19 MEMBER STETKAR: Okay.

20 MR. REMER: But yes, I fully agree. And I  
21 feel fully coordinated with them in that. And we do  
22 with the industry.

23 MEMBER STETKAR: Okay. Thank you.

24 MR. REMER: Okay. So a little bit about the

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1 Aging Management process. If the two principles are  
2 the foundation, then Aging Management is the heart of  
3 our license renewal. These are just a list of some of  
4 the AMPs out there. I had Alan go through and just  
5 check off which ones were based on existing programs.

6 And, you know, at least from this list, about  
7 half of them are based on existing plant programs from  
8 the start of the plant operation. Some of them are  
9 improved. They're all improved in some way. Some are  
10 brand new. One time inspection was a great idea.

11 MEMBER STETKAR: By the way, my comment  
12 earlier when, I probably was too glib when I  
13 distinguished between existing and new. I include in  
14 new ones that have been enhanced --

15 MR. REMER: Yes.

16 MEMBER STETKAR: -- for consistency --

17 MR. REMER: Okay.

18 MEMBER STETKAR: -- with the GALL --

19 MR. REMER: I need to be right about that.

20 MEMBER STETKAR: So a lot of the --

21 MR. REMER: Absolutely.

22 MEMBER STETKAR: -- existing ones are --

23 MR. REMER: Yes. And if we said this is the  
24 list from the start of the plant operation that was

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1 changed, then we wouldn't be true to what we were saying  
2 about O&E and self improvement. Probably all of them  
3 have been majorly changed and improved.

4 MEMBER STETKAR: Yes.

5 MR. REMER: You know, back when I started in  
6 the plant LUVAL analysis, you know, we were nowhere.  
7 Now you have a laboratory on your table that can do as  
8 much analysis, all the analyses that you need to do most  
9 tasks. So the whole process has improved greatly  
10 through the years.

11 Just a real quick point here about, there's  
12 been some discussion of how do we know this thing is  
13 working? This is the ten elements that are listed in  
14 the GALL that you have to go through as you're preparing  
15 an application.

16 And so you have a confirmation process, which  
17 basically says, how do we make sure that the AMPs we  
18 put in place are effective? And you have to list what  
19 you're doing to make sure they're affective.

20 We believe the processes we have in place at  
21 the plant to ensure effective Aging Management  
22 Programs, just like our other programs have to be  
23 effective. If they're not effective, then you begin  
24 to see degradation of physical condition, performance,

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1 of safety.

2 And so we'll be talking a bit more about some  
3 details of that. But I just want to let you know that  
4 this is already a very much embedded process in our  
5 systems at the plant.

6 CHAIRMAN SKILLMAN: Please go back --

7 MR. REMER: Yes.

8 CHAIRMAN SKILLMAN: -- to the previous  
9 slide. Where is the challenge and oversight for the  
10 robustness of this process? Where is the challenge?

11 MR. REMER: Like, what's hard for us to do?

12 CHAIRMAN SKILLMAN: No.

13 MR. REMER: Is that what you're saying?

14 CHAIRMAN SKILLMAN: Where's the adult  
15 supervision that says, hey, wait a minute. This is not  
16 good enough. There needs to be Number 11 or a Number  
17 12.

18 MR. REMER: Yes.

19 CHAIRMAN SKILLMAN: Or the adult  
20 supervision that says, this might not be perfect. But  
21 for what we know today it's 99 percent of what is needed  
22 --

23 MR. REMER: Right.

24 CHAIRMAN SKILLMAN: -- for safety. Where

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1 is the --

2 MR. REMER: Okay, well --

3 CHAIRMAN SKILLMAN: -- administrative  
4 oversight to make sure --

5 MR. REMER: Right.

6 CHAIRMAN SKILLMAN: -- that this is --

7 MR. REMER: Okay.

8 CHAIRMAN SKILLMAN: -- sufficient and  
9 thorough?

10 MR. REMER: It starts with you all. Because  
11 you review the applications. And this is in the  
12 application. That's where it starts. If it gets  
13 approved by the staff it goes and gets integrated in  
14 the plan.

15 CHAIRMAN SKILLMAN: So, you all is --

16 MR. REMER: You all is this --

17 CHAIRMAN SKILLMAN: -- the NRC?

18 MR. REMER: Yes, the NRC.

19 CHAIRMAN SKILLMAN: The NRC processes?

20 MR. REMER: This Board here reviews every  
21 application which have these parameters in it. Once  
22 it goes into the plant, then the NRC performs a series  
23 of inspections.

24 CHAIRMAN SKILLMAN: Okay. Before it gets

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1 to the NRC thick magnifying glass --

2 MR. REMER: Okay.

3 CHAIRMAN SKILLMAN: Where is the peer  
4 review? Where are the people that are --

5 MR. REMER: As far as setting this up, and  
6 getting it going?

7 CHAIRMAN SKILLMAN: Making sure it's  
8 sufficient and thorough.

9 MR. REMER: Right. So what we have is,  
10 people that prepare license renewal packages today have  
11 been through many, many before. And so we've developed  
12 best practices.

13 CHAIRMAN SKILLMAN: So those people are  
14 utility people? Or in the --

15 MR. REMER: Yes. Utility people and some  
16 contractors that -- I meant to bring the GALL Report,  
17 but it's like this thick. There's been so many of them  
18 done, and so much back and forth with the NRC, the  
19 lessons learned have been incorporated into the  
20 processes.

21 So that when we turn in a package today, you  
22 fully expect it to not have a lot of problems. Because  
23 we've been through this so many times. So the  
24 confirmation that's working is the experience that is

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1 through the years.

2 MEMBER STETKAR: Jason, there's one thing  
3 about the process of getting the initial license, and  
4 the then the license renewal through the approval  
5 process. I think Dick's asking about, once it's  
6 approved, and these --

7 MR. REMER: Right. Okay.

8 MEMBER STETKAR: -- processes are in place  
9 --

10 MR. REMER: Can I go to the next slide? I  
11 think this is going to answer your question, if it's  
12 about maintaining the effectiveness of Aging  
13 Management Programs. Was that your question? How do  
14 you make sure that it is maintained?

15 CHAIRMAN SKILLMAN: My concern is  
16 complacency.

17 MR. REMER: Okay. Right.

18 CHAIRMAN SKILLMAN: You get to a point where  
19 you say, by golly, this is a great program.

20 MR. REMER: Right.

21 CHAIRMAN SKILLMAN: The book's closed, and  
22 we're going to march.

23 MR. REMER: Right. Right. Okay.

24 CHAIRMAN SKILLMAN: And two months later

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1 someone squeaks from France and says, guess what I  
2 found?

3 MR. REMER: Right. Right. Okay. Well,  
4 take a look at this. This tries to lay out how it  
5 actually works in our utilities and our plant. So you  
6 basically start out with plant specific OE, or Industry  
7 Operating Experience.

8 It could be international stuff, codes and  
9 standards, research, the GALL Report come together to  
10 help us develop Aging Management Programs. We've got  
11 a list right now in GALL that's going to be updated soon.  
12 I think we've got on the order of, how many ISGs open,  
13 like maybe 20 Interim Staff Guidance documents that the  
14 staff has put together.

15 So those are issued on a periodic basis two  
16 or three times a year, we get something new. And so  
17 all those come together to bear upon developing Aging  
18 Management Programs that work. And they're accepted  
19 by the staff. We implement those.

20 And we ask ourselves, do we meet the criteria  
21 for effectiveness? And if we did, then we continue  
22 monitoring. If we didn't, then it kicks out to our  
23 plant Corrective Action Programs. If we find  
24 deficiencies occurring in our systems out in the plant,

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1 the Corrective Action Program documents, I mean, it's  
2 down to a quite low level of documentation in the plant.

3 To say, hey, this isn't working. Or we're  
4 finding issues that we shouldn't find. Those issues  
5 are evaluated. And we then either correct the problem  
6 by repairing or replacing it, and/or modify the Aging  
7 Management Program.

8 Exactly what Bennett was saying earlier. We  
9 modify the AMP, and then it kicks back in there. And  
10 then you have a better, better Aging Management  
11 Program.

12 Many plants do a very formal self assessment  
13 right now. Many of the programs are mature. So  
14 something like a chemistry program, that has a very  
15 detailed assessment report to it. A very, very  
16 detailed criteria.

17 A slide further back we'll be talking about  
18 some of the initiatives that our industry's taking to  
19 actually, let's just say more harmonize how we all do  
20 these self assessments. Because we want to do a better  
21 job with this than we've done before. So, I don't know  
22 if that answers your question or not.

23 CHAIRMAN SKILLMAN: Well, I heard in an  
24 earlier presentation a concern about ensuring that the

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1 AMP is a living document.

2 MR. REMER: Yes, right.

3 CHAIRMAN SKILLMAN: And I think that's what  
4 you are trying to communicate.

5 MR. REMER: That's exactly what we're trying  
6 to communicate. And it's, what we do is, we integrate  
7 it into the plant procedures. So, just because we  
8 don't keep a document that says Aging Management  
9 Program document up to date, that's a submittal.

10 We update the program documents, which are  
11 the procedures. So the procedures are integrated  
12 throughout the plant life, just like EQ would be, just  
13 like human performance would be, just like any, a  
14 plethora of different programs we have out there.

15 Aging Management, as important as it is, is  
16 really just one program out of, literally I would say  
17 hundreds of programs. Alan, help me. When you say  
18 hundreds of plant programs we have out there, we  
19 integrate it so it's not a separate thing, but it's one  
20 with the other programs to maintain safety in our plant.  
21 Alan Cox with Entergy.

22 MR. COX: Alan Cox with Entergy. Yes, I  
23 don't know if call them programs, activities. There's  
24 a lot of other activities that we do at the plants that

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1 are independent of Aging Management. And I guess those  
2 things are implemented through procedures. And we  
3 make procedures.

4 Jason mentioned program basis documents.  
5 The program basis documents are prepared a lot of times  
6 in support of what goes into the license renewal  
7 application. And an individual utility may decide not  
8 to maintain that as a living document and have it  
9 updated. But as Jason said, the details of that are  
10 in the implemented procedures.

11 So if we have OE that says we need to change  
12 something, we'll go change the implemented procedure.  
13 And there'll be a description in the front of the  
14 procedure that says, here's why we made this change.  
15 And it will reference the Operating Experience that led  
16 to that.

17 MR. REMER: Yes, good. Thank you. And,  
18 you know, the other thing that's a little tricky too,  
19 you have maintenance rule that we're going assume it's  
20 going to cover Aging Management for active equipment.

21 That's kind of the implicit thing we're  
22 talking about. I think it was even identified in the  
23 SECY. But for passive equipment, you know, Aging  
24 Management Programs are what we use to maintain those

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1 programs, nothing else. Okay. So --

2 DR. SHACK: When you say modify the AMP, how  
3 is that experience transmitted to the rest of the  
4 industry --

5 MR. REMER: Okay. Good point.

6 DR. SHACK: -- and the NRC?

7 MR. REMER: Good point. So right now, if  
8 it's a significant issue in a plant it gets reported  
9 up to INPO, if it causes a transient or affects the  
10 safety system. All the plants maintain their own  
11 history of what they've done.

12 As part of our, as part of this group right  
13 here, this implementation working group that meets on  
14 a, two times a year, they share Operating Experience.  
15 And they say, hey, when we were doing this, this  
16 happened, and we did this.

17 Some of that information is available  
18 through INPO. Some of it, however, doesn't get to the  
19 level that we would report to INPO. That's one of them  
20 issue we're taking at the plant is, we are developing  
21 guidance to drop that threshold for passive, long lived  
22 equipment. So we can better share the OE data amongst  
23 ourselves.

24 License renewal and passive, long lived

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1 equipment is a little bit like comparing a glacier to  
2 a river. Maintenance really deals with things that are  
3 moving fast and going fast. Passive equipment moves  
4 very slowly. Things happen slowly. They degrade  
5 slowly, but they still degrade. They're still moving.

6 So you may not see it in the same kind of time  
7 frame. It's way slowed down, because stuff happens  
8 slow. So you might not see it as fast as you would a  
9 maintenance rule. But when OE comes in as significant,  
10 it isn't -- We'll evaluate it.

11 DR. SHACK: You have a very formal program  
12 for --

13 MR. REMER: Yes.

14 DR. SHACK: -- the buried pipe.

15 MR. REMER: That's right.

16 DR. SHACK: And I just sort of wondered, how  
17 many of the Aging Management Programs have something  
18 similar? Or is that a kind of unique program?

19 MR. REMER: We're basically going to take,  
20 using loosely, modeling after the buried pipe program  
21 for all passive, long lived equipment, that you can  
22 report that kind of data to INPO. And then it will be  
23 available to the industry.

24 It's also available to NRC. NRC presently

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1 gets all the OE data from INPO right now. You don't  
2 get the tools, they don't get the tools to assess it.  
3 But it's all available.

4 (Simultaneous speaking,)

5 CHAIRMAN SKILLMAN: What frequency does  
6 your procedure require you to update the AMP?

7 MR. REMER: As far as for new information?

8 CHAIRMAN SKILLMAN: I'm going to use a term  
9 that my colleague Charlie uses, a watchdog timer.  
10 What's the watchdog timer --

11 MR. REMER: Yes.

12 CHAIRMAN SKILLMAN: -- to cycle this, so  
13 that the AMP really remains current.

14 MR. REMER: Right.

15 CHAIRMAN SKILLMAN: Let me give you an  
16 example. I, like you, worked in a plant for a long,  
17 long time. We would say we've got about 150 programs,  
18 about 75 or 80 are regulatory mandated. Of those,  
19 there are about 30 that are critical to the material  
20 condition of the plant.

21 MR. REMER: Right.

22 CHAIRMAN SKILLMAN: So the question was, how  
23 often do those critical regulatory mandated programs  
24 get updated? It shouldn't take an event at some far

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1 away plant to kick off a review. The review ought to  
2 be on some timer that ensures that that program is  
3 healthy, or is being adjusted to become healthy. In  
4 other words, it shouldn't take an event.

5 MR. REMER: Right. I agree with you.

6 CHAIRMAN SKILLMAN: It should be something  
7 from within that says, let's take a look. Let's circle  
8 back around and make sure that this program is good to  
9 go.

10 MR. REMER: Right.

11 CHAIRMAN SKILLMAN: So, what keeps the AMP  
12 healthy?

13 MR. REMER: I'll let Al come on up, and I'll  
14 start answering this. A lot of the AMPs are on a basis  
15 of years between each actual application for the Aging  
16 Management Program. You may do an inspection once, and  
17 then five years later you'll do it again.

18 Every time you do that inspection you  
19 evaluate the data you have, based on what you expected.  
20 And you make an update at that point if necessary.  
21 Because if you find what you didn't expect, then  
22 something's askew.

23 So in every case, I'd say maybe with the  
24 exception of the one time inspection, which only

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1 happens once, you will update it when you perform the  
2 Aging Management inspection. I'm going to let Al  
3 Fulvio, from Excelon, expand upon, or correct me if I'm  
4 wrong.

5 MR. FULVIO: Yes. Al Fulvio, from Excelon.  
6 Excuse me. For our major programs at Excelon, we do  
7 a self assessment every five years. The major programs  
8 are the ones basically identified by INPO, you know,  
9 in their oversight of the industry programmatic  
10 activities.

11 However, for the Aging Management Program,  
12 some of them are new programs to the INPO population,  
13 if you will. And currently we have in process a  
14 procedure to perform that same self assessment on a  
15 frequency of five years for those AMPs.

16 Now, part of your self assessment could be  
17 a function of how often you do the activities for that  
18 AMP, okay. All AMPs are not the same. They're all  
19 actually very different in terms of what they're really  
20 trying to do. So, it's not unreasonable for a program  
21 that has a high volume of activities to self assess and  
22 say, hey, we got to look at this more than every five  
23 years.

24 Or, if you're only doing an inspection

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1 activity every five years, you may say, well, maybe  
2 that's not enough. Or if you have two plants on a site,  
3 maybe I'll wait for both of them to be done. And that  
4 could take, you know, five to seven years. So it is  
5 AMP specific. But the generic answer I think is about  
6 five years.

7 CHAIRMAN SKILLMAN: Thank you.

8 MR. REMER: Thank you. Okay. Moving on.  
9 Just to draw your attention to the fact that we update  
10 these documents regularly. The GALL is on Rev. 2, and  
11 we're talking about another Rev. We have ten Interim  
12 Staff Guidance documents that currently are out there.

13 So basically we have to pull that, and use  
14 that as guidance, in addition to the GALL.  
15 Recommendations, rather, and guidance. Twenty-three  
16 previously closed ISGs. So that the process of change  
17 is really, it's happening. We're up to Rev. 6 on the  
18 95-10 document, which is a guidance document for  
19 preparing applications.

20 So there's been a lot of water under the  
21 bridge already. And a lot of activity there that I  
22 think can show you that this is a living program. A  
23 little bit to your point too on plant inspection. Once  
24 you get your license you don't just, you don't set it

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1 on the shelf. You integrate it into your plant  
2 processes.

3 NRC has a couple series of inspections.  
4 They do a license renewal site inspection. Then they  
5 do a post approval site inspection that occurs right  
6 at the time where you implement your license. They  
7 have a Phase 1, Phase 2 and Phase 3 that asks the  
8 question, are you implementing what you said you would  
9 implement?

10 Because you might have a license approval.  
11 And it may be, you know, seven, ten years. I don't know  
12 if that's a good number or not, but at least five or  
13 six years. And so you have to ask the question, are  
14 you going to implement what you said you were going to  
15 implement? So those inspections happen.

16 Actually, I was at the A&O inspection. And  
17 it was good to see, to be able to look and say, you said  
18 this in your application. What are you doing here  
19 today?

20 Many times programs are implemented in  
21 advance, way in advance of when it was required. But  
22 in every case that I saw, this confirms that you're  
23 actually putting in place what you said you'd do.

24 In addition to that, Aging Management has

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1       become part of the normal NRC site inspection  
2       procedures. The procedures are being revised. And as  
3       they're being revised they are being added to with  
4       statements like, look at the Aging Management Program  
5       for this, or look at the Aging Management Program for  
6       this, which I think is a very good step.

7               Because it again helps the NRC confirm that  
8       you're really doing what you said you'd do. These,  
9       once you do an inspection, and you may or may not get  
10      findings, it's included in the ROP as well. So that's  
11      a second level of check that if, at the end of the day  
12      it's about performance. If the plant is not performing  
13      well, if safety is declining, it will show up in the  
14      ROP.

15             I wanted to mention also, there are three SLR  
16      audits, Nine Mile, Ginna and Robinson. I was at  
17      Robinson. I read the audit reports. And there really  
18      weren't any major deficiencies noted in the report. I  
19      know there'll be some follow-up reports.

20             I was at the exit for Robinson. There  
21      weren't any major findings, like, well we can't find  
22      this in your processes. You know, a lot of times your  
23      transitioning staff, and you're training new people.  
24      And there's always little issues here and there. But

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1 this would be surprising to me if we used this as a basis  
2 for having to do license rulemaking.

3 MEMBER RICCARDELLA: Are those really SLR  
4 audits, or are they LR audits?

5 MR. REMER: No, they're SLR audits. They  
6 were particularly designed to look at, what would it  
7 look like if we go past 60 years? And so John and his  
8 staff, I think you weren't there for the first two, but  
9 you did the Robinson.

10 MR. LUBINSKI: Yes. Since you brought that  
11 up, Jason, if I could comment.

12 MR. REMER: Yes, please clarify.

13 MR. LUBINSKI: It's really just not an SLR  
14 audit. It was an audit of the implementation program,  
15 with the idea that if we identified issues that we  
16 believe were important to the current license renewal  
17 period, we would address them immediately. So I'll  
18 agree with Jason's comment from the standpoint of no  
19 major deficiencies.

20 So from the standpoint of the current license  
21 renewal we identified no major issues or deficiencies  
22 that would require something to be done for current  
23 license renewal. The first license, you know.  
24 They're being used to help inform what we're doing in

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1 developing Subsequent License Renewal.

2 So there were really two parts to that. And  
3 we haven't referred to them as either license renewal  
4 or subsequent License. We've referred to them as AMP  
5 audits.

6 MEMBER RICCARDELLA: Okay.

7 MR. REMER: Corrected on that. All right.  
8 Okay. So, let's look at a detailed analysis of the SECY  
9 paper now. I won't bore you with the two principles  
10 for licensing. I think you've seen it about five times  
11 now. And so this is highlighted.

12 We do again want to commend the staff for the  
13 work they did on putting this SECY together. It's a  
14 really good document that goes through the history of  
15 license renewal. Many good hours have been spent on  
16 just pulling it together, thinking about it.

17 They held a series of public meetings. I  
18 think we had three public meetings. Collected public  
19 input. A lot of good stuff has gone into it. And we  
20 were very grateful that they came down on the same side,  
21 as far as the structure. The basic structure of  
22 license is sound

23 And so there's things we definitely want to  
24 agree with, that the license renewal process and

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1 regulations are sound, and can support Subsequent  
2 License Renewal. Environmental issues are presently  
3 addressed in the guides. We agree that it's helpful  
4 that NRC revise the GALL Report, but not essential.

5 We're actually not going to be able to answer  
6 all technical questions out to 60 or 80 years. Because  
7 there won't be the data there to answer every single  
8 point. We haven't answered the questions for license  
9 renewal all the way up to 60 years.

10 But we have a process that works it, a process  
11 that does inspections. We have R&D coming in. And  
12 when we see divergence in those, then we take action.  
13 But we're not going to be able to look at the crystal  
14 ball.

15 But we have programs in place that have been  
16 the foundation for license renewal. We also agree, no  
17 need for applicants to include PRA update, because no  
18 unique nexus to SLR.

19 MEMBER STETKAR: Jason, on that last bullet  
20 there, we hear a lot that you can't, you can never  
21 justify the PRA if you look at each individual issue  
22 in isolation. That's what we continually hear.

23 You can't justify it based on SLR. You can't  
24 justify it based on anything in isolation. What's

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1 NEI's position on PRA in total, for the integrated  
2 safety of the plant?

3 MR. REMER: Well, I do have an associate,  
4 Victoria Anderson, here. Victoria, are you here?

5 MS. ANDERSON: Yes.

6 MR. REMER: She can come up as -- She's  
7 coming up. We have a very, we have an appreciation --

8 MEMBER STETKAR: You just said --

9 MR. REMER: -- for this area. And we want  
10 to include it when we can. And actually as I was, this  
11 morning listening to some of the things that were talked  
12 about, I was part of the maintenance rule, and did  
13 configuration management. And did the whole  
14 reliability center of maintenance. So I saw what it  
15 did for active equipment, and how it really improved  
16 the process.

17 License renewal right now is very  
18 deterministic. It's 100 percent deterministic. And  
19 so there are advantages to be had. But our point right  
20 now is to force it on us because of SLR would not be  
21 appropriate. So I'm going to ask Victoria. Victoria,  
22 our feelings about the PRA.

23 MS. ANDERSON: Our feelings about the PRA in  
24 general?

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1 MR. REMER: Yes.

2 MS. ANDERSON: Well, I guess first I have to  
3 introduce myself. Victoria Anderson, from NEI. I  
4 think we do see lots of great benefits of PRA. And  
5 that's why you've seen so many utilities take advantage  
6 of so many of their informed applications. And why  
7 every single licensee, reactor licensee has a PRA of  
8 some sort.

9 Pretty much everybody has an internal event  
10 PRA. And almost everybody's had one of their PRAs peer  
11 reviewed. So people are very much committed to  
12 achieving quality PRAs and using them in the regulatory  
13 process. I think as far as Subsequent License Renewal,  
14 we need to be concerned about expanding requirements  
15 that may not be beneficial.

16 For the most part an internal events PRA for  
17 many applications, and for applications such as  
18 maintenance rule and giving you information about  
19 condition monitoring, and many of the applications we  
20 can envision for Subsequent License Renewal, many of  
21 those can be accomplished with the internal events PRAs  
22 that the licensees all have, and all maintain for  
23 various purposes.

24 So I think there is a place to possibly in

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1 the future consider using, giving an option for using  
2 risk information to better focus some of the work done  
3 in support of Subsequent License Renewal. But I don't  
4 think that that would call for necessarily having a full  
5 scope PRA. Did I answer the question?

6 MEMBER STETKAR: No. But that's -- Thank  
7 you.

8 MS. ANDERSON: Okay.

9 MR. REMER: I think --

10 MS. ANDERSON: Okay.

11 MEMBER STETKAR: You've cleverly focused on  
12 internal events for full power, and discussed that, and  
13 then jumped to Subsequent License Renewal. I was  
14 asking for NEI's position on the use of PRA to support  
15 a wide variety of initiatives for safety, one of which  
16 is Subsequent License Renewal, and only one of which.  
17 And not everything is driven by internal events for full  
18 power, as we have learned from doing fire analysis, for  
19 example.

20 MS. ANDERSON: Right. And if --

21 MEMBER STETKAR: And if you did shut down  
22 analysis you'd learn more. And if you did a seismic  
23 PRA you'd learn even more. And if you did a full scope  
24 Level 2 PRA you'd learn even more.

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1 MS. ANDERSON: Right. I think that as those  
2 applications become available, people will develop  
3 those models, and will --

4 MEMBER STETKAR: Well, the key is, people  
5 are not doing that. So I'm asking, from NEI's  
6 perspective, speaking for the industry, why aren't  
7 people doing that?

8 MS. ANDERSON: Well, I think --

9 MEMBER STETKAR: Because you can justify the  
10 fact that it's not economically justified, if you parse  
11 down the little applications finely enough in your  
12 little spreadsheet. It's never justified for that  
13 little single cell in your spreadsheet.

14 Or you can say, it's internal events at full  
15 power, with these other restrictions. It's probably  
16 good enough for this one little cell. I'm asking the  
17 broader question.

18 MS. ANDERSON: I think that there is  
19 actually a lot more development beyond internal events  
20 PRA than many people are aware of. We actually just  
21 recently took an inventory industry wide. I think it  
22 was sent to the Commission in a December 19th letter,  
23 which I'm sure the ACRS is aware of.

24 So there is work going on in that area. And

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1 we are supportive of it when the models can be applied.  
2 And I think as we pilot the methods as they're  
3 developed, we identify potential applications. So I  
4 think it will come. But I think if it's forced, you  
5 won't necessarily get the best results.

6 MEMBER STETKAR: Okay. Thanks.

7 MR. REMER: Thanks, Victoria. Okay.  
8 Moving on, this is just kind of overall concerns with  
9 rulemaking. We believe the current suggestions for  
10 entry into rulemaking would be overall out of step with  
11 the implementation of cumulative effects of regulation  
12 process changes.

13 Those have to do with a lot of input up front,  
14 better estimating, implementing the guidance, or  
15 sending out the implementation guidance along with the  
16 draft, those kind of things.

17 The second item is, we haven't seen a  
18 significant issue, inspection finding, audit report,  
19 or implementation difficulty, or operational need to  
20 implement rulemaking. We're asking ourselves, what's  
21 the forcing function? We want to improve. And I think  
22 we've shown you in this presentation and others you'll  
23 see, is that we have improved a lot.

24 We can't find a forcing function that rises

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1 to the level that says, we've got to do a rulemaking  
2 here. Because frankly, when you do a rulemaking you  
3 spend a lot of money on your side, and on our side.

4 And we're asking a question, what's the  
5 attendant cost and benefit equation? What's the  
6 improvement in safety? We don't see any. Or we don't  
7 see, we see very little. We don't disagree with most  
8 of the points, as we'll get into. But we just believe  
9 that they can be implemented in other ways.

10 The SECY claims improved efficiency, and a  
11 more predictable review process. But again, we  
12 haven't seen anything backed up with a cost benefit  
13 justification or study. Or even stories about how we  
14 can improve this. It is a complex process. It's a lot  
15 of back and forth a lot times.

16 But I think we, working with the NRC, have  
17 done really well to prepare guidance documents that  
18 minimized that. Again, this can be done without  
19 rulemaking. Most changes suggested in the SECY are not  
20 unique to SLR, and can be implemented without  
21 rulemaking.

22 For these non safety significant issues the  
23 schedule for rulemaking may impact industry plans and  
24 industry staff resources for our SLR application

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1 review. So we may get behind. And we may clog up a  
2 process that works quite well right now.

3 Okay. I want to go through this, because  
4 this is just a summary of the proposed changes. But  
5 I'll jump right to our opinion about the various --  
6 Option 1, of course, is our choice.

7 CHAIRMAN SKILLMAN: Jason, let me ask you --

8 MR. REMER: Yes.

9 CHAIRMAN SKILLMAN: -- to please target  
10 completing your presentation by 15 minutes after 3:00  
11 p.m., okay?

12 MR. REMER: Okay. I'll be done in a few  
13 minutes.

14 CHAIRMAN SKILLMAN: Okay.

15 MR. REMER: Thank you. Option 1 is the one  
16 we propose and we suggest. We believe Part 54 is sound  
17 and robust. And in fact, as I mentioned before,  
18 nothing prohibits in the rule right now from turning  
19 in another application. Existing regulatory  
20 processes ensure safe operation.

21 We've talked about several of these.  
22 Appendix B is a big one. All the plants have committed,  
23 in their Aging Management Programs, to utilize the  
24 quality assurance aspect of Appendix B for license

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1 renewal of equipment. So that's not just covering  
2 safety related equipment, but it covers all license  
3 renewal of equipment.

4 So not all the elements of Appendix B, but  
5 the reporting and mediations piece. Everybody's  
6 committed to in their SAR. Aging Management Programs,  
7 they're the heart of the process. They're healthy,  
8 they're well. They're improving, they're growing.

9 Maintenance rule deals with active  
10 equipment. We don't see any reason to change it. And  
11 we agree with the staff and their assessment. The ROP  
12 process is increasingly getting, looking at Aging  
13 Management Programs. And so, as we go forward more and  
14 more procedures will include looking at Aging  
15 Management.

16 We think it's appropriate and well founded.  
17 Through all these things the design basis is  
18 maintained. This process is proven through vast  
19 experience 73 renewed license, 27 reactor units and the  
20 PEO, a reliable, predictable process. Option 2, it's  
21 really editorial changes. Really nothing is gained  
22 from this. It's just a reference.

23 MEMBER RAY: Wait a minute. I can't -- I got  
24 to say, look --

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1 MR. REMER: Okay.

2 MEMBER RAY: The experience process has got  
3 lots of things in it. We just were talking this morning  
4 about the fact that Fort Calhoun got its license  
5 renewed, and within a short period of time exceeded its  
6 design basis. So I don't want to get off on that track  
7 again. But it just seems like an overly broad  
8 statement you're making.

9 MR. REMER: About this Option 2?

10 MEMBER RAY: About the experience proving  
11 the process.

12 MR. REMER: Fort Calhoun had nothing to do  
13 with Aging Management. I mean, that, I understand what  
14 you're saying.

15 MEMBER RAY: It depends on how you define  
16 Aging Management. I happen to define it as including  
17 the aging of the site design basis, okay. Now, you  
18 don't. That's okay. But you're going to get, I think,  
19 if you have time, if I don't take too much of your time,  
20 you're going to talk about --

21 MR. REMER: Oh, no.

22 MEMBER RAY: -- the Fukushima role here in  
23 a minute. And I just didn't feel like what you said  
24 should go without some response. So, just carry on.

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1           MR. REMER:    We don't disagree that if  
2           conditions change you should evaluate that.  And we  
3           just think it should be done now, rather than wait until  
4           license renewal.  You know, if it's an event, a  
5           situation, or environmental condition --

6           MEMBER RAY:   Well, I'm just saying, if that  
7           occurs you're going to take note of it.  The question  
8           is whether the probability of the event is changed.  
9           And again, I don't want to delay things.  Because we're  
10          behind time here now.

11          But it's really a question of what is the risk  
12          of the event occurring, not did the event occur, and  
13          did you ignore the fact that it occurred.  Clearly you  
14          won't do that.

15          MR. REMER:    All right.

16          MEMBER STETKAR:    Jason, because Harold  
17          brought it up, I was going to wait until Option 4.  But  
18          I'll continue this.

19          MR. REMER:    Okay.

20          MEMBER STETKAR:    So we can keep the  
21          discussion going.

22          MEMBER RAY:    I just --

23          MEMBER STETKAR:    This morning I asked  
24          earlier, and I had to duck out.  Plants update their

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1 FSARs every two years. Now, I don't know, we don't look  
2 at updated FSARs as the ACRS. Do the plants --

3 The example I used, do you license the plant  
4 40 years ago, based on five years of meteorological data  
5 from some met source 100 miles away from the site? The  
6 plant has now operated 40 years. In the updated FSAR,  
7 Chapter 2, do plants keep a running total of that  
8 information? Do they update the history? Do they  
9 update the current state of knowledge about the site  
10 environs in the updated FSAR?

11 So that, for example, as new knowledge about  
12 oh, seismicity comes up it's updated in the FSAR. As  
13 new information about the trends in rainfall come up,  
14 is it updated in the FSAR? I don't know. That's what  
15 I'm asking.

16 MR. REMER: Well, I don't know if, Al, you  
17 want to field that question?

18 MEMBER RAY: He said when you were out that  
19 it wasn't required.

20 MR. FULVIO: Yes. Al Fulvio from Excelon.  
21 I do not believe that plants do that. However, when  
22 we do go for the license renewal that information is  
23 reviewed as part of the NEPA review. And they look for  
24 anything new and significant since you originally

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1 licensed.

2 So all of that environmental stuff does get  
3 under the microscope in a license renewal. But to  
4 answer your question about do we routinely do that? I  
5 would say, probably not.

6 MEMBER STETKAR: Okay. Thank you.

7 MR. LUBINSKI: Is it possible to interject  
8 here? I guess I, responding to Al's comments. There  
9 may be issues looked at under NEPA. But that's an  
10 environmental review. And your question had to do with  
11 the safety review.

12 MEMBER STETKAR: I had the, yes, it's a  
13 safety review.

14 MR. LUBINSKI: Yes. And unfortunately when  
15 you left the room this morning this came back up again,  
16 and responded. And I'm going to repeat myself.

17 MEMBER STETKAR: Okay. I'll go back and  
18 look at the transcript and see.

19 MR. LUBINSKI: Okay. But from that  
20 standpoint, when they do it as part of the NEPA review,  
21 we do not then look at it as part of our safety analysis  
22 when we're looking at the safety review as part of  
23 license renewal.

24 MR. FULVIO: Yes, I'm sorry. I

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1       misunderstood. I thought I remembered from this  
2       morning you were giving the example of the  
3       meteorological data, is that updated? That's what I  
4       remember from this morning.

5               MEMBER STETKAR: That's, I'll look at the  
6       transcript from this morning. Thanks.

7               MR. REMER: Okay. All right. So, Option  
8       2, editorial changes. Again, I think it's been even  
9       mentioned by the staff is that you wouldn't do this  
10      alone. Because it's really got limited value. It's  
11      an editorial change. And yes, it should be fixed if  
12      we can fix it without doing rulemaking.

13              Option 3. Again, this would apply to all  
14      license renewal plants. This issue of timely renewal  
15      has been already mentioned at Indian Point. The  
16      process was handled extremely well. The AMPs were put  
17      in place by commitment. The utility committed to do  
18      that. The inspection procedure was written and  
19      executed.

20              And again, this is probably a rare event. It  
21      may happen again at some point in time. But I wouldn't  
22      suggest that that would be cost beneficial to do,  
23      through an event that really has been handled very  
24      adequately.

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1           Anybody that would refuse to implement their  
2 Aging Management Programs, to enter into the PEO, I  
3 would just have to say they would be not very smart.  
4 And so I wouldn't say this would be something we have  
5 to do.

6           As far as adding equipment, large area loss  
7 of equipment, fire and flex equipment. Currently it's  
8 managed by its own procedures. Much of the equipment,  
9 I would probably say most of it is not even in the  
10 maintenance rule, because it's temporary and portable  
11 equipment.

12           It already is handled through existing plant  
13 processes and procedures. It does not need to be added  
14 to the license renewal scope. Because if you did add  
15 it, it might only be a very, very few pieces of equipment  
16 anyway, if any. Maybe a connection here or there, or  
17 something like that.

18           It's just not, again, it doesn't add to  
19 safety to a significant degree. It may already be  
20 included in our plant, depending on how we implement  
21 it.

22           MEMBER STETKAR: How do you know that it  
23 doesn't contribute to safety?

24           MR. REMER: I'm sorry, say that again?

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1           MEMBER STETKAR:   How do you know that it  
2           doesn't contribute?   You made a statement, well, there  
3           might be a few pieces of equipment.   But if it applied  
4           --

5                               (Simultaneous speaking,)

6           MR. REMER:   Well let me just give you an  
7           example.   If it's a connection say in the service water  
8           header, so you can attach the component.   It will be  
9           in scope already, because it's part of the service water  
10          header.   And if it's a, say we decide to do the  
11          instrument on the spent fuel safety related, it's  
12          already in scope.

13          MEMBER STETKAR:   If it's safety.

14          MR. REMER:   It will be in there.

15          MEMBER STETKAR:   Yes.   If it's safety  
16          related.

17          MR. REMER:   Right.

18          MEMBER STETKAR:   Okay.

19          MR. REMER:   So, under existing programs.

20          MEMBER STETKAR:   Yes.

21          MR. REMER:   So there wouldn't be any reason  
22          to call this out.   I think there was a comment made this  
23          morning about a more general approach, just to say,  
24          look, important things, safety related, it's important

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1 to safety ought to be in scope.

2 MEMBER STETKAR: I didn't say safety  
3 related. I said important to safety.

4 MR. REMER: Important to safety.

5 MEMBER STETKAR: There's a difference.

6 MR. REMER: There is. When you say safety  
7 and important to safety.

8 MEMBER STETKAR: And in fact, some safety  
9 related might not necessarily be important to safety.

10 MR. REMER: That's true.

11 MEMBER STETKAR: It is true.

12 MR. REMER: The final point. It is true.

13 MEMBER STETKAR: Well, you saw the slide  
14 this morning.

15 MR. REMER: Yes.

16 MEMBER STETKAR: Texas.

17 MR. REMER: Yes. Deterministic world that  
18 we live in, it's not the way it is. But I agree with  
19 you. Okay. Option 4. We feel like it conflicts with  
20 fundamental regulatory principles and the license  
21 renewal rule. We believe this is already required as  
22 part of the GALL Report.

23 We're already required to do monitoring  
24 trending, Operating Experience, and all this, actually

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1 confirmations. We have to say how we are making sure  
2 we are maintaining our Aging Management Programs. In  
3 addition, 10 CFR 50, Appendix B overall requires these  
4 things for all plant equipment that's safety related.  
5 And by extension for license renewal equipment, because  
6 of our commitments.

7 In addition to that, we have a couple of  
8 industry initiatives underway. We're going to develop  
9 a couple of NEI guidance documents that will be  
10 committed to all the utilities. That will improve  
11 Operating Experience for age related degradation and  
12 Aging Management Program effectiveness reviews.

13 So those documents, much like the buried  
14 piping program, will be reviewed and then agreed to by  
15 the industry. And then mandated that the industry  
16 follow them. Everyone will follow them, much like the  
17 buried pipe. And everybody participates.

18 CHAIRMAN SKILLMAN: Please back up a slide?

19 MR. REMER: Yes.

20 CHAIRMAN SKILLMAN: What is your  
21 understanding of the robustness of the Appendix B  
22 programs for the plants across the country? Do you  
23 believe all have really strong programs? Or do you  
24 believe some plants have deficient and weak Criterion

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1 16 programs?

2 MR. REMER: This is the gospel for operating  
3 a power plant. If you have a weak quality assurance  
4 program you will shortly see it in the results of your  
5 operation or your safety factors. Your ROP will  
6 suffer. So if you do not have good Corrective Action  
7 Program, you do not have a good materials control,  
8 design control, storage and safety control, you will  
9 shortly see it.

10 So there are programs that fall into problems  
11 occasionally. But you will see that in the actions  
12 that are taken to have inspection reports and  
13 violations to get it back up to speed. But my  
14 experience so far, having been at quite a few plants,  
15 is that it is a very robust program at the sites. It's  
16 taken very seriously. And to my knowledge, without  
17 exception.

18 MEMBER BLEY: Jason, just a comment on that.

19 MR. REMER: Yes.

20 MEMBER BLEY: In some way it supports what  
21 you said. But when we look at severe operating events  
22 that generate freak inspections and reports, it's not  
23 uncommon after those to find that part of the reason  
24 for what happened was weaknesses in the Correction

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1 Action Program.

2 MR. REMER: Yes.

3 MEMBER BLEY: I don't know how quick you get  
4 slapped on the hand for having one. Some of them it  
5 looks like they've gone back years with the problems  
6 that lived there. So in principle what you say makes  
7 sense to me. In practice, I wonder how many holes there  
8 are.

9 MR. REMER: Well, it's a little bit like the  
10 Declaration of Independence and the Constitution. It  
11 works very well most of the time. But it works because  
12 there will be problems. There will be events.  
13 Equipment will fail. You're trying to minimize it.  
14 You're trying to make sure your programs are strong.

15 But sometimes programs fall off. And  
16 sometimes they're not assessed. Sometimes you have  
17 management that doesn't understand. You have cost  
18 pressures occasionally. But the programs we have  
19 around this, and the monitoring that NRC has, I believe  
20 it allows us to quickly find out that, and make  
21 corrections when necessary.

22 MEMBER BLEY: I don't like the way we find  
23 out sometimes.

24 MR. REMER: No. I know that. And I wish --

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1 Yes, I agree with you. I agree with you.

2 MEMBER BLEY: Okay. Go ahead.

3 MR. REMER: Okay. So Option 4, energy  
4 initiatives underway. And again, if it's important to  
5 do, then why are we going to wait 15 or 20 years to  
6 implement it? You know, if it's part of the SLR it may  
7 actually be 15 to 20 years before some of the plants  
8 actually are required to implement these programs.

9 And we feel like they're already covered in  
10 sufficient regulation. We're creating a couple of  
11 industry initiatives to improve it. We don't need  
12 regulation to do this.

13 MEMBER STETKAR: Do you have a time schedule  
14 for those NEI 14 initiatives?

15 MR. REMER: Yes, they'll be -- They're  
16 drafted right now. And we're in discussions with  
17 having the NRC review and approve them, because it's  
18 a document. And we're working with INPO to make sure  
19 that what we put in place is sensitive to the burdens  
20 that are out there right now.

21 We don't want to burden the utility with  
22 another form they have to fill out. So we're going  
23 through that process with INPO. We're shooting for the  
24 end of the year, or early next year to implement these

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1 across the units.

2 MEMBER STETKAR: That's implement after  
3 staff approval? Or --

4 MR. REMER: I'm not sure how that's going to  
5 go exactly.

6 MEMBER STETKAR: Okay. I'm just interested  
7 --

8 MR. REMER: Yes.

9 MEMBER STETKAR: -- because these sound  
10 intriguing.

11 MR. REMER: No. It's, we, working with the  
12 staff, we saw that these were a couple of areas that  
13 we could tighten up on. And we could make information  
14 easier to get to. Also, the program effectiveness,  
15 make it a little bit more standardized.

16 Everybody does this already to varying  
17 levels. We said, let's just make it standard here. So  
18 we feel good about the process. And I think that's a  
19 reasonable time frame to implement it.

20 MEMBER STETKAR: Can I, we should really  
21 like to see that one.

22 MR. REMER: Once it grows a little bit of --

23 MEMBER STETKAR: Yes.

24 MR. REMER: We'll sit back in the chair with

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1       you.   Sure.   Great.

2               CHAIRMAN SKILLMAN:   Jason, if I connect the  
3       dots in my own mind, what I think you're saying is, we  
4       don't want Option 2, 3 or 4.   We want Option 1.   But  
5       we'll do this instead.

6               MR. REMER:   Yes, that's right.

7               CHAIRMAN SKILLMAN:   That's the punch line.

8               MR. REMER:   Well, we're going to do this  
9       anyway.   No matter what happens we're going to do this.  
10      If you do a rulemaking and say --

11              CHAIRMAN SKILLMAN:   So let me state it  
12      again.

13              MR. REMER:   Okay.

14              CHAIRMAN SKILLMAN:   You're saying, we don't  
15      want 2, 3 or 4, we want 1.   And we're doing this.

16              MR. REMER:   Yes, that's right.   We are doing  
17      this of our own initiative.   And we don't believe --  
18      It's not because we don't want more work, or want it  
19      better.   We just don't think it would justify the  
20      safety and the cost, what it would take to actually  
21      change the rule.   Because we think the rule works very  
22      well.   And then guidance can implement almost  
23      everything that's been mentioned.

24              CHAIRMAN SKILLMAN:   Got you.   Thank you.

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1 MR. REMER: Sure.

2 MEMBER BLEY: Let me ask you a question.  
3 Because nobody's talked about this. From your point  
4 of view, your vision, is it that GALL may be updated,  
5 maybe not, but it might be. But then the process for  
6 Subsequent License Renewal, and the application for  
7 that, will be essentially identical to that for a first  
8 renewal?

9 MR. REMER: That's right. Yes. That's  
10 right. With the lessons learned incorporated. I mean  
11 there --

12 MEMBER BLEY: I mean, it will evolve.

13 MR. REMER: The ISGs will be rolled back.

14 MEMBER BLEY: At any point in time if one  
15 plant was coming in for a first license renewal and one  
16 was coming in for a subsequent, they'd do the same  
17 application? They'd do all the same things?

18 MR. REMER: That would, yes, I think that  
19 would be, well, that's what we suggest in general. I  
20 think right now I'm not sure where the GALL is going,  
21 if it's just going to apply to SLR. I think that's  
22 still a discussion, John, right now.

23 CHAIRMAN SKILLMAN: Let's -- You got two  
24 minutes.

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1           MR. REMER: Oh, two minutes. Oh boy. I  
2 better make it to the points here. I don't know if I  
3 answered your question or not. So, limited time, we  
4 can do the application. Since, by the time you get to  
5 the second round of renewals you're going to have so  
6 much Operational Experience on the AMPs you really  
7 don't need any more.

8           And the only reason somebody's going to turn  
9 it in 20 years beforehand is if they have another sister  
10 plant, they want to do them together. And so, we don't  
11 believe this will be any benefit at all to this.  
12 Because we'll have tons of OPE before that. We've  
13 already talked about this. I'm not going to talk about  
14 it anymore.

15           Summary, future of license renewal depends  
16 on certainty in the existing regulatory process, in the  
17 regulatory process. Existing license renewal  
18 regulation provides a solid foundation for safe  
19 operation.

20           The schedule is tight, compared to the first  
21 round. And if we do rulemaking we may compromise the  
22 rulemaking schedule, or the SLR schedule. Criteria  
23 for rulemaking is not supported by increase in safety,  
24 nor efficiency improvements. Thank you very much.

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1                   CHAIRMAN SKILLMAN: Jason, thank you. To  
2                   pause for my colleagues, any questions for Jason?  
3                   Okay. And I admit I'm pushing for schedule, because  
4                   we may have travelers that might want to go back to the  
5                   West Coast. So with that, I would like to please call  
6                   Sherry Bernhoft, from EPRI, to come forward.

7                   (Pause)

8                   MS. BERNHOFT: Is my presentation loaded on  
9                   here?

10                  CHAIRMAN SKILLMAN: This is a low budget  
11                  operation. You get to do your own -- Where's Kent?  
12                  Hey, Kent?

13                  FEMALE PARTICIPANT: You might find it's  
14                  there if you close that one, and see what's on the  
15                  desktop. Usually it's on the desktop somewhere. And  
16                  so, one of these looks like yours, right. The one  
17                  that's on top I think is yours, because I just opened  
18                  it.

19                  MS. BERNHOFT: Oh, okay. Thank you.

20                  FEMALE PARTICIPANT: No problem. You'll  
21                  get my bill.

22                  MS. BERNHOFT: Appreciate that.

23                  FEMALE PARTICIPANT: Okay.

24                  CHAIRMAN SKILLMAN: Sherry, welcome to you.

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1 MS. BERNHOFT: Well, thank you. I  
2 appreciate that.

3 CHAIRMAN SKILLMAN: Thank you for coming  
4 here today.

5 MS. BERNHOFT: I'm glad to be here, now that  
6 I've figured this all out. And we can probably do that.  
7 If it will do it for us. Clicking the right buttons?

8 MALE PARTICIPANT: Do the F5, F5.

9 MS. BERNHOFT: F5? All right. I'm ready  
10 to drive. Well, thank you for letting me come talk to  
11 you this afternoon.

12 CHAIRMAN SKILLMAN: Thank you, Sherry.

13 MS. BERNHOFT: I do appreciate that. I'm  
14 going to talk to you. I'm going to give you just a  
15 couple of quick overviews on what it is, EPRI is. I  
16 just, I don't know if any of you had an opportunity to  
17 talk with us very much.

18 We do have our mission. It's safe,  
19 reliable, affordable and environmentally responsible  
20 electricity. We do have four sectors in EPRI, one of  
21 which, the largest of which is the nuclear sector, where  
22 I work. We do cover all of electricity and generation.  
23 So we have a couple aspects I want to make sure we  
24 understand.

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1           One is that our nature is we are funded by  
2           the utility members. I mean, that's who pays the  
3           bills. But with that we strive to stay very  
4           independent in our research. And they actually want  
5           us to stay independent, and challenge us to stay  
6           independent.

7           We have a utility advisor structure that  
8           helps us make sure the research is relevant. It  
9           coordinates with their needs. But we actually hold  
10          back quite a bit of our budget too, to do strategic long  
11          term work. And that's a part of the governance that  
12          we have with them. And we are a non for profit  
13          organization as well. And we heavily collaborate.

14          One thing you'll hear is that EPRI, even  
15          though it's a research institute, we're really more of  
16          an applied development type work. That's why we  
17          partner so well with the Department of Energy, Light  
18          Water Reactor Sustainability Program that you'll hear  
19          about next. They do a lot of the fundamental research.

20          We really work with them on a lot of the  
21          applied applications from that research. So it's a  
22          very beneficial. We have other organizations that we  
23          work with that way. In the nuclear sector we do have  
24          a number of key drivers, you know, maximizing the

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1 safety, the existing assets. We have a large program  
2 for deploying, working on the advanced technologies.

3 And of course, what we're here to talk about  
4 today is the work that we do for long term  
5 sustainability of the current fleet. So the EPRI  
6 program for long terms operations, similar to, you  
7 know, what you've heard previous discussions. NRC and  
8 DoE hosted some workshops around 2008, 2009 time frame,  
9 talking about the question of what would happen with  
10 60 to 80 years.

11 The EPRI program for long term operations  
12 formally started as a program area in 2010. But what  
13 it does is it integrates all across EPRI. And I'm going  
14 to talk about, in my presentation, the different EPRI  
15 technical areas that we integrate across.

16 And what we do is we go to those program  
17 areas, and we incrementally say, if the plant's going  
18 to operate for 60 to 80 years, what in your program area  
19 do we need to do in addition to what you're already doing  
20 now, to give us the tools for safe, reliable operation  
21 for 60 to 80 years?

22 And we also pose the question also, are there  
23 ways that we can look at economic enhancements for the  
24 fleet of plants, if they're going to continue to

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1       operate? Can they also be economic to do it?

2               Because as you heard Jason say, if you're the  
3       plant operator a lot of your decisions are going to be,  
4       can I economically and safely operate the plant? So  
5       that's an important part of it too. So we integrate.  
6       And we also do quite a bit of collaboration at  
7       Department of Energy, that you'll hear about.

8               NRC research, you heard Mirela talk about  
9       some of the programs that we work with with her staff,  
10      very helpful. We work with EDF quite a bit, with  
11      support with NEI, the owners groups, IAEA. We work  
12      quite a bit with the Japanese, and of course  
13      universities. So it's a big part of our job.

14              So Aging Management. We've talked a lot  
15      about, you know, what is in the Aging Management. And  
16      this is kind of a graphic. It's the plastic bathtub  
17      curve that we're all used to seeing. And quite  
18      honestly, when you're in the plant you're kind of  
19      focused on that flat area. That's where you hope you  
20      spend most of your time.

21              If you invest in your com point, you've  
22      designed it, you've correctly installed it, you're  
23      hoping that you're going to spend most of your time in  
24      the flat part of the curve. So we spend the majority

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1 of our research time out on the tail end of the curve.

2 We want to understand when that tail's going  
3 to curve, how we can inspect for it, find it sooner.  
4 And then a lot of times we also want to talk about how  
5 we can mitigate, you know, slow down the tail end of  
6 the curve. And another important part that we do a lot  
7 of our research around is, what is the safe end of that  
8 curve?

9 You know, can we start predicting at what  
10 point we have to start looking at repairs or  
11 replacements of materials, before you start exceeding  
12 a safety threshold? Or, as the NRC staff says, what  
13 gives you reasonable assurance you're going to continue  
14 to operate safely?

15 So, what are some of the basics for the Aging  
16 Management Program, and some of the areas that we do  
17 research? We do a lot of fundamental research to help  
18 us understand the degradation mechanisms, the failure  
19 modes, growth rates. And then we do a lot of things,  
20 what we call these inspection and evaluation  
21 guidelines.

22 Again, this is kind of a hand off between the  
23 fundamental research, and then the applied work that  
24 we provide to the utilities, which are these

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1 inspections and evaluation guidelines. We do quite a  
2 bit of work on inspection methodologies.

3 If you've ever been to our center in  
4 Charlotte, our NDE Center, that's really one of our  
5 jewels. Something we're very proud of is our  
6 non-destructive examination center. The  
7 qualification that we do there, we support the entire  
8 world with qualifying techniques, testers and methods.

9 Mitigation strategies. We have a very  
10 aggressive work in our chemistry. It's not just to  
11 maintain the plant. But we do a lot of work on  
12 understanding how we can improve the plant, and  
13 mitigate system and components, or chemistry,  
14 different stress relieving techniques, weld overlays.

15 We also do a lot of work in the condition  
16 monitoring. That's on line monitoring, and some of the  
17 different in field detection techniques. For example,  
18 like with cables, Mirela talked about. You know, we  
19 look at doing indenture testing or LIRA testing to help  
20 give us some feel for current cable conditions.

21 We're starting to do a lot of work right now,  
22 what we call prediction of remaining useful life. How  
23 do you take the information that we gather from our on  
24 line monitoring and our detections, and work up the

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1 algorithms to come up with, predict, helping us  
2 understand the remaining useful life?

3 And we do have what we call this fleet  
4 monitoring software that we're working on developing  
5 right now, again, with DoE. And of course, a lot around  
6 the repair and replacement decisions. We have, we  
7 published life cycle management guidelines for both  
8 active and passive components.

9 We're working on advanced welding  
10 techniques. Highly irradiated materials cannot be  
11 weld repaired with current existing welding methods.  
12 So we're working very closely with Oak Ridge, at Oak  
13 Ridge National Lab, to come up with techniques to weld  
14 highly irradiated materials.

15 And then working on the tools, which is, we  
16 call it Integrated Life Cycle Management Program. The  
17 overall EPRI program, when it was established in 2010,  
18 these were all the different program areas. And it's  
19 really in three areas that the program provides the  
20 leadership for the research. And that's the Aging  
21 Management.

22 And then we have what we call the  
23 Opportunities for Modernization and Enabling  
24 Technologies. All I'm going to talk about today is the

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1 Aging Management ones. This was a -- I'm going to kind  
2 of take a transition here.

3 This was a report that we recently published.  
4 It came out I think in August last year. It's called  
5 "Assessment of R&D Supporting Aging Management  
6 Programs for Long Term Operations". We were actually  
7 asked to do this by our members, by the utilities.

8 We have quite a few utilities, as Jason said,  
9 that we know are actively going through the business  
10 phases right now, to talk about, you know, does it make  
11 sense for them to consider Subsequent License Renewal?  
12 And so they want to know, as well as the NRC staff and  
13 everybody else wants to know, are there any unknowns  
14 out there?

15 Is there any research we should be doing that  
16 we aren't doing? How much of my cables am I going to  
17 have to replace? Is my vessel going to make it? I  
18 mean, just from a pure economic business sense, we could  
19 ask that question. And I've heard it.

20 So we have a couple of different ways that  
21 we've gone around, making sure that we are doing all  
22 the correct research, or all the right research in the  
23 right time frame. I'll talk about some of those tools  
24 when I get into the detailed program areas.

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1           But our members came to us about a year and  
2           a half ago. And they said, help us understand when we  
3           look at the Aging Management Programs, are we doing all  
4           the research that we need to do, based on GALL Rev. 2,  
5           to implement GALL Rev. 2? Asking the question of  
6           what's going to happen 60 to 80 years.

7           And so this was a program that we undertook.  
8           We went through all the Aging Management Programs. And  
9           we went through and we mapped the EPRI research to those  
10          Aging Management Programs. And we put out a  
11          publication there.

12          And to help, in our simple minds, how to do  
13          these things is, we put the Aging Management Programs  
14          into three different categories. We said, there's a  
15          category of Aging Management Programs, whereas we talk  
16          about the question of 60 to 80 years.

17          Additional research is still needed. And  
18          I'll kind of jump ahead of it. It matches very closely  
19          with what Mirela, you know, presented this morning with  
20          the IASEC, the internals, the cables, the concrete, you  
21          know, we agree. That's what that showed us. We found  
22          that there are, so if you look on this ongoing research  
23          areas, there are eight of those.

24          We also looked at, a number of the Aging

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1 Management Programs fell into what we call this  
2 established program area. That was 20 of those. And  
3 some of the examples we have are like the chemistry  
4 programs, steam generator inspections, flow  
5 accelerator corrosion.

6 And the characteristic there is yes, we're  
7 seeing aging characteristics. We're seeing, you know,  
8 mechanisms happening in those systems. But they're  
9 well understood. We have established, strong programs  
10 in place that are providing the management for those.  
11 And we'll continue those.

12 I'm going to show you a few examples in my  
13 presentation about how that work will continue to  
14 support those established programs. But those are  
15 well established programs. And then there were 22 of  
16 them that fell into, I think, this category that we  
17 talked about, are these new, of the plant specific, one  
18 time inspections.

19 Areas that, if you're going to go into an  
20 extended period of operation, you should go out and look  
21 at. But not necessarily areas where research is going  
22 to help you inform or improve how you're doing those  
23 Aging Management Programs. So we did this to help  
24 really focus, and then go back and challenge ourselves.

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1           Are we doing the right research to support  
2           our members going forward, as they're thinking about  
3           60 to 80 years? And where their risk could be. And  
4           I know you posed that question to me when I first came  
5           in. So I hope this helps you with that.

6           CHAIRMAN SKILLMAN: Yes. As I understand  
7           it, this slide indicates the 50 that Tina Taylor  
8           mentioned at the RIC. This is that population of 50.

9           MS. BERNHOFT: Yes. And this is how we  
10          broke that down.

11          CHAIRMAN SKILLMAN: Thank you.

12          MS. BERNHOFT: And then this is, of those  
13          eight that I mentioned, these are those eight Aging  
14          Management Programs that we looked at, where, you know,  
15          the research will continue to provide insights for the  
16          management for the 60 to 80 years.

17          So, I mean, by default these are our high  
18          priority areas. One thing that we found when we went  
19          through this, it's important to note is, we had no  
20          surprises. This is, we did it, you know, with a clean  
21          slate of paper.

22          But we did not have anything that came out  
23          and said, wow, you really should be paying attention  
24          to this. You really need a program for this. It did

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1 inform us that we needed to adjust some of our  
2 priorities.

3 But nothing came out and said, you know,  
4 there's something happening here that we're not  
5 covering, or we're not taking a look at. So it was  
6 beneficial from both standpoints, help with  
7 priorities, and help that we felt that there's nothing  
8 unidentified.

9 CHAIRMAN SKILLMAN: So let me say again what  
10 I was trying to communicate.

11 MS. BERNHOFT: Okay.

12 CHAIRMAN SKILLMAN: At the RIC what was  
13 communicated is, look at 50 AMPs. And of the 50 AMPs,  
14 eight really rose to the surface as needing more  
15 attention. And on this slide are those eight.

16 MS. BERNHOFT: Correct.

17 CHAIRMAN SKILLMAN: These are the biggies.  
18 Okay. Thank you. It was very helpful. And, thank  
19 you.

20 MS. BERNHOFT: And understand, this is just  
21 an EPRI --

22 CHAIRMAN SKILLMAN: Yes.

23 MS. BERNHOFT: -- position with our members.

24 CHAIRMAN SKILLMAN: Okay. That's good.

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1 Thanks.

2 MS. BERNHOFT: Okay. And so I'm going to  
3 talk about, so now I'm going to talk about each one of  
4 these. And I'm going to give you a picture of what  
5 we're doing in those areas. Actually, I want to back  
6 up on this publication, one thing. I think there's,  
7 there is some misconception that came out of the  
8 publication.

9 We put this publication out late last year.  
10 We did release it as a publicly available document,  
11 because we wanted, we felt this is important  
12 information to get out to the general population of  
13 stakeholders interested in Subsequent License Renewal.  
14 So we non-priced it. We made it publicly available.

15 We do have a lot of information in there about  
16 how we came to our conclusions on these eight AMPs. And  
17 we provided a very brief synopsis on some of the  
18 research programs that are going on in these areas.  
19 And we actually provided some GANT charts on, you know,  
20 some timeliness for some other research in these areas.

21 But I want to make sure that everybody fully  
22 understands. In the context of about a, you know, 40  
23 page document, we haven't even begun to touch the  
24 research in those areas. So, I would urge anybody

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1 looking at this document to take it as a first step.  
2 But it is not a standalone document. There are two,  
3 and you go to, there are 200 references to this  
4 document.

5 And so to really understand where the  
6 research is at this point, you know, you really need  
7 to go through those 200 documents. Or, if you call  
8 myself, you know, I'll get the smart people to come in,  
9 and we'll go through those questions with you.

10 So don't, again, you can't just take a  
11 snapshot of that and think you know everything about  
12 every research. It's really just meant to give us kind  
13 of a first pass, if that helps. Okay. So I'm going  
14 to talk first about RCS metals. And then I'm going to  
15 talk about cables and concrete.

16 Okay. Before I talk about RCS metals, this  
17 is our largest area of research. So I want to take kind  
18 of a few minutes and describe to you how we approach  
19 our research on RCS metals.

20 The industry itself spends \$50 million  
21 dollars per year on R&D for RCS metals research. That  
22 also includes the owners group in that number as well.  
23 It does not include the DoE number. So that's another  
24 encrusted number, in addition to that. And we've been

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1 at this for a very long time.

2 And as you can see in NEI Document 03-08, so,  
3 you know, from 2003, it's where the NRC, the industry,  
4 on their own, the industry management actually came  
5 together and said, we need to be pro-actively managing  
6 materials degradation issues. We don't like being  
7 surprised. We don't like the unknowns.

8 So the industry came and they established  
9 this initiative. There were several meetings of  
10 working groups before that. But they actually put a,  
11 they put a line in the sand when they put out NEI 03-08.  
12 It was a communications document. It's a protocol.  
13 And it's also sharing an Operating Experience with each  
14 other, and with the NRC. And INPO is also a part of  
15 this too.

16 So, for some of the programs that are under  
17 this, like the boric acid program, the vac program, the  
18 chemistry programs are all covered in NEI 03-08.  
19 INPO, when they do their plant assessments, they go in  
20 and they evaluate the plants against those program  
21 areas. So like I said, this is a real line in the sand.

22 The industry came together to help manage  
23 their degradation they were seeing happening in  
24 materials areas. So we have a number of program areas

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1 within EPRI that fall in under that. And that's the  
2 BWR vessel internals, the materials, which is the same  
3 for all the PWR materials, the steam generators, the  
4 NDE, primary system corrosion research, which is, works  
5 mostly with DoE, and a lot of the fundamental work, our  
6 water chemistry, and our welding repair and technology  
7 programs.

8 I heard some questions about how information  
9 is exchanged. Each of these issue programs has a group  
10 of industry advisors, U.S. and international. All  
11 U.S. industry has a member on these programs. And  
12 about 40 percent of the internationals has a member on  
13 these programs.

14 This is one of our largest programs for the  
15 international, are these materials programs. They  
16 meet two to three times a year, each of these program  
17 areas. And a good half day is devoted just to Operating  
18 Experience exchange. So that happens up there.

19 We have a monthly phone call with the leads  
20 from all these program areas in EPRI. We have a  
21 quarterly phone call with the NRC. We have an annual  
22 meeting with the NRC. And if any of that comes up we  
23 will set up meetings using this type of a protocol. So  
24 it gives pretty quick turnaround.

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1           And like when Ringhals happened, or  
2 something like that, we were on the phone right away,  
3 you know, going through this initiative. So, how do  
4 we, so starting off in some of the materials area, we  
5 do have a strategic plan that systematically approaches  
6 and evaluates how we manage the materials.

7           I think some of you may have heard of the  
8 materials degradation matrix and the issue management  
9 tables. They are both publicly available documents  
10 off of EPRI.com. The materials degradation matrix  
11 specifically goes through, and I'll show you an example  
12 here in a minute. It looks at everything we know about  
13 the materials.

14          We identify the vulnerabilities, we assess  
15 the conditions. And we look at, you know, when repair  
16 and replacements are needed. We update this at about  
17 an every other year frequency. And it's based on  
18 research, Operating Experience, and expert panel  
19 solicitation.

20          In 2010 we went through the existing  
21 materials management database. It's actually on Rev.  
22 3 right now. We're working on Rev. 4. In 2010 we went  
23 through, and this is, you'll see the color coding here  
24 in a minute. Yellow is significant. That means those

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1 are the gap areas. Green means it's well  
2 characterized. Yellow shows the gap areas.

3 So this is an example of the BWR reactor  
4 vessel internals. And you see the little LTO flag up  
5 there. That was added in 2010. And the areas that are  
6 green, you know, we look at the material. We look at  
7 the potential degradation mode that could happen. And  
8 then we color code.

9 If it's green that means we feel like we have  
10 adequate information in that box. If it's yellow that  
11 means there's still, you know, a gap in our  
12 understanding for the research. So when they went  
13 through in 2010 and added in these "LTO flags", some  
14 of the stuff that was green did go to yellow. But it  
15 was a very formal, systematic process.

16 And there's, this is just one example. I  
17 mean, there's tables and tables in this document for,  
18 you know, each component that is vulnerable to aging  
19 of an RCS metal. So this shows you the formality and  
20 rigor of the process it's gone through. So that's  
21 just, I don't mean to go into a lot of detail. But I  
22 just want to give a flavor.

23 I've heard some questions, how do we know  
24 we're doing the right thing? We've gone at it a number

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1 of different ways. So, what we rolled up, coming out  
2 of the 2010 effort is shown on this overhead. We went  
3 back through the materials degradation matrix.

4 And we said, okay, what are the higher level  
5 items that we see are questions for the long term  
6 operations? And you can see they fall into three  
7 areas, you know, it's the effects of the increased  
8 fluence, the possibility for a life stress cracking  
9 initiation, and of course, increased fatigue usage.

10 So if we go back through and we evaluate what  
11 we know, and add that back into the HE management  
12 tables, and this made sense with us too. And again,  
13 this jives, or aligns very well with what, you know,  
14 Mirela presented this morning.

15 And it's, you know, so from the neutron  
16 influences you see the reactor pressure embrittlement.  
17 You see the impacts, or the potential impacts from the  
18 four internals. The core periphery materials, we're  
19 evaluating those. And then, like I said, the late life  
20 potential for stress corrosion cracking, and the  
21 fatigue usage factors, both from increased fatigue  
22 cycles, and also from the environmental effects on the  
23 properties of the materials.

24 We looked at it from the AMP standpoint. We

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1 looked at it from the materials degradation matrix. We  
2 feel we have identified the high priority issues to be  
3 researching. What I'm going to do in these next few  
4 overheads is, I'm going to step through what came out.

5 I'm going to go through, look at each of those  
6 Aging Management Programs I talked about. I'm going  
7 to talk about each of those Aging Management Programs,  
8 and kind of give you a very high level snapshot on where  
9 we feel we are with those. And again, this is very high  
10 level. I could spend days here. I could get people  
11 smarter than I am to come spend days with you on these.

12 So the first one we talked about is the BWR  
13 vessel internals program. And, of course, our issue  
14 there is, we want to predict the SEC initiation and the  
15 growth trends, due to the increased neutron fluence.  
16 And I want to emphasize, as with all the programs,  
17 you'll see this repeated.

18 This is very much of a living program. We  
19 work with our utility advisors. GE is actually a  
20 member of this too. And we've done an extensive amount  
21 of work on IASCC and the BWRVIP documents. In fact,  
22 the Aging Management Program for, this particular Aging  
23 Management Program references 32 of the BWRVIP  
24 documents, the EPRI documents.

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1           And then as I said they're updated and kept  
2           current based on our Operating Experience. We've  
3           pulled back in the inspection results and the research.  
4           This is kind of a busy overhead. But we put this  
5           together to show how the different BWRVIP documents are  
6           used for a utility that's going through and doing an  
7           inspection of their BWR internals.

8           So you can see all the components are listed  
9           that are the internal components for a BWR. You see  
10          the inspection and evaluation guidelines. You see how  
11          you could look at doing repairs or replacements. And  
12          then you see mitigation recommendations.

13          And I should note too that if you see  
14          everything that has the alpha designation after that,  
15          that means it's actually been reviewed and approved by  
16          the NRC. There was an SER on that. It's an acceptable  
17          approach. So if, only four is with the BWRVIP.

18          We're going to continue a lot of our  
19          understanding on the IASCC. And really, where we feel  
20          we are right now in IASCC is, we know quite a bit about  
21          it. But we need to continue to reduce the  
22          uncertainties in the current modeling. We need to look  
23          at improving some of the correlations, based on some  
24          crack growth rate studies.

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1           And we want to continue working on mitigation  
2           and repair strategies.   Mirela talked about this  
3           today.   And I actually have more detail in a later  
4           overhead.   But I'm going to go ahead and talk about it  
5           right now.   And that is how important some of the  
6           harvesting projects are right now.

7           Zorita is a plant in Spain.   It's a retired  
8           plant.   It had several years of operations on it.   So  
9           we worked on a collaborative project with the NRC  
10          research.   And we harvested some of the baffle plate  
11          material from Zorita.   Our plan right now is to do some  
12          mechanical testing on that, and some microscopic  
13          property testing on it.

14          I had an opportunity to look over lunch, and  
15          some of those Zorita materials are anything from a  
16          couple of DPA to, there are some that have up to 58 DPA  
17          on some of those materials.

18          Another project that we have relating to the  
19          internals materials is the GONDOLÉ Project.   And  
20          that's specifically, it's again an internationally  
21          collaborated project that's specifically looking at  
22          the void swelling properties with exposure to a PWR  
23          environment.   We have samples of that right now that  
24          have 15 to up to 85 DPA of work that we're doing for

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1       some void swelling. And then there's another project  
2       that --

3               DR. SHACK: Where did those come from?

4               MS. BERNHOFT: That's, I can get some more  
5       detail on that for you. Let me pull up some more  
6       detail. Like I said, I looked up something over lunch,  
7       because there was some question about some of the  
8       detail. But I'll get that to you. And then -- What's  
9       that?

10              CHAIRMAN SKILLMAN: Just cleared his  
11       throat.

12              MS. BERNHOFT: Okay. Anybody have  
13       questions? Okay. I'm ready. And then the Halden  
14       research we're also working on. We have some, three  
15       or four stainless steel material pieces that were  
16       fabricated out of some thimble tubes.

17              And we're doing some work on that with crack  
18       growth rate experience in a lithium environment.  
19       Again, typical of a PWR. And we have samples in that  
20       testing. And they're in the 60 to 100 DPA range as  
21       well. So there's still work to do.

22              We're still working on correlating these  
23       crack growth models. I totally agree with Mirela, the  
24       next thing we want to do at Zorita is, that we do have

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1       some, like I said, we've harvested these baffle plate  
2       materials. We also have some weld materials sitting  
3       there harvested.

4               And our next plan is that we would like to  
5       take and further irradiate that, to get that out towards  
6       100 DPA. So, that's kind of the Phase 2 Zorita that's  
7       being planned right now. And so, then again, it's, we  
8       keep these technical reports up to date. So that's  
9       BWRVIP.

10              DR. SHACK: How about taking some three DPA  
11       material and irradiating it to 58 DPA in the fast  
12       reactor? And seeing how it compares with the 58 DPA  
13       from the LWR? You were awfully dependent on fast  
14       reactor radiations.

15              MS. BERNHOFT: Yes. Just to say, because as  
16       you well know, I mean, one of the characteristics we  
17       see at the higher watts and the accelerated test  
18       conditions, you do see conservatisms. And we see that  
19       all over. We see it with cables, we see that with  
20       metals, we see that with concrete.

21              DR. SHACK: If you could convince me it was  
22       conservative, that would be fine.

23              MS. BERNHOFT: Okay. Next one I want to  
24       talk about is the Aging Management Program on cracking

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1 of nickel based alloys. This is under our materials  
2 reliability project, our PWR. And the concern here is,  
3 you know, the boric acid crack, primarily the alloy 602  
4 being --

5 I think we're all familiar of course with the  
6 head penetrations and the bottom mounted nozzles in two  
7 primary areas of concern. So right now, these are, we  
8 have code cases that have accepted by the Section 11  
9 Code, reviewing the examinations, the head  
10 penetrations, the butt weld examinations.

11 We have completed work on the impacts of the  
12 leakage on the wastage rates. We've developed the  
13 inspection techniques. And we've put out reports on  
14 the crack growth rates, and the modeling techniques.  
15 And they have been accepted into the Section 11 Code.

16 Similar to the last situation, you know, the  
17 work that we want to continue to do is to further refine  
18 the crack growth rate models, looking for the  
19 conservatisms on that. And the further work we want  
20 to do also is continuing to work on some of the  
21 mitigation strategies.

22 And that's tools such as painting. There  
23 are a couple of painting techniques already with the  
24 water jet or the laser painting. And we've prepared

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1 topicals on that. And there was actually a couple of  
2 utilities in the U.S. that are looking forward to  
3 wanting to do some painting for stress relief.

4 But similar to most economic investments, if  
5 they make the investment to do it, they want to be able  
6 to get some of the relief from some of the inspections.  
7 So they're trying to come up with the technical basis  
8 to justify that.

9 We're continuing to work on bottom nozzle  
10 inspection technology. It's a very difficult place to  
11 get in to apply those somewhat complex geometry. And  
12 then, as plants are starting to replace their 600 with  
13 690, continuing to work on 690. Same type of question,  
14 that's growth inspection.

15 And I think as people in the materials world  
16 know, we're just trying to get the stuff to even crack,  
17 so we can start getting some initiation crack growth  
18 rates on it. But first we've got to threaten it enough  
19 to crack it.

20 Next area is, the next Aging Management  
21 Program has to do with the thermal aging and  
22 embrittlement of CASS materials. There's a lot of CASS  
23 materials, cast austenitic stainless steel materials,  
24 just outside of the reactor pressure vessel. They're

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1 exposed to, of course, radiation environments and  
2 higher temperatures.

3 So the irradiation embrittlement's hot  
4 handled under the internals materials. We're looking  
5 here mostly at the thermal affects on it, thermal aging.  
6 And right now we have a flaw tolerance approach that  
7 basically allows you to estimate its time at exposure,  
8 and estimate they types of flaws you have.

9 Our inspection technique right now for cast  
10 austenitic stainless steel is a visual inspection. So  
11 we are trying to work through, you know, NDE techniques.  
12 Again, it's not a very conducive material for an NDE  
13 technique.

14 CHAIRMAN SKILLMAN: Is any of this material  
15 in a fluence area where you actually get embrittlement  
16 of the austenite matrix? Or is it this is, all the  
17 embrittlement is really occurring in the ferrite,  
18 either from thermal or irradiation?

19 MS. BERNHOFT: It's primarily thermal  
20 irradiation that we're seeing right now. And probably  
21 we'll see it in the ferrite materials that we've seen.  
22 But we're still doing some more work on that.

23 CHAIRMAN SKILLMAN: All right.

24 MS. BERNHOFT: And we're working quite a bit

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1 with DDF on this as well. So there is actually a joint  
2 working group ASME put together. And I should say too  
3 that there is a list of RAIs that has come from the NRC  
4 staff.

5 And so we have a joint working group between  
6 the BWRVIP and the MRP, and several utility  
7 representatives that are working on responding to those  
8 RAIs, that actually, in the disposition or the  
9 treatment of those RAIs, will take care of a lot of the  
10 concerns that we feel are going to be in this Aging  
11 Management Program for 60 to 80 years.

12 And that is coming with a good screening  
13 evaluation criteria. How we handle the uncertainties  
14 and the fracture properties. And there's already been  
15 a couple of conference calls with the NRC. And we'll  
16 be submitting our response and our guidance documents  
17 here in the near future to the NRC on that.

18 So significant work on that already. But  
19 again, we feel a lot of what's -- As that resolution  
20 pass is confirmed, that will take care a lot of what  
21 needs to be considered for the 60 to 80 in this  
22 particular Aging Management Program.

23 PWR vessel materials, again, very similar to  
24 what I covered on the BWR vessel materials. It's

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1 covered under the NRP program via -- The issue here of  
2 course is the IASCC and the void swelling. EPRI has  
3 developed MRP, what we call 227 alpha, which again is  
4 an NRC approved inspection techniques.

5 Plants move into their period of extended  
6 operation. They use this as their guidance document  
7 for doing a comprehensive inspection of the PWR  
8 internals. And we've worked with the owners group to  
9 do a lot of the acceptance criteria and methodology,  
10 and their W cap.

11 Right now this is not actually in the GALL.  
12 But it's covered by Interim Staff Guidance. I guess  
13 it wasn't reviewed and approved by the time GALL Rev.  
14 2 was issues. So as you saw back from that early curve,  
15 we have quite a few PWRs that are coming into their  
16 period of extended operation. They've started doing  
17 this inspection.

18 Right now, I think best characterizes, we  
19 really are not finding any surprises. Some plants are  
20 harvesting and replacing their baffle bolts. And so  
21 we do have some baffle bolts that, at Oak Ridge right  
22 now we'll be doing some further testing on those baffle  
23 bolts.

24 And this is where, I kind of pulled this slide

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1 forward. And I talked about that earlier, when I  
2 talked about the Zorita Project, the GONDOLE Project,  
3 and the Halden Project. So they work together. I  
4 mean, it's a similar type material.

5 But again, understanding, exactly as Mirela  
6 talked about, the impacts on the internals materials.  
7 So we do have these going at the higher fluence levels.  
8 But we do have a program in place, under both PWR and  
9 the BWR issue programs to do the inspection, the  
10 management and the evaluation criteria.

11 Reactor vessel surveillance inspections.  
12 We talked about that a little bit earlier today as well.  
13 Or that question came up. So the need here is to  
14 monitor for fracture toughness of the reactor pressure  
15 vessels, and the nozzles, due to radiation.

16 If you look at the red area on the little  
17 graphic there on the side. That's just typically what  
18 we've looked at, you know, of course, the active fuel  
19 area. And your primary concern that started a lot of  
20 the PTS concerns was the belt line weld.

21 As we, more recent experience now, we're  
22 actually starting to look at the outside of the belt  
23 line area, and in particular the nozzle area. You  
24 know, it's more complex geometry of the higher stress

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1 level. So we do have a number of reports. So for the  
2 BWRs, when they went into the 40 to 60, they relied on  
3 the integrated surveillance program.

4 The PWRs had in place their surveillance  
5 capsule program, where they harvest the capsules, and  
6 they do their Charpy V-notch test, and put that in  
7 embrittlement trend correlation. As we go in --

8 CHAIRMAN SKILLMAN: Now, there is an MRP  
9 report that isn't listed here, that sort of looks at  
10 the PWR surveillance capsules, and tries to extend it  
11 out.

12 MS. BERNHOFT: Yes.

13 CHAIRMAN SKILLMAN: Has that been accepted  
14 by the NRC? I mean, is there an evaluation of that?

15 MS. BERNHOFT: Yes. No. Yes, there is  
16 that program. No. Then I'll go right through that  
17 right now. So, the first thing we ask --

18 CHAIRMAN SKILLMAN: The coordinated --  
19 Sorry. Sorry.

20 MS. BERNHOFT: No, that's okay. It's a  
21 great set up. I appreciate that. Not everybody knows  
22 about it. It almost made the headlines this morning.

23 MEMBER STETKAR: Bill knows about  
24 everything.

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1 MS. BERNHOFT: So we actually, so there's a  
2 need -- As was talked about this morning is, when you  
3 have the surveillance capsules, you know, they were put  
4 into the vessel at an area that has a lead factor. So  
5 we have enough data right now that shows we have a  
6 sufficient lead factor, you know, out to the 60 some  
7 years of operation.

8 As we started talking about the 60 to 80 what  
9 we've done is, we've done two programs. One is this  
10 coordinated reactor vessel surveillance program. We  
11 went through the 13 remaining capsules that are still  
12 in the vessel.

13 And we worked with those utilities to extend  
14 out the timeline that they would stay in vessel. And  
15 so the action that needs to happen there is, each of  
16 those utilities needs to send a letter to the NRC,  
17 notifying them of that change, that we're going to leave  
18 those in longer, to continue to get a larger fluence  
19 level out, more representative to the 80 years.

20 So where that is with the NRC staff, I  
21 couldn't answer that. But that's kind of the next  
22 action. Those utilities need to process that letter  
23 to the NRC staff. The second program that we're doing  
24 is, we're actually taking some surveillance materials

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1       that have been removed, and putting them back into a  
2       vessel.

3                   MEMBER RICCARDELLA:   Miniature samples?

4                   MS.    BERNHOF:        Some    of    them    are  
5       reconstructed samples that been previously moved out.  
6       So if they have radiation exposure on them we'll put  
7       them back in.   And so between the two programs we'll  
8       get additional data points out to the 80 years of  
9       operation.

10                  Recently we had had some conversation, or I  
11       should say the MRP had some conversations with the NRC  
12       staff about the supplemental surveillance program, on  
13       being able to re-use those surveillance capsules.

14                  There's a tricky nuance in the license  
15       renewal language that, working with the staff we're  
16       going to be able to overcome that move, and have this  
17       program to reintroduce these surveillance capsules.  
18       So between these two programs, so again, we've got data  
19       out there with a good lead factor on it right now.

20                  And then we're also going to continue to  
21       start collecting additional surveillance capsules, to  
22       take this out to the, you know, out closer to the DPE,  
23       so the exposure's for 80 years.

24                  In addition to that, we're also doing other

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1 work on, you know, reducing some of the uncertainties  
2 in the embrittlement trend correlations. And we're  
3 also working on a project with the Japanese right now  
4 to maybe see if we can find a more direct measurement  
5 or correlation for embrittlement trend, or for testing  
6 the embrittlement versus just doing the Charpy V-notch  
7 test. So again, a couple of efforts that will help  
8 remove some of the conservatisms in there.

9 And then the other area, as I said before,  
10 that we're working on is, you know, the components are  
11 actually outside of the beltline area, the impacts on  
12 that. Okay. That's metals. And I hardly did that  
13 justice.

14 I should say that the first week of June our  
15 metals researchers, the EPRI issue program leads with  
16 their industry chair persons, have a three day meeting  
17 planned with the NRC staff. So they will actually go  
18 through what I went through in a very few minutes, and  
19 give it due justice in three days. And that's a public  
20 meeting. It will be here, you know, at White Flint,  
21 that first week in June.

22 Okay, cables. Okay. This is actually  
23 under the EPRI plant engineering group. The concerns  
24 or issues that we're looking at there are the thermal

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1 radiation exposure of cable insulation material.  
2 Again, cable research at EPRI has been going on for,  
3 you know, 20 plus years. It's a well established  
4 program.

5 Of course, it started with having to do a lot  
6 of forensic testing. And a lot of that actually  
7 started with, as we talked about earlier today, was some  
8 of the results from some of the submerged cables, or  
9 cables in leaded environments.

10 We have several publications out there.  
11 They did put out a license renewal electrical handbook.  
12 There's been several cable aging reports, guidelines  
13 for management of medium voltage. There's one coming  
14 out on low voltage cables. And we've done several  
15 reports on forensics testing.

16 And we just recently, I didn't put it on this  
17 overhead, but Mirela made mention of it. Did put out  
18 a report where we went through working plants. And we  
19 collected from 18 different plants the actual  
20 temperature and radiation environments that the cables  
21 are exposed to.

22 We've provided that information to our  
23 partners through the DoE to Sandia. So as they're  
24 doing their continued accelerated aging and radiation

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1 testing, they have more representative type data of the  
2 plant conditions for that Sandia testing.

3 CHAIRMAN SKILLMAN: Sherry, what is that  
4 image that is presented?

5 MS. BERNHOFT: Okay. There's two images.  
6 The one at the top is what happens. So, sometimes when  
7 I make this presentation, you know, I'll make the  
8 statement that cables are generally done pretty well  
9 in normal environments.

10 Actually the top, that is what happens when  
11 somebody puts a cable, or puts in a valve, a hot valve  
12 near a cable train and doesn't shield it. This  
13 happened in one cycle to a plant. And then the bottom  
14 one is what we call an indenture.

15 MEMBER BLEY: That was one cycle?

16 MS. BERNHOFT: I think so. It probably,  
17 could have been a couple of cycles. But, you know --

18 MEMBER BLEY: It must have been a darn hot  
19 valve.

20 MS. BERNHOFT: And then the bottom thing,  
21 what that is, is that's what they call the indenture.  
22 And what it does is it tests, it takes, it puts the probe  
23 against the --

24 CHAIRMAN SKILLMAN: Insulation.

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1 MS. BERNHOFT: -- insulation material.  
2 Thank you. And you look at the elasticity of the  
3 material. And we have correlated, there's kind of a  
4 criteria. And Sheila can help me here with that too.  
5 Is that you get what your elasticity is before you get  
6 failure from having to do actually a longation and break  
7 test.

8 So what we try and do is, we correlate what  
9 we see coming out from some of the indenture readings  
10 to what we see from the elasticity with this. It's just  
11 to give us some kind of influence, or insights as to  
12 how far we are from potential failure of the cable  
13 insulation material --

14 CHAIRMAN SKILLMAN: Thank you.

15 MS. BERNHOFT: -- or breakdown of insulation  
16 material.

17 CHAIRMAN SKILLMAN: Understood. Thank  
18 you.

19 MS. BERNHOFT: Sheila, you're standing up.  
20 Do you have anything? Oh. I'm not an electrical  
21 engineer. I get nervous any time somebody asks me a  
22 cable question. So, I still got more cable slides too.  
23 Okay.

24 So we actually, the end of this month we'll

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1 be making a technical presentation. We'll have the  
2 cable researchers coming to talk to the NRC Division  
3 of License Renewal staff at the end of this month, on  
4 the road maps with regard to cable testing. We have  
5 been working very hard together. And this has been  
6 DoE, EPRI and NRC research with Sheila, on developing  
7 a joint road map.

8 And the first thing we did is we went through,  
9 similar to what we did on the material with our metals  
10 sides, we went through and we had expert teams get  
11 together and say, what do you think are the highest  
12 priorities to make sure that we've covering for  
13 research for 60 to 80 years, you know?

14 And these are some of things that we saw  
15 coming up, with the submergence, the condition  
16 monitoring, the degradation with irradiation and  
17 actual field conditions, coming up with improved life  
18 time predictions. So we came up with those. And then  
19 we came up with integrated road maps.

20 And it's those integrated road maps that  
21 we'll be presenting at the end of the month, and our  
22 action plans to cover those. Concrete. Any more  
23 questions on cables? I told everybody I'm scared of  
24 questions on those. Okay. Concrete.

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1                   MEMBER BLEY: I'm just curious. There's  
2                   been a lot of work done recently. And I was looking  
3                   at your license renewal electrical handbook. But  
4                   that's some years old now. Is there an update to that  
5                   coming soon, to bring in all this work that's been done  
6                   in the last few years?

7                   MS. BERNHOFT: Actually the --

8                   MEMBER BLEY: Or did I miss something?

9                   MS. BERNHOFT: Jason, under his working  
10                  groups, you know, there is an electrical working group.  
11                  And they have taken it on themselves. They're going  
12                  through and they're providing us some inputs to that.  
13                  So we'll be putting that back out.

14                 MEMBER BLEY: Okay.

15                 MS. BERNHOFT: Okay. Concrete containment  
16                 structures. This is always a very -- You know, I  
17                 started working for EPRI two and a half years ago. And  
18                 I've actually learned that concrete is very, very  
19                 interesting.

20                 MEMBER STETKAR: We're sick people, aren't  
21                 we?

22                 MS. BERNHOFT: You know, I was a steam  
23                 generator engineer for years and years and years. And  
24                 I used to like really get into looking at, you know,

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1 600 cracking. So I started with a kind of off  
2 personality. Okay. So we did have a detailed --

3 So this is actually covered, believe it or  
4 not, under our NDE group. We have a large group, and  
5 a growing group right now of concrete researchers  
6 within EPRI. And within the nuclear sector we handle  
7 all the concrete aging for all of EPRI. And that  
8 includes like dams and support structures for large  
9 power poles.

10 So our concrete researchers, I mean, I think  
11 they're, you know, they get test a lot, and they're  
12 pretty state of the art. They've gone out and they've  
13 crawled up and down dams and all that other stuff. And  
14 they've talked to like the highway people. And so we  
15 get a lot of good cross-pollination there.

16 We did have a presentation in the December  
17 time frame to the Division of License Renewal staff.  
18 We did, in 2010, publish a prioritized issue management  
19 table. And what we saw was all the issues out there  
20 with potential concrete. We also did a detailed  
21 literature OE search on any concrete issues that we  
22 found in the nuclear industry.

23 And the best way to characterize it is,  
24 concrete again has behaved very well. We've seen a few

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1 instances. But they make the national news. You  
2 know, like the condition of Davis-Besse, of course,  
3 Crystal River --

4 CHAIRMAN SKILLMAN: Crystal River.

5 MS. BERNHOFT: -- Seabrook. They make  
6 national news when you have a concrete issue.

7 MEMBER BLEY: Some of the new reactors, not  
8 just the one that's been through certification, but  
9 some of the newer ones are making extensive use of this  
10 steel plate concrete structure, which the last I heard,  
11 there's still no standards out on. Have your folks  
12 been working on that at all? And is there anything on  
13 that that you might point us to?

14 MS. BERNHOFT: I can find out for you. I  
15 know under our advanced nuclear technology group that  
16 channels new plants, I know that we have a large track  
17 on concrete research with them.

18 MEMBER BLEY: Okay.

19 MS. BERNHOFT: So, as far as, you know, the  
20 modular construction, I'm not sure if that's something  
21 we've done research on, or if the vendors are working  
22 on that.

23 MEMBER BLEY: I did hear a rumor that there's  
24 a draft standard finally coming out on it. But it was

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1 a big deal here because there hadn't been a standard.

2 MS. BERNHOFT: I would hope, yes. Good.

3 So, also with the interest in concrete, in 2012 we  
4 actually did set up a member advisor group on concrete  
5 for EPRI. Some of the issues, of course, were we're  
6 well now familiar with the alkali silica reactions,  
7 looking at that potential.

8 And that's what the picture is of. It looks  
9 pretty ugly. The impacts of this, we had talked about  
10 radiation and gamma heating, and of course, creep  
11 fatigue. As we said, we've done extensive data  
12 collection.

13 We have completed just recently a project for  
14 all of the existing literature that there is on  
15 concrete. I've got a little bit of that in here. I  
16 think Tom has some of that in his presentation also.

17 We provide a lot of technical support on ASR.  
18 And we are in the second year of a three year project  
19 doing mechanistic modeling of boric acid tagged on  
20 spent fuel pools.

21 So this is classically called the Hilsdorf  
22 Data Curve. It's kind of an existing, well cited  
23 literature source that talks about the impacts of  
24 irradiation on neutron and its compressive strengths.

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1 That's a measurement they've used is, you know, loss  
2 of the compressive strength.

3 And you can see that there's a knee of the  
4 curve out there. I'm going to toggle between a couple  
5 of overheads here in just a minute. So look where that  
6 knee of the curve is. And if you go on to this next  
7 overhead what this shows is, this is the PWR fleet in  
8 the United States.

9 We did a lot of work this last year. And we  
10 went back, and we asked the question on the PWRs, where  
11 would -- The PWRs have the higher fluence in their  
12 containment than the BWRs. So we posed the question  
13 of, where would be the critical concrete as far a  
14 radiation standpoint for the PWRs?

15 And of course the response comes, you're  
16 looking at the biological shield wall and the support  
17 pedestal for your reactor vessel. So we went back, and  
18 we took, we went through ADAMS. We looked at all the  
19 fluence data from the reactors. And we derived,  
20 between the air space and the vessel, what we felt at  
21 80 years would be the total fluence level at the reactor  
22 support pedestal.

23 And that's what this data shows you right  
24 here. I've taken all the names of the plants off. But

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1       you can see that the peak comes with the Westinghouse  
2       two loop plants, which makes sense, that they're, you  
3       know, much smaller containment, much tighter  
4       configuration. That they're going to have the highest  
5       fluence levels out to 80 years, around that area, the  
6       biological shield wall and the reactor support  
7       pedestal.

8               And so if you look at, you know, the highest  
9       fluence plant being that Westinghouse two loop plant,  
10      where that level is. And then you go back and look  
11      right about where that knee of the curve is on your  
12      Hilsdorf data.

13             So what this tells us is a couple things is,  
14      you know, we've got some time, you know, we've got some  
15      lead factor on that, based on this data. But what we  
16      want to be doing, and we're working with DoE right now,  
17      is that we do want to go out and do some additional  
18      radiation testing right around where this knee of the  
19      curve is, to get some more insights.

20             And then we also want to do some further  
21      modeling and methodistic understanding of, if you do  
22      start getting this loss of compressive strength, what  
23      does that really mean to the structural integrity of  
24      your reactor support pedestal?

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1           So, like I said, it tells us that we're  
2           starting to see something out there. But it sounds  
3           like we've got some time, you know, there's margin.  
4           But taking everything, and fully believing and  
5           understanding what it tells us, you know, we also need  
6           the reasonable assurance, you know.

7           We'll continue with some research out in this  
8           area to figure out -- So we want to do the irradiation.  
9           We want to take that concrete and do some mechanical  
10          testing on it, and see exactly how that is changing some  
11          of those properties. And also with that too, we want  
12          to be developing some NDE techniques.

13          MEMBER REMPE:    So are you grouping all  
14          concretes together, whether it's the salt based or  
15          whatever, and things like this? Or do you have, do you  
16          see any differences in the different types of concrete?

17          MS. BERNHOFT:    Yes.    You would see  
18          different, for instance the aggregate, the one thing  
19          about the concrete that we're talking about is, you  
20          know, the good thing is it's a safety related concrete.  
21          So there, you know, we can go back to kind of a uniform  
22          standard or specification, or criteria that it was,  
23          that the aggregate was made to.

24                 (Off microphone comments)

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1 MS. BERNHOFT: Especially when you get to  
2 like some of the other concrete around the different  
3 areas, you know, it has to be more, you know,  
4 commercially available type concrete. When you get to  
5 more what's in the reactor vessel support pedestal, it  
6 was done to a standard. So we can go back and we can  
7 pull those standards.

8 MEMBER REMPE: Yes. But there is a  
9 difference, even amongst --

10 MS. BERNHOFT: Yes, there is.

11 MEMBER REMPE: -- the standards. And you  
12 can't tell the difference in something like this yet?

13 MS. BERNHOFT: No, not yet.

14 CHAIRMAN SKILLMAN: Sherry, how is this  
15 information factored into the new construction in the  
16 United States, relative to concrete mix, aggregate,  
17 chemistry of concrete?

18 MS. BERNHOFT: That's a good question. I  
19 mean, this is fairly recent data. We've made, you  
20 know, we've provided like, it's the same concrete  
21 researchers that we have that do both. So they've been  
22 talking also to our new plant technology people on this  
23 data.

24 CHAIRMAN SKILLMAN: Thank you. That's all.

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1 Thank you.

2 (Simultaneous speaking,)

3 CHAIRMAN SKILLMAN: Just, you know, a quick  
4 take on that is that the old Westinghouse two loopers  
5 are more susceptible to others. But there are a couple  
6 of CEs and a handful of Westinghouse three loopers that  
7 are not too far behind.

8 MS. BERNHOFT: Right. And quite honestly,  
9 yes, some of the things we've talked about is, and I  
10 hate to say this, because some of the Westinghouse two  
11 loop plants are the ones that --

12 CHAIRMAN SKILLMAN: Are susceptible.

13 MS. BERNHOFT: Well, they're susceptible,  
14 and it's a shut down. One already has.

15 CHAIRMAN SKILLMAN: Yes, Prairie, Kewaunee.

16 MS. BERNHOFT: Ginna.

17 CHAIRMAN SKILLMAN: Point Beach, Ginna.

18 MEMBER STETKAR: This is only U.S.?

19 MS. BERNHOFT: This is only U.S. data, yes.

20 MEMBER STETKAR: Interesting.

21 MEMBER RICCARDELLA: Well, this one, but not  
22 that other curve, claiming the drop off.

23 MS. BERNHOFT: Oh, you're right. This is an  
24 aggregate curve. And though we haven't published it

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1 yet, there are curves that do show some more recent data  
2 that the Japanese have finished, have also --

3 MEMBER BLEY: At higher fluences?

4 MS. BERNHOFT: Some higher fluences. But  
5 --

6 MEMBER BLEY: But you only got two points out  
7 there --

8 MS. BERNHOFT: Yes.

9 MEMBER BLEY: -- at the end. And then you  
10 drive your bounds right through it.

11 MEMBER REMPE: Yes. The two points at the  
12 end says no data, right? So those --

13 MS. BERNHOFT: Yes, those are no, yes.

14 MEMBER REMPE: -- are somebody's model?

15 MEMBER BLEY: It doesn't say no data. It  
16 says no information.

17 (Simultaneous speaking,)

18 MEMBER REMPE: Or what is it?

19 MS. BERNHOFT: No, those are data points.

20 MEMBER REMPE: They are data points?

21 MS. BERNHOFT: Yes.

22 MEMBER REMPE: But we've got to see if  
23 they're fast for thermal neutrons or anything?

24 MS. BERNHOFT: We screened out to, you know,

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1       some of the higher -- We did standardize this curve  
2       somewhat too, to make sure that we were all talking  
3       about the relatively same type neutrons. Tom, what was  
4       the neutron load? It came with one grain and 1 MeV on  
5       these?

6               MR. ROSSEEL: I'm sorry. Would you repeat  
7       that?

8               MS. BERNHOFT: We did, when we went through  
9       this Hilsdorf exercise we did screen out and try and  
10      standardize some of the fluence levels. So we're  
11      putting some of the --

12              MR. ROSSEEL: Generally what we tried to  
13      standardize it to, I think, was .1 MeV. And that's one  
14      of the things I'll address later on this afternoon,  
15      about the cutoff energy. It's quite arbitrary. And  
16      in fact, no knowing the neutron spectrum will get you  
17      in trouble in the long run.

18              MS. BERNHOFT: All right.

19              MEMBER REMPE: So when it has here fast and  
20      thermal, or slow neutrons, you've actually tried to  
21      correct for that difference? And plot something  
22      that's based on thermal? Or --

23              MR. ROSSEEL: Well --

24              MEMBER REMPE: -- fast? Or what is it?

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1           MR. ROSSEEL:   There's a problem.   Trying to  
2   go back in time is not easy.   We've gone back to the  
3   literature.   And we've, when you look at those points,  
4   they were presented in the Hilsdorf review paper.  
5   There's a limited amount of data.

6           But when you go back to the source material  
7   -- And you can come up.   And I'll show a slide where  
8   we might have 300 or 400 points, you get a lot different  
9   perspective on what's happening.   But to try and  
10   determine the spectrum, unless they give you a lot of  
11   information, you're not going to be able to go back and  
12   figure that out.

13           And that's one of the issues that we think  
14   is important to look at, is trying to understand the  
15   effect of the spectrum.   And as the neutrons go through  
16   the concrete the spectrum actually changes.   Because  
17   different energies attenuate at different levels.   But  
18   I'll show a little bit more of that later this  
19   afternoon.

20           MS. BERNHOFT:       So, Tom, through his  
21   bilaterals has been able to get some of this data.   And  
22   so again, what we're finding by doing the literature  
23   searches we've done so far is, a lot of the fleet --

24           I mean, we have some time to work on this,

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1       you know, we have some lead time on this. But, by all  
2       means, we still need to do work on the tail end of this  
3       curve.

4               MEMBER REMPE: Yes.

5               MS. BERNHOFT: Nobody disagrees with that.

6               MEMBER REMPE: Interesting.

7               MS. BERNHOFT: Yes, it's interesting  
8       information.

9               DR. SHACK: Just coming back to Joy's  
10       question again. When it says slow neutrons, that means  
11       that flux level that's plotted up there is for neutrons  
12       way down in energy? When it says fast it's everything  
13       above .1 MeV?

14              MS. BERNHOFT: Yes. And we had a lot of  
15       discussions too about, you know, what to put on. As  
16       Tom said, you know, we got into kind of some diminishing  
17       returns on the data that we had available.

18              DR. SHACK: So, I mean, that scatters even  
19       more?

20              MS. BERNHOFT: It could be. And some data  
21       points we took off. I mean, we did filter the data  
22       somewhat that we got from some of the original Hilsdorf  
23       data. And some of the two, like you said, the aggregate  
24       types were just so unrepresentative, you know.

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1           There were actually some points that never  
2 hit the knee of the curve. And when we went out and  
3 looked at those, those are actually more of a glass type  
4 aggregate too. So we just took those off the curve.

5           MEMBER RICCARDELLA: Any plans to harvest  
6 any of this kind of data from existing plants, shut down  
7 plants?

8           MS. BERNHOFT: DoE is, I think, attempting  
9 to harvest some concrete from Zion. I don't know if  
10 you're going to be talking about that.

11          MR. ROSSEEL: Yes. I'll talk about that a  
12 little bit later. But we're trying to obtain  
13 materials, cores from the Zion plant. We're in the  
14 process of doing that. We hope to get some in the next  
15 few months, if it's feasible with their schedule.

16          We've also initiated discussions with  
17 Barceback to obtain cores from their reactor. We've  
18 talked to Zorita as well. We'd like to talk to Crummel.  
19 We haven't been able to engage them yet. But we hope  
20 to do that. And I'll try and explain how we're going  
21 about that process.

22          MS. BERNHOFT: Thanks. Okay. So we do  
23 have an integrated road map with DoE. We're working  
24 on alkali silica reaction. One of the things we're

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1 doing is, we have developed a map across the United  
2 States, looking at where we think some of the, where  
3 the high risk aggregates came from.

4 Looking at the testing methods for the plants  
5 to us, to test how much ASR that they have, so they can  
6 start setting up their possible susceptibilities. And  
7 LWRS has taken the lead on doing some of the mechanistic  
8 modeling, and the structural integrity from that.

9 We talked about this, the need for the  
10 irradiation testing. The fact about how, when you're  
11 doing the radiation testing, how you account for what's  
12 the gamma heating, how you account for what's the  
13 radiation affects. And how possibly you need to look  
14 at either bifurcating or combining those two affects.

15 And so we've completed the literature  
16 search. And we're looking at going into more of  
17 thermal and the accelerated radiation testing this  
18 year. Those are some of the things we're looking at.  
19 Creep fatigue.

20 We're working with the department, looking  
21 at the database from the Department of Transportation,  
22 and how that can possibly apply to the nuclear power  
23 plant civil structures. The boric acid impacts. Like  
24 I said we're in Review 2 of that project right now.

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1 Working with CEA in France, doing the mechanistic  
2 models of the boric acid tack on the concrete and the  
3 rebar structures.

4 And for our members, we're going to be  
5 developing an overall toolbox for concrete, and  
6 concrete structure repairs. Some of the things we  
7 talked about that I didn't put on the overheads, because  
8 they're not into the Aging Management Programs.

9 We're also doing quite a bit of work in  
10 support of like the dry cast storage containers and the  
11 aging of the concrete on those. In the few minutes I  
12 have left, and I appreciate the time, I just want to  
13 give a couple of quick examples on how you handle a  
14 Category 2. So these are the Category 1 Aging  
15 Management Programs.

16 And again, what I want to say is, you know,  
17 we agree. You can see from what the data shows that  
18 there are areas that we, you know, want to continue the  
19 research. But we have a lot of information. We have  
20 the programs. We have the research in place, you know.

21 We've also set up how we're going to  
22 prioritize that research. Like I said, we agree,  
23 internals, we want to keep working on that. Concrete,  
24 let's make sure we're doing the right things before we

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1 go in and start doing some of the concrete, you know,  
2 radiation testing. It needs to be done. It might not  
3 be quite the highest priority.

4 What we need to do right now is, it's in a  
5 limited talent of the resources that we have. So a  
6 couple, these are just a couple of examples I pulled  
7 of some of the Category 2 Aging Management Programs.

8 Steam generators, we've already talked quite  
9 a bit about the buried pipe flow accelerated corrosion,  
10 and the water chemistry. And these are the programs,  
11 we totally agree that they're aging. They need  
12 attention. They need management.

13 So we have established programs in place that  
14 will continue to do what they're doing in these Aging  
15 Management areas. A steam generator program is  
16 actually required by a plant's technical  
17 specification. We have the steam generator management  
18 program, it's a large international program.

19 We have an NEI document out there. You can  
20 see several of the reports that help the plants with  
21 implementation of their steam generator management  
22 program. And also under their tech specs there are  
23 reporting criteria and requirements, if they find  
24 anything coming out of their steam generator

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1 inspections.

2 Buried pipe, we talked about that. This is  
3 covered under an NEI initiative. Utilities have been  
4 implementing this. The programs are in place. With  
5 that, we are continuing to do research. But the  
6 research is focused more on advancements in the section  
7 methodologies.

8 It's, you know, it's not, there's a lot of  
9 miles of pipe to inspect. So we're trying to work on  
10 automated inspection methodologies. And we're  
11 working on some better repair and replacement. We're  
12 looking at like, particularly HDPE piping as a  
13 replacement. Flow accelerated corrosion. This is  
14 also covered under, primarily under NRC Generic Letter  
15 89-08.

16 And we have programmatic guidance in some of  
17 the EPRI reports. And this is also a program that INPO  
18 looks at when they come in. Again, it's a very mature  
19 program, a lot of experience. We have the database  
20 through the CHUG workers group. Work we continue to  
21 do is program optimization.

22 And again, inspections are ways that we can  
23 improve the inspection methodology and the feedback.  
24 And then our water chemistry programs. Again, these

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1 are all actually under NEI 03-08. And or goals are,  
2 of course, material integrity and corrosion. That's  
3 our Number 1 goal.

4 Then fuel integrity, radiation control, and  
5 of course, plant specific optimization. But we base  
6 these guidelines on Operating Experience. We also  
7 have large U.S. and international input on to these.  
8 And we do quite a bit of inspection results.

9 And we're always working to do continuous  
10 improvement in these programs. They're updated  
11 routinely, based on what we find from inspections, R&D  
12 and Operating Experience. And will continue to be.

13 So in summary, based on the tools that are  
14 provided from the EPRI research, there is, you know,  
15 robust background for the Aging Management, between the  
16 R&D to understand the degradation, the inspection  
17 methodologies, mitigation strategies.

18 How you do condition monitoring, working on  
19 the tools, and the algorithms and software to predict  
20 remaining existing life. And always, you know, we  
21 always look at also, you know, what could be the repair  
22 or replacement decisions that we need to provide for  
23 these facilities.

24 CHAIRMAN SKILLMAN: Sherry, thank you very

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1 much. What I really heard you just do is, identify the  
2 50, went out to the eight. And you just explained in  
3 detail those eight AMPs that, at least in EPRI's  
4 judgment, constitute the highest risk at this point in  
5 time.

6 MS. BERNHOFT: No, the highest priority for  
7 research.

8 CHAIRMAN SKILLMAN: The highest priority  
9 for research. Thank you. Let me just pause for my  
10 colleagues. Any questions around the table here?

11 MS. BERNHOFT: And hopefully gave you some  
12 feel for the wealth or research that exists in those  
13 areas.

14 CHAIRMAN SKILLMAN: Sherry, thank you. I'm  
15 going to ask for a ten minute break.

16 MS. BERNHOFT: I think Mirela has a  
17 question.

18 DR. GAVRILAS: It's not a question. I just  
19 want, this is Mirela Gavrilas of the staff. I just  
20 wanted to answer Dr. Shack's question regarding the  
21 accelerated testing. We actually have a program now  
22 where we're doing samples on Halden, and radiated to  
23 0.5 degree DPA.

24 And we're irradiating exactly the same

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1 material in the ATR, within the same range, to see what  
2 the accelerated, what the flux rate and the spectrum  
3 ATR does, in terms of introducing atypicalities.

4 DR. SHACK: Okay. But you're not going to  
5 get to 100 DPA in the ATR.

6 DR. GAVRILAS: I was going to say that you  
7 have to wait 15 years for us to tell you the answer to  
8 the 58 DPA.

9 DR. SHACK: But the 100 DPA I assume is being  
10 done in a fast reactor, somewhere in Russia.

11 MEMBER STETKAR: The HFIR, or something that  
12 --

13 DR. GAVRILAS: No plans along those lines  
14 yet.

15 DR. SHACK: You said 100 DPA, right?

16 MS. BERNHOFT: The one project that we  
17 pulled, we actually did is, we took some thimble tubes,  
18 which get a high radiation exposure out of a reactor.  
19 And we fabricated samples out of those.

20 MR. SHACK: Oh, okay. That's where your  
21 high fluence -- Okay. That's nice, actually.

22 MS. BERNHOFT: Yes.

23 CHAIRMAN SKILLMAN: Thank you, colleagues.  
24 Any other questions? I'm going to call for a ten minute

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1 break. Please, reconvene at half past four, 1630 on  
2 that clock. Thank you.

3 (Whereupon, the meeting in the  
4 above-entitled matter went off the record at 4:19 p.m.  
5 and back on the record at 4:30 p.m.)

6 CHAIRMAN SKILLMAN: We're back in session.  
7 Good afternoon. Richard and Tom, welcome. We look  
8 forward to your presentations. Please proceed.

9 MR. REISTER: Thank you, Mr. Chairman. My  
10 name's Richard Reister. I'm a program manager for the  
11 Department of Energy's Light Water Reactor  
12 Sustainability Program. And I'm going to give a very  
13 brief overview of our program. And then I'm going to  
14 turn it over to Tom to cover the details of our materials  
15 research, which I think this committee is mostly  
16 interested in.

17 The objectives of Light Water Reactor  
18 Sustainability Program is to develop technologies, and  
19 other solutions that can improve the reliability,  
20 sustain the safety, and extend the life of current  
21 reactors. So we're about supporting the long term  
22 operation of the existing fleet where it's centered  
23 around license renewal.

24 But the long term operation, which really

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1 comes down to economic issues, as was mentioned earlier  
2 today. So the program goals, develop -- And I think  
3 as Sherry outlined very well, you know, we're focused  
4 on the scientific basis to understand, predict and  
5 measure the changes in materials.

6 And EPRI focuses more on their applied  
7 research. So we're more the basic research. And so  
8 we're going to apply this knowledge to develop and  
9 demonstrate methods and technologies that can support  
10 the long term operation of the existing fleet. We're  
11 also looking at new technologies to address and enhance  
12 plant performance, economics and safety.

13 So again, we're not all about license  
14 renewal, or a licensing process, but the long term  
15 economic viability of these plants. As you can see,  
16 we have a program plan, a detailed program plan. We  
17 also have a joint research plan with EPRI. These plans  
18 are available on our website.

19 And actually, each of our technology areas,  
20 which I'll be discussing, has their own detailed  
21 program plans. And these are also available, publicly  
22 available on our website, if you need some sleeping  
23 material. This is just a very brief outline of how  
24 we're organized.

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1           The main points I want to make is, we have  
2           the three technical research areas, which I'll  
3           highlight very briefly. We do have an industry  
4           advisory committee, that's given us good advice on  
5           making sure we're headed in the right direction. And  
6           as was mentioned, we're very closely integrated with  
7           EPRI's long term operations program.

8           And we coordinate very closely with NRC's  
9           Subsequent License Renewal program. And we also try  
10          to coordinate internationally as well, to make sure we  
11          have, you know, the big picture on where the research  
12          should be going. We are coordinated through our  
13          national lab system by having a technical integration  
14          office.

15          And Kathy McCarthy is here. She's the head  
16          of our technical integrating office that's out at Idaho  
17          National Lab. The materials research is done through  
18          our Oak Ridge National Laboratory. And that is  
19          actually the largest. More than 50 percent of our  
20          program is really in the materials research area.

21          The two other areas are on advanced  
22          instrumentation and controls, and risk informed safety  
23          margin characterization, are led from, out of Idaho  
24          National Laboratory. So first I'm going to cover the

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1 two areas that I think you're probably not, or as  
2 interested in. And then we'll cover the materials  
3 research, and I'll turn it over to Tom.

4 The first one is the instrumentation  
5 information and controls. And this is looking at the  
6 long term aging of our INC systems. And we see that,  
7 you know, especially when you look at going from 60 to  
8 80 years, these plants need to modernize to stay viable,  
9 economically viable.

10 And just the systems, the analog systems are  
11 not going to be able to be maintained. And we're  
12 talking about 30, 40 years from today. So we're  
13 working with industry, primarily through pilot plant  
14 projects at plants, to demonstrate how you would move  
15 instrumentation and control systems.

16 And it's not all about the control room.  
17 We're talking about all the control systems in a plant.  
18 Moving them from the current mostly analog based  
19 technology, to digital systems, the current modern  
20 technology.

21 We think there are a lot of improvements,  
22 both safety improvements and economic improvements  
23 that can be realized at these plants. And so we've made  
24 some good progress in this area.

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1           CHAIRMAN SKILLMAN: Before you change that  
2           slide, Richard, let me speak for myself. I see change  
3           in the INC systems as critical to this discussion.  
4           While EPRI just showed us eight programs that require  
5           more research, maybe in a different vein, changing from  
6           analog to digital, and making sure that the new digital  
7           meets new standards, as we are saying for the new  
8           designed, will be a critical part of this.

9           Because the analog systems won't make it.  
10          They're dying. The analog systems don't have parts.  
11          And so, I think around this table there will others who  
12          will echo my comment that, we do see the INC systems  
13          as a very critical piece of what we are talking about.  
14          So I don't want that to be lost in your comments. We  
15          get it. We understand how important it is.

16          MR. REISTER: All right. So we're working  
17          with industry again to try and find ways to move the  
18          ball forward in incremental ways. It's a big problem  
19          to take on all at once. And so we think the right way  
20          to do it is to find areas where we can move forward.  
21          Find some success, and get some momentum behind  
22          modernizing these plants.

23          CHAIRMAN SKILLMAN: Oh, we're seeing  
24          digital upgrades. We know it's occurring. We know

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1 the bases for these upgrades. So it's not a stretch  
2 to see that that will be something that is important  
3 for the future. John.

4 MEMBER STETKAR: Richard, in this area  
5 though, you mentioned that you're looking at this out  
6 in real plants. Those are all distributed, focused  
7 digital control? It's like a digital feedwater  
8 control? Or a digital, I don't care, turbine control?  
9 Or a digital, help me out.

10 MR. REISTER: Well, we have a whole suite of  
11 --

12 MEMBER STETKAR: I guess my question is,  
13 where are you looking at the fully integrated  
14 protection control systems? Or are you?

15 MR. REISTER: We are looking at that. And  
16 we have, we actually built a simulator in Idaho that  
17 can replicate on glass panels an analog control room.  
18 And then it can also start implementing digital  
19 controls in combination with analog.

20 Because we think, for the most part, it will  
21 probably end up being a hybrid control system, where  
22 you have some digital and some analog. At least  
23 talking to the utilities, we don't see a very high  
24 likelihood that they will do a wholesale replacement

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1 of their control room, for example.

2 So there will be some mix, at least for some  
3 period of time, with analog and digital systems. And  
4 so you need to be able to understand how you can do that  
5 hybrid, I'll call it, control room technology. And so  
6 this simulation environment enables you to look at  
7 those types of changes.

8 So we are looking at the future vision for  
9 what a modernized plant would look like. Because you  
10 don't want to, you want to move with that vision in mind  
11 as you modernize the plant.

12 But we don't really see right now a very high  
13 likelihood that they would rip out the entire control  
14 room, basically replace it with what you would see at  
15 an AP 1000 now, which is basically computer screens,  
16 right? We don't really see that happening at the older  
17 plants. I could be proven wrong. But we don't see it  
18 right now. That would be part of what --

19 MEMBER STETKAR: Have you looked at what's  
20 been done internationally?

21 MR. REISTER: I understand that.

22 MEMBER STETKAR: Okay.

23 MR. REISTER: But it took, you know, a multi  
24 month outage to accomplish that.

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1                   MEMBER STETKAR:       But somehow people  
2 justified the cost of doing it.

3                   MR. REISTER:       In a plant that was  
4 essentially owned by the Government, or a monopoly  
5 electrical system. But anyway --

6                   CHAIRMAN SKILLMAN: Let's proceed.

7                   MR. REISTER: Another area is the, we call  
8 the risk informed safety margin characterization. And  
9 this is looking at advanced methods to understand this  
10 safety margin in a plant. So as the plants age, as  
11 changes are made, this is a methodology to understand  
12 those, the safety margin.

13                   And the methodology is really looking at a  
14 simulation based analysis tool, where you have a high  
15 fidelity plant simulation model. And then you run a  
16 scenario through that model, that simulation model.  
17 But what happens during that simulation is driven by  
18 probability. So you run that model many times, maybe  
19 thousands of times through that simulation model.

20                   And you can get a probability distribution  
21 for the outcome of that scenario that you're looking  
22 at. And then you can understand, not just in a point  
23 way, you know, whether you were safe or not for a  
24 particular scenario.

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1 But how close are you to your safety limits?  
2 And if you made changes, if you had different  
3 reliability for equipment, of if the plant ages, you  
4 can understand how those safety margins, that  
5 probability distribution is changing with the  
6 different scenarios that you might be looking at.

7 This methodology has been well understood.  
8 But the problem is, they didn't have enough modern tools  
9 to make it practical to do this type of an analysis.  
10 And so we're developing the tools to make this  
11 methodology more viable.

12 RELAP-7 is a modern version of RELAP-5.  
13 It's not because we thought RELAP-5 couldn't do its job  
14 for what it's focused on. But RELAP-7 can do a better  
15 job for a much wider range of scenarios, and much  
16 easier. It's a modern tool that can be changed much  
17 more easily, and maintained for this type of analysis.

18 RAVEN is the simulation controller. It's  
19 what drives the scenario. It's what controls the,  
20 allows the operator to define the parameters for the  
21 scenario they're looking at. It also does a lot of the  
22 probabilistic type analysis.

23 And then we're also developing an aging  
24 simulation, which we call Grizzly. But it's a

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1 component aging model. And so this touches on a lot  
2 of the things, a lot of the issues that were raised this  
3 morning, related to the risk analysis. But it's a tool  
4 that can move us, we believe, in the right direction,  
5 in terms of modern capability.

6 And there are other areas that nuclear energy  
7 is working on. Not part of my program, but in the  
8 modern safety analysis tools like Castle, for looking  
9 at the reactor core and very high fidelity through our  
10 NEMS program, Nuclear Energy Modern Simulation  
11 program.

12 Looking at some other advanced modeling  
13 tools. So there's a lot of work in the modeling area.  
14 And we're hoping to bring it to bear on this issue of  
15 long term operations.

16 MEMBER BLEY: Is this going on at Bonneville  
17 in particular or is it spread out?

18 MR. REISTER: Well, it's led by Idaho  
19 National Laboratory. But a lot of other labs are  
20 involved in the work. So with that, I'll move toward  
21 materials research. And again, this is the largest  
22 area.

23 And I think as you all are aware, you know,  
24 as these plants age there's additional time at high

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1       temperatures, stress, coolant chemistry, environments  
2       and neutrons, all leading to materials that are  
3       susceptible, that have a higher susceptibility and  
4       severity of known forms of degradation. And in  
5       addition, there could be new forms of degradation that  
6       we haven't seen yet.

7               So we're trying to develop the scientific  
8       basis for understanding and predicting these long term  
9       degradation behaviors for materials unique to nuclear  
10      power plants.

11             So we've talked about concrete. We're  
12      looking at concrete in the unique nuclear environment.  
13      So there's a lot of data outside of the nuclear area.  
14      And saying we're using these data and methods to assess  
15      the performance of these systems to support the safe  
16      operation of the plant.

17             When we look at our particular materials  
18      degradation area, we're looking at it in various  
19      dimensions. One, the first we look at is the  
20      measurements of degradation. So it's important to  
21      have high quality data. We can collect a lot of data.

22             In particular if you collect data, I think  
23      it was mentioned this morning, collecting materials  
24      from different plants. If you don't really understand

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1 the environment that the material was in, the history  
2 of that material, the data you get can probably not be  
3 very valuable. So it's important to get high quality  
4 data to really understand what's occurring to the  
5 materials degradation.

6 And so with this, and high quality data can  
7 be valuable, you know, by itself. And we're trying to  
8 use this data to develop mechanisms of degradation. So  
9 we're really trying to understand the fundamental modes  
10 of degradation that are occurring.

11 So again, this gets back to the basic science  
12 area. And so, if we can better understand the methods,  
13 mechanisms of the degradation, then we can develop  
14 models that can model that degradation, particularly  
15 if you're trying to look in the future.

16 So you mentioned high fluence affects. If  
17 you really understand the degradation of the material,  
18 the mechanisms of the degradation, and you can model  
19 it, then you can predict how that material would behave  
20 at higher fluences.

21 And then, of course, we have to monitor that  
22 to validate those models at the higher fluence, both  
23 with models, model materials where we can test in a lab,  
24 representative materials that are tested in a lab

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1 environment. But also collecting samples from  
2 operating plants that we can again validate that our  
3 models are accurately predicting how the material's  
4 really behaving in a real world environment.

5 And then finally, we have mitigation  
6 strategies. We're trying to understand how we can  
7 apply, or correct. Either prevent the degradation in  
8 the first place, repair, or replace components. So  
9 this is my last slide. But it's really just a summary  
10 of the areas that we're focusing on in terms of  
11 materials.

12 Reactor metals is a typical area that we  
13 looked at. Mechanisms of irradiated assistance,  
14 stress growth in cracking, the high fluence effects on  
15 reactor pressure vessel steels, the thermal shock  
16 issue. And crack initiation of nickel based alloys,  
17 which is really for internals.

18 And we have, kind of the new areas are  
19 concrete and cables, in terms of the focus areas for  
20 Subsequent License Renewal. And I think Sherry did a  
21 good job of discussing how we're closely coordinated  
22 with industry in joint research plans to address both  
23 concrete and cable aging.

24 And I would also say that we try to work very

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1       closely with the Nuclear Regulatory Commission to  
2       include them in our research, so that they can at least  
3       -- Maybe they're not doing the research themselves, but  
4       they're understanding what we're doing and how we're  
5       collecting the data, so that they understand and can  
6       provide input if they feel that something needs to be  
7       done in terms of our research priorities and  
8       directions.

9               And then finally, as I mentioned, there are  
10       mitigation repair and replacement technologies. Some  
11       particular areas we're working on is welding repair  
12       techniques, in particular welding repair for highly  
13       irradiated materials. So for example, if you wanted  
14       to repair core internals, how you could do that  
15       successfully.

16              We've talked about post irradiation  
17       annealing, like reactor pressure vessel annealing.  
18       But we're not doing a lot of work in that area yet, until  
19       it becomes more of a likelihood that someone would  
20       actually move in that direction. Or that they would  
21       need to, and consider doing that.

22              And we're also looking at advanced  
23       replacement alloys. If you did have to replace a  
24       component, you might be able to replace it with

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1 something better than what we currently have today.

2 And with that, unless you have any questions  
3 for me, I'm going to turn it over to my expert, Tom,  
4 from Oak Ridge, who's going to cover the materials  
5 research in more detail.

6 CHAIRMAN SKILLMAN: Can we just pause?  
7 Colleagues, any questions for Richard. Tom, please  
8 proceed.

9 MR. ROSSEEL: Okay. I have way too many  
10 slides. So I'm going to try and go through these at  
11 a reasonably good clip. And, like I said, if the  
12 Chairman would give me a five minute warning, it would  
13 help me.

14 CHAIRMAN SKILLMAN: I will do that. Thank  
15 you, Tom.

16 MR. ROSSEEL: I'm speaking on behalf of  
17 Jeremy Busby, who is the pathway lead. Jeremy is in  
18 the Czech Republic. He's in Prague. He's attending  
19 a meeting on environmentally assisted corrosion.  
20 That's a interaction between specialists that share  
21 information pre-publication. I believe the NRC is  
22 also a participant in that as well.

23 So let me give you a quick outline of my  
24 presentation. I'm going to talk a little bit about the

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1 pathway. And I've got some slides that Rich has  
2 already shown you. So I'll just skip over those, then  
3 talk about the key activities within the materials  
4 aging and degradation pathway.

5 A little bit about partnerships, which is an  
6 important part of our pathway. And then some examples  
7 of research. This is not going to be a comprehensive  
8 overview. I cannot cover everything in depth, because  
9 it would take hours. So I'm going to talk a little bit  
10 about concrete, cables, metals, weld repair, and  
11 integrated research.

12 Basically Zion, because that's something  
13 that I'm involved with, harvesting materials. So this  
14 is a slide that Rich has already shown you. I think  
15 the only thing that I want to point out is, of course,  
16 at 60 to 80 years the severity of some degradation  
17 should get worse.

18 But we also expect to -- I lost my pointer  
19 someplace. There it is. New mechanisms of  
20 degradation, sometimes called the unknown unknowns.  
21 And what that of course leads us to is to perform a gap  
22 analysis. And that gap analysis is what Mirela talked  
23 about earlier today, which is the EMDA process.

24 And, of course, it's based on the PMDA, which

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1 was, I think work was done in 2003 through 2005. I  
2 guess the NUREG report 6923 was published in 2007. And  
3 the idea behind that is that you're asking panelists  
4 to basically evaluate the susceptibility, as they see  
5 it, of the likelihood of degradation, versus the  
6 knowledge.

7 And then there's actually a third dimension,  
8 which is their confidence in their assessment. And in  
9 terms of concrete they actually came up with a fourth  
10 dimension, which had to do with how important that  
11 particular affect was, according to their assessment.

12 So again, I'm not going to spend a lot of time  
13 talking about this, other than the fact that, of course,  
14 pressure vessels, concrete and cables are new. The  
15 core internals and primary piping was covered under  
16 6923 for 60 years. The core internals and primary  
17 piping for 60 to 80 years is what's covered in the EMDA  
18 report, Volume 1 or 2, whatever it might be.

19 And this is just a slide to point out  
20 actually, I think we counted five volumes, because it  
21 included an overview. And again, I'm not to spend any  
22 time talking about this, because I think you've heard  
23 enough earlier today. This is kind of a picture of all  
24 the things that we're involved with.

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1 I think we have 20 separate tasks within the  
2 materials aging and degradation pathway. We're  
3 involved with concrete degradation and NDE of concrete.  
4 High fluence affects on reactor pressure vessels, as  
5 well as NDE of the reactor pressure vessels, analysis  
6 of cable degradation, as well as NDE of cables.

7 The NDE tasks are all fairly new. So we  
8 don't have a lot of new results. We're in the process  
9 of developing those areas of interest. Mechanisms of  
10 irradiated assisted stress corrosion cracking, crack  
11 initiation. I think I have one slide on that for nickel  
12 based alloys.

13 Swelling of core internals, high fluence  
14 based transformations. I believe I have a slide on  
15 that. Environmental fatigue, I don't think I have  
16 anything today on that. CASS, stainless steel aging,  
17 nothing on that today.

18 High fluence irradiated assisted stress  
19 corrosion cracking, surrogate materials and  
20 attenuation, those are issues dealing with mitigation,  
21 as well as what happens when you run out of materials  
22 that you had in your surveillance capsules originally.  
23 Can you find other materials that you can either put  
24 back in? And I think that's been addressed a little

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1 bit by Sherry. And I think Mirela might have mentioned  
2 something as well.

3 We switched to green color to show  
4 mitigations to repair welding, thermal annealing. And  
5 it was pointed out the Russians have done this. And  
6 this is something that Oak Ridge National Laboratory  
7 was involved with, through the heavy section steel  
8 irradiation program, which Ted Hackett is very familiar  
9 with.

10 Back in the '90s we talked about it, but  
11 funding became short. And we have some preliminary  
12 results. But I'm not going to talk about that today.  
13 And I think as Rich mentioned, advanced replacement  
14 alloys. And again, we have about 20 tasks within the  
15 program, within the materials pathway.

16 I don't have time to talk about those all  
17 today. I'm only going to just show you this slide one  
18 more time. You've seen this with Rich. I'm not going  
19 to go through all the details. But when you look at  
20 this again sometime in your leisure you'll see, this  
21 is the model that Jeremy has instilled into each of our  
22 tasks.

23 So we look at degradation, excuse me,  
24 collecting data, mechanisms, modeling, monitoring and

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1 mitigation strategies. That's the thought process  
2 that we're working on on all of our tasks. So let me  
3 just skip through that.

4 This is a chart of the partnerships that we  
5 have. As Rich pointed out, the program is, the TIO  
6 office is at Idaho National Laboratory. We put the DoE  
7 National Laboratories at the center of this. But we  
8 work closely with the nuclear industry. We have a MOU  
9 with EPRI. We have a joint research R&D plan with EPRI.

10 We're involved with industry pilot projects.  
11 We work with a number of universities, Michigan,  
12 Missouri, MIT, Santa Barbara. We interact with some  
13 of the DoE user facilities HFIR, ATR, Castle, the  
14 Consortium on Advanced Simulation of Light Water  
15 Reactors.

16 We have an MOU with the U.S. Nuclear  
17 Regulatory Commission. We have partnerships with  
18 Halden Reactor Project, as well as Materials Aging  
19 Institute. Work is being done not only at Idaho and  
20 Oak Ridge, but Pacific Northwest, Sandia and Argonne.  
21 I think I've got them all.

22 CHAIRMAN SKILLMAN: Brookhaven.

23 MR. ROSSEEL: Brookhaven's not on here, and  
24 it should be. Old slide. All right. So I'm going to

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1 transition now to some of the work we're doing, just  
2 some of the tasks we're involved with. And start out  
3 with concrete and civil structures.

4 This was work actually, I think, that started  
5 with the NRC. This is the nuclear concrete materials  
6 database. It's been completed. And it's been  
7 populated for aging, elevated temperature, irradiation  
8 and migration of hostile species. I won't spend much  
9 time talking about that. That report is done.

10 I think there's the ORNL/TM-2011/296. And  
11 then we'll talk a little bit more about concrete and  
12 irradiated concrete. And as I was telling Joy, I  
13 actually yanked about four or five of my slides, because  
14 I thought way too much detail. But based on the  
15 questions earlier, maybe that was a mistake.

16 But I'm going to talk a little bit about how  
17 we developed the road map for this multi path strategy  
18 for addressing irradiated concrete issues. And then  
19 talk a little bit about something that I just  
20 participated in. And this was the organization of an  
21 international irradiated concrete information  
22 exchange meeting.

23 This is similar to what Jeremy is attending  
24 on the environmentally assisted corrosion. It's very

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1 similar to the IGRDM, which is their international  
2 group on irradiation damage mechanisms. The idea is  
3 to share data pre-publication, so that the researchers  
4 in the field can advance it more rapidly.

5 And as you can understand, with the issues  
6 of trying to get to Subsequent License Renewal, it  
7 certainly would be more helpful, since irradiation of  
8 concrete or reactor pressure vessel material takes  
9 time. So you need to move the field as quickly as  
10 possible. So we put this together.

11 We've gone through preliminary stages. And  
12 we now have a new group called the International  
13 Committee on Irradiated Concrete. And it's modeled  
14 after the IGRDM model. And that was last month in  
15 Barcelona that we did that.

16 This is the Hilsdorf curve. And let me just  
17 explain this in a little more detail than we've talked  
18 about before. A lot of this work was probably done,  
19 maybe even in the '50s, '60s and '70s. The specimens  
20 were not the typical concrete cores that you'd like to  
21 look at. They were cubed specimens.

22 Usually with concrete cores you want the  
23 diameter to be twice the size of the aggregate.  
24 Typically the length of the core to be twice the size

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1 of the diameter. So there really weren't ideal  
2 concrete core specimens to be looking at.

3 The temperatures typically were done in a  
4 reactor that should be at 65 degrees C, not to exceed  
5 maybe 93 degrees C. In these materials it could be as  
6 high at 200 degrees. Some of them were done in water.  
7 A lot of strange things were going on. But basically,  
8 from these critical levels and codes, were placed into  
9 codes.

10 And based on this experimental data  
11 collected by Professor Hilsdorf, Kropp and Kock, excuse  
12 me, back in 1978. And you can see they came up with  
13 a cutoff energy, a reference energy of one times ten  
14 to the 20th.

15 And generally it was thought that they were  
16 talking about energies greater than .1 MeV. And then  
17 for gamma rays, referenced those at two times ten to  
18 the 10th rads, or two times ten to the 8th rays.

19 MEMBER REMPE: Before you leave this slide  
20 --

21 MR. ROSSEEL: Sure.

22 MEMBER REMPE: Could you go back? Why does  
23 it say liquid glass? That's something that wasn't on  
24 the slide that we saw earlier.

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1           MR. ROSSEEL: Yes. That's actually what it  
2 turns out that material was. It was, just to show you  
3 that there was a lot of strange things that were in  
4 there, and that they were radiated. But I will show  
5 you one in which you will see that there actually is  
6 a knee to this curve.

7           And I will show you some, a little bit  
8 additional data. But this is what most people kind of  
9 look at and say, okay this is -- There are a lot of  
10 strange things here. It's a little unusual. And you  
11 can see that the neutron fluence cutoff energy, not well  
12 known.

13           And certainly one of the things we're  
14 interested in is trying to develop sort of a DPA model,  
15 rather than saying, well, fast neutrons. But what does  
16 a fast neutron mean? Is it 1 MeV? Is it .1 MeV? Is  
17 it anything greater than thermal?

18           How much does it depend upon the spectrum?  
19 What is the composition of the concrete? Concrete, we  
20 like to say, is one of the most complex materials  
21 around. Everybody, I think it's been around since the  
22 Roman times. But it's extremely complex. It's a  
23 complex composite.

24           What was the irradiation temperature? What

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1 was the gamma ray dose? Were some of the gamma rays  
2 shielded? Or what was the temperature? Is there any  
3 model to understand how radiation affects concrete?  
4 So what we think is important is, certainly more data  
5 is needed under control conditions.

6 A better understanding, and control the  
7 variables. And a robust understanding of the affects  
8 of irradiation. And we don't feel that that is there  
9 right now. But something we're working on.

10 Back in the fall of 2013, with EPRI we  
11 developed a road map. And I won't go through it in  
12 great detail. But there is a, the X axis is the  
13 timeline. We have knowledge of degradation  
14 mechanisms, assessing and managing the degradation  
15 rate. And safety margin assessments and structural  
16 significance.

17 This is, the gray color is prior or existing  
18 knowledge. In the orange, this basically relates to  
19 work that's been done by the Japanese. They've got  
20 quite a lead on us. It's the Japanese Aging Management  
21 Program for Structures and Systems.

22 They've been working on this for a number of  
23 years, and are currently, they've completed some gamma  
24 radiation studies. They're doing some neutron studies

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1 at Halden. In addition, Fortem is also doing some  
2 irradiation studies at Halden as well.

3 We're planning some irradiation studies.  
4 We'll be doing some of that with EPRI. That's why this  
5 color I was trying to indicate is, and I think I'm  
6 running out of time here very quickly. Let me go on  
7 to --

8 Having a road map is one thing. But trying  
9 to develop a strategy that actually works is something  
10 that's more important. So one of the things we've been  
11 doing is trying to characterize the radiation fields  
12 in concrete structures. Determining the bounding  
13 values. That's something that Sherry has shown you.

14 We've been working with EPRI on that. We'd  
15 like to obtain more data that involves both irradiating  
16 prototypical concrete to levels equal to or greater  
17 than the expected extended service. There are some  
18 issues with accelerated irradiation in terms of whether  
19 there are any rate affects.

20 We'd like to harvest and test irradiated  
21 concrete from decommissioned plants, both in U.S. and  
22 in international. And I mentioned Barceback and  
23 Zorita, as well Zion in the United States. Trying to  
24 develop a more robust fundamental understanding of the

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1 affects of irradiation on concrete.

2 And then establish a collaborative research  
3 with international partners. And that's one of the  
4 things I mentioned with the meeting that we had in  
5 Barcelona. So this is a valuable curve to look at.

6 This is the neutron flux profile. I think  
7 this was for the H.B. Robinson 2. And the black curve  
8 is the thermal neutrons. The orange or red is the total  
9 neutron flux. The light blue, or the blue, is greater  
10 than .1 MeV. And the green is greater than 1 MeV.

11 And you can see as you go through the  
12 concrete, the attenuation is different for different  
13 energies. You can also probably look at this in terms  
14 of the scale. And you can see in the first ten  
15 centimeters, the attenuation is pretty sharp.

16 So if there is irradiation damage in  
17 concrete, it's going to happen in the first four inches  
18 of the concrete. Whether that has any structural  
19 significance is debatable. But that's pretty much  
20 what it looks like at this particular stage, when you're  
21 talking about potentially 80 years of operation.

22 MEMBER RICCARDELLA: Is that analysis or  
23 data?

24 MR. ROSSEEL: This is analysis based on

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1 data. This is another way to look at the curve, the  
2 information that Sherry showed you for -- The red is  
3 neutron fluence for the entire spectrum. Blue for  
4 greater than .1 MeV, and green greater than 1 MeV.

5 And you can see that the 1 MeV neutron's  
6 really not likely that you'll see much of an affect to  
7 get to ten to the 19th or higher. And this is the curve,  
8 Joy, that I wanted to show you, you mentioned earlier.  
9 This is a more comprehensive look at some of the  
10 literature data.

11 And you can see that there is definitely a  
12 knee. But you can see, this is where the two loop plant  
13 at 40 years, two loop at 60 and two loop at 80. So  
14 there's just the beginning of an effect here. And if  
15 you look at the colors, it turns out that the type of  
16 aggregate that you look at is very important in this  
17 process.

18 And as it turns out, quartz is a very  
19 important player in this. The more quartz you have,  
20 the more likely you're going to see some sort of affect.  
21 So those plants that have quartz were more likely to  
22 see degradation.

23 And again, even though they see some  
24 degradation, it does not necessarily mean that there's

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1 going to be any critical affect on the operation of the  
2 plant. It just means that they're, the concrete can  
3 suffer some degradation, at least in the four inches  
4 or so of the, for example, the biologic shield. All  
5 right. So if you, I don't know if you need to ask me  
6 any questions about irradiated concrete now, or if I  
7 should go on?

8 CHAIRMAN SKILLMAN: Colleagues, any  
9 questions? It almost seems counterintuitive, with the  
10 higher percentages of quartz, the reduction that you  
11 see in the compressive strength, when vitrification  
12 seemed to be the path forward for waste.

13 And maybe compressive strength doesn't have  
14 any play with vitrification. But it seems that, you  
15 know, for a while there we were saying vitrification  
16 is a way to take care of waste.

17 MR. ROSSEEL: Right.

18 CHAIRMAN SKILLMAN: And quartz is a very  
19 important piece of glass.

20 MR. ROSSEEL: Well, when quartz is  
21 irradiated and it becomes amorphized it has a tendency  
22 to swell. And we believe that radiation induced  
23 volumetric expansion of the quartz is the thing that  
24 will cause the cracking and loss of compressive

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1 strength in the concrete.

2 CHAIRMAN SKILLMAN: Thank you.

3 MR. ROSSEEL: Another we're looking at is  
4 NDE. We're looking at it for concrete, cables, fatigue  
5 damage, reactor pressure vessels. And this is just a  
6 picture of some, there it is. This is a 3D cut of some  
7 rebar and post tensioning cables. This is at three to,  
8 if I can read that, three to six inches. And this is  
9 from six to eight inches.

10 You can see when you look at it in different  
11 slices, you see different things on the, using this  
12 ground penetrating radar. Recently with ORNL, with  
13 the University of Minnesota, and engineering and  
14 software consultants, they tested a variety of  
15 ultrasonic detection, NDE techniques.

16 And specimens included rebars, flaws that  
17 were put into the specimens. And what we found was that  
18 a lot of these different techniques need to be  
19 evaluated. Some have strengths, some have weaknesses.  
20 But perhaps advanced signal processing techniques may  
21 be the most important thing.

22 And you can that the original ultrasonic data  
23 is shown on the right over here. And then on the left  
24 you can see a little bit better as to where the voids

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1 are, and the rebars. So that's with post processing.  
2 So as the technology improves with NDE and ultrasonic  
3 detection methods, I think we'll see a lot better data,  
4 and a lot more ways of monitoring concrete.

5 MEMBER REMPE: So I'm a little slow on the  
6 questions here.

7 MR. ROSSEEL: I'm sorry.

8 MEMBER REMPE: But if we go back to 17. The  
9 ones that are the diamonds, that are -- Is that river  
10 rock, is what that is?

11 MR. ROSSEEL: Yes.

12 MEMBER REMPE: There on the far right?

13 MR. ROSSEEL: Yes, yes.

14 MEMBER REMPE: And it's showing -- What  
15 temperature was it at? I mean, the quartz thing was  
16 at 500 C on that other plot, right? Was this at a  
17 different temperature?

18 MR. ROSSEEL: I thought that was at 200 C.  
19 But I guess I'd have to take a look at it.

20 MEMBER REMPE: Your thing I think said 500  
21 on that plot.

22 MR. ROSSEEL: It might, yes. Okay.

23 MEMBER REMPE: But, I mean, there is a  
24 temperature affect too. And is that shown on some of

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1 your plots somewhere too?

2 MR. ROSSEEL: I don't think this was  
3 corrected for temperature.

4 MEMBER REMPE: Would that make it stronger,  
5 if -- Well maybe river rock is at low temperature,  
6 right? So, I mean, I guess, it seems like there's a  
7 lot of affects. And perhaps we don't know all of --

8 MR. ROSSEEL: That's correct. That's why  
9 we want --

10 MEMBER REMPE: And it's just a lot of  
11 uncertainty.

12 MR. ROSSEEL: That's why we need to collect  
13 more data. We believe that it's important to irradiate  
14 prototypical concrete. And one of the things I had  
15 some slides on is a little bit about modeling. And we  
16 do have a model on that, a preliminary model, as well.  
17 But again, we need more data to be able to make sure  
18 that the model really works.

19 MEMBER REMPE: Of course, again, it's two  
20 loops in 80 years are the ones that, I guess, are  
21 thinking may have the worse case scenario.

22 MR. ROSSEEL: Right.

23 MEMBER REMPE: But where would like a four  
24 loop, how far down would it be? I've forgotten now from

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1 the -- Is it going to be ten to the 18th instead, or  
2 something?

3 MR. ROSSEEL: Let's see.

4 MEMBER REMPE: There's a three loop.

5 MR. ROSSEEL: There's a three loop. I don't  
6 think I have a -- Three loop is it.

7 MEMBER REMPE: So it still can get up there?

8 MR. ROSSEEL: Yes. That's the integrated.  
9 But we don't really know what the --

10 MEMBER REMPE: Okay.

11 MR. ROSSEEL: -- how to evaluate that at this  
12 point. Cable insulation. All right. This work is  
13 being done at Sandia National Laboratory. This is  
14 gamma irradiation at the LICA Facility, the low  
15 intensity cobalt array.

16 And there's some initial data. I think they  
17 had some problems with their facility. But it's back  
18 in operation. And I will show you a little bit about  
19 accelerated aging of real cables. This is cables that  
20 were taken from the high flex isotope reactor.

21 And there was some tensile data at varying  
22 times and temperatures that were taken. And I can see  
23 that it would be a whole lot easier to look at this if  
24 we had drawn lines to these various plots of different

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1 temperatures.

2 But from that we were able to superimpose the  
3 data, using activation energy of 79 kilojoules per  
4 mole. And from that come up with a curve which we can  
5 plot tensile elongation versus time and hours at 90  
6 degrees C. And under those conditions we find that the  
7 cable at HFIR could last as long as about 300 years.

8 But this is just a preliminary look at doing  
9 this. We haven't applied it to any other existing  
10 cables from plants. But this is just one example of  
11 what was done with the HFIR cables.

12 We were able to get these and send these over  
13 to Sandia. And like I said, those cables were about  
14 45 years in age, and typically operated at 27 degrees  
15 C, and the relative humidity of 70 percent.

16 A little bit about reactor pressure vessels.  
17 I think this has to deal with late blooming phases. I  
18 think it was just mentioned briefly, earlier this  
19 morning. It's well known that copper rich welds have  
20 hardening issues. It causes embrittlement of the  
21 reactor pressure vessel.

22 Modern reactor pressure vessels have lower  
23 residual copper levels. However, as it turns out,  
24 irradiation made dry phase transformations, even in low

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1 copper alloys. This is the so called late blooming  
2 phases. They're typically composed of manganese,  
3 nickel, also silicon, copper materials.

4 And as it turns out, these do seem to show  
5 up in different materials earlier than perhaps  
6 previously anticipated. This is an example over here  
7 on the right. This is the, I think it comes from  
8 Ringhals Unit 4. This is low copper material. And  
9 this is from the surveillance capsules.

10 You can see that at higher lead times it looks  
11 like you see a fairly large shift in the transition  
12 temperature. And you can see it using an atom probe,  
13 that you start to see these precipitates, which are  
14 where you're going to get hardening. They're rich in  
15 nickel, manganese, copper and silicon.

16 And then I'm going to show you another one,  
17 where this is the Ringhals Unit 3, and a series of atom  
18 maps at one nanometer slices. And what the first on  
19 is, I believe that is in blue, so that's manganese rich,  
20 copper rich, silicon and nickel. And I guess, oops,  
21 I missed, excuse me, that one is phosphorous, and that's  
22 nickel.

23 And this is an example of what you're looking  
24 at using an atom probe. You can see what the atoms are.

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1 So these are not just necessarily just the typical  
2 copper rich precipitates that you see when you're  
3 thinking about looking at copper welds, copper heavy  
4 welds. But these are fairly low copper, .08 percent.  
5 High nickel, high manganese, higher than in a U.S.  
6 plant, both the nickel and the manganese.

7 But we can see that we do get a fair amount  
8 of embrittlement with these materials. And basically  
9 validating that late blooming phases can be an issue  
10 at higher fluence. Obviously it's accentuated by the  
11 fact that we're looking at high manganese and high  
12 nickel, which are not as typical in U.S. plants

13 But this is something that certainly is a  
14 concern. This is something that we did kind of merging  
15 a little bit of the RPV work with Grizzly, which Rich  
16 had mentioned from the RSMIC pathway, to calculate  
17 changes in temperature, and transition shift over time  
18 and location. Basically, taking data from 40 years,  
19 and then extrapolating it using the Grizzly aging  
20 program.

21 And this is just a model. It's not real,  
22 anything more than just an example of what can be done.  
23 This would be at 32 years of operation, 60 years and  
24 80 years, where the temperature shift is larger. And

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1 of course, this is near the core region.

2 And just showing that we're incorporating  
3 this. We'll be incorporated welds in heat affected  
4 zones, spatial variations and chemistry, and vessel  
5 cladding. This is a collaboration between Idaho, Oak  
6 Ridge and UT, okay, in Knoxville.

7 Radiation affects. Just briefly, this is  
8 just some high fluence data on some core internals.  
9 And from these we were looking at, this is some TEM,  
10 looking at coherent precipitates, incoherent  
11 precipitates and phase transformations.

12 The researchers are beginning to be able to  
13 develop models that can predict a little bit more about  
14 what the damage mechanism will be. And this is an  
15 example of some work that we're doing with Areva and  
16 EPRI. It has to do with, we're doing the post  
17 irradiation evaluation of some embrittlement of nickel  
18 based alloys.

19 I can't explain a whole lot more about it.  
20 Because there's some proprietary work with Areva that's  
21 been involved with this. But what they're trying to  
22 do is, from this data be able to develop mechanisms to  
23 explain the nickel based alloy cracking. And I'm going  
24 to skip the corrosion, because we're, I guess --

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1 CHAIRMAN SKILLMAN: You've got ten minutes,  
2 Tom.

3 MR. ROSSEEL: All right. And then on the,  
4 let's see, the corrosion material. This is something,  
5 this is a new area that we've been starting. This has  
6 to do with some work being done at PNNL on stress  
7 corrosion cracking initiation testing, where the  
8 alloys have received different surface treatments.

9 And they're able to look at 30 tensile specs,  
10 and the simultaneously, using mill-annealed alloy 600  
11 under different cold working conditions, and studying  
12 the crack nucleation that was detected. And again, the  
13 idea is, this is a new pathway. But this is an  
14 important area that needs to be addressed

15 And then, in terms of mitigation. I think  
16 Sherry mentioned this earlier. This is a joint project  
17 between the Light Water Reactor Sustainability Program  
18 and EPRI. And it involves basically using finite  
19 element analysis to assess the stress at different  
20 temperatures. And then being able to try and control  
21 both the stress and the temperature field.

22 And using advanced welding technology such  
23 as hybrid lasers, friction stir welding and other  
24 techniques. And I'll show you, I think this one shows

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1 a little bit more about what they're trying to do in  
2 terms of doing this in a hot cell. This is a first of  
3 its kind in the United States. We can use different,  
4 laser welding, arc welding and friction stir welding.

5 And again, the idea is to be able to monitor  
6 and control the temperature and stress, or excuse me,  
7 monitor the temperature and stress. And be able to  
8 control those so that you can avoid cracking of the  
9 irradiated material when you're welding it. And  
10 they're making really good progress on this.

11 But again, this is just to show you a little  
12 bit about what we're trying to do in this area. And  
13 then in integrated research. This has to do with Zion.  
14 We've been working with them since about 2011. And  
15 this is, again, in collaboration with the USNRC, EPRI  
16 and others. Trying to harvest materials that have,  
17 from the reactor as they decommission it.

18 We're interested in thru-wall reactor  
19 pressure vessel sections. We're interested in cables  
20 and concrete bore samples. With, I don't know if  
21 Sheila Ray is still in the room. But the first thing  
22 that we were able to harvest were six control rod drive  
23 mechanism cable bundles, which include the power cable,  
24 position indicator and the thermocouple.

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1           And they were harvested in the fall of 2012.  
2           And I believe that NRC has a contract with NIST. And  
3           they've begun looking at those as well. We're going  
4           to be sending our cables to Sandia for their cable work.

5           We're also, back in August we had another  
6           tour and visit to the containment area, in August of  
7           2013. We're interested in cables that I think Sheila  
8           briefly mentioned, that are both in thermal and  
9           radiation environments. High thermal environments  
10          near the steam tunnel. And then areas outside of that,  
11          the cable spreading room.

12          I think she had a picture of that, that more  
13          benign or controlled environment for comparison. And  
14          then eventually we'd like to be able to get cables from  
15          submerged environments such as tunnels between  
16          buildings. That won't happen for a considerable  
17          period of time. Because again, we're depending upon  
18          their decommissioning schedule.

19          That's their primary goal is to do that. And  
20          I think they told us they're happy to work with us. But  
21          we have to remember, they're not Zion National  
22          Laboratory, they're a decommissioning operation. And  
23          they have to get it to greenfield by 2020.

24          In terms of concrete cores, we have had, we

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1 visited Zion in December of last year. We've  
2 identified a number of sites. This is in the  
3 containment area. We'd like to obtain cores from three  
4 different elevations in the biological shield.

5 That can't be done until the reactor pressure  
6 vessel is removed. So that will be sometime in the,  
7 hopefully in the near future, within a year or so. We'd  
8 like to do it just outside the, inside the missile  
9 barrier, just below the loop area, outside the missile  
10 barrier, and then in the turbine building area, perhaps  
11 in the auxiliary building in the cable spreading room.

12 And again, similar idea in terms of looking  
13 at concrete that's been in a radiation environment and  
14 a thermal environment, a thermal environment only, and  
15 then in more benign. So we're also interested in  
16 obtaining reactor pressure vessel segments.

17 We're interested in obtaining the beltline  
18 weld from this section, as well the vertical weld. And  
19 then EPRI, CRIEPI and ORNL are interested in obtaining  
20 the cold nozzle. Because we'd like to look at the  
21 albedo effect, the reflected neutrons. There's very  
22 little information about that. And at high fluence  
23 there might be some problem with that. So we'd like  
24 to look at that.

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1           Just to give you an idea of how big this stuff  
2           is, we're talking about fairly large sections. So  
3           about a ten foot by five foot section from the --

4           CHAIRMAN SKILLMAN: Reactor vessel.

5           MR. ROSSEEL: -- reactor vessel for the  
6           nozzle. And these would be five by five feet by five  
7           feet. So we're talking about 60,000 pounds of steel  
8           hopefully being shipped to, Energy Solutions has a  
9           facility, a bonded rad warehouse in Memphis, Tennessee.

10          And we'd like to do some NDE there, and then  
11          cut them up into mechanical specimens, and test them  
12          as well. That's on the to do list. I'll skip over that  
13          and just go to the summary for the material aging and  
14          degradation pathway.

15          The program has initiated a national  
16          material research effort to help provide fundamental  
17          and mechanistic knowledge to support extended reactor  
18          decisions. And irradiated assisted stress corrosion  
19          cracking, RPV issues, concrete, cables, nickel based  
20          alloys, NDE, mitigation strategies and integrated  
21          research.

22          The research is collaborative and  
23          coordinated with partners around the world. And then  
24          going back to that slide about how we try and attack

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1 each of the tasks. It has to do with high quality data.  
2 It's the measurements to mechanistic understandings,  
3 to developing models, to monitoring, as well as  
4 mitigation. And with that, pretty close.

5 CHAIRMAN SKILLMAN: Tom, thank you very  
6 much. Let's pause for a minute. Colleagues, any  
7 questions or comments for Tom?

8 MR. ROSSEEL: Stupefied everybody.

9 CHAIRMAN SKILLMAN: Tom, that was great.

10 MR. LUBINSKI: Richard, that was great.  
11 Thank you.

12 CHAIRMAN SKILLMAN: Let me now ask John  
13 Lubinski to conclude remarks today from the staff.

14 MR. LUBINSKI: Thank you. I appreciate  
15 that, Chairman. Let me first by saying, I appreciate  
16 the time that the committee spent with us today. We  
17 appreciate the comments and questions we heard today.

18 Any time we're in front of the Board we like  
19 to be questioned about items, make sure that our  
20 thinking is sound. And it makes us think and reassess.  
21 I appreciate that.

22 Based on the discussions today, as you know,  
23 we said we have a paper in front of the Commission for  
24 consideration, as well as our technical review to pass

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1 around. I believe from what we heard today, I met with  
2 the staff, we didn't hear anything significantly that  
3 would change where our views are with the Commission.  
4 And we feel comfortable with the paper we have in front  
5 of the Commission.

6 If the Commission does approve our  
7 recommendation in moving forward with Option 4, we did  
8 hear some information today that is going to help us  
9 crystallize the details in moving forward in that area.

10 Some examples in the regulatory area are,  
11 looking at items important to safety, rather than just  
12 looking at some of the regulations, and incorporating  
13 those. Information on AMP effectiveness, from the  
14 standpoint of, what type of criteria are we talking  
15 about to look at effectiveness? Is it quantitative,  
16 qualitative? How do we assess that?

17 Also, our communication of some of the  
18 options, and the way we're getting those, both  
19 internally and externally with the public. I think it  
20 was good to get the feedback today, and the questions  
21 that are helping us to do that.

22 With respect to the AMP effectiveness, Jason  
23 Remer provided some comments on what the industry is  
24 doing in a voluntary manner. And I think again, it's

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1 something we're going to have to continue to work with  
2 the industry, you know.

3 We do have questions on the transparency of  
4 how those processes work, as well as, again, what type  
5 of criteria they're using to determine whether the AMPs  
6 are met from an effectiveness standpoint. I  
7 appreciate the discussions we had today on the  
8 technical issues.

9 I think the committee, from what you heard  
10 today, is very much a coordinated effort, us working  
11 with DP doing reviews, DOE working with EPRI, us  
12 communicating with EPRI and the industry on what  
13 research is done. And as you can see, many of the  
14 issues that we think are important, or the ones that  
15 need more research, are pretty identical between what  
16 NRC sees, DoE, as well as EPRI.

17 And we appreciate the comments and questions  
18 we heard today. Because as we said, we do plan to come  
19 back to the committee and talk about where we're going  
20 on the technical framework. And it was good to hear  
21 the comments and questions, so that we make sure, one,  
22 we address them.

23 And then Number 2 is, having engaging  
24 conversation as we come back, and have a good dialogue.

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1 There was a question, I believe, by one of the committee  
2 members, as to whether or not the revised GALL would  
3 address just Subsequent License Renewal, or would it  
4 also be used from the standpoint of those currently  
5 going forward.

6 From the plans at this point we would expect  
7 to issue a revised GALL Report that addresses  
8 Subsequent License Renewal, with the idea of that being  
9 it's beyond 60 years, or maybe changes to the program,  
10 different than what we have currently.

11 Depending on what that comes out with, there  
12 will probably be an option for those who are under a  
13 current license renewal to either address that new  
14 GALL, because it would be more comprehensive and  
15 require more details.

16 But GALL Rev. 2, along with the current ISGs  
17 out there could be an option for them as well. But  
18 again, that would be in open questions. But that's our  
19 goal at this point, to come back with a GALL that  
20 supports Subsequent License Renewal beyond 60 years.

21 Regarding our PRA discussion you heard this  
22 morning, and Joe Gitter and Jerry Dozier, I appreciate  
23 their comments this morning. I do want to echo two  
24 things that Joe said. There was a difference of

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1 opinion as we move forward, with respect to PRAs.

2 And I really appreciate the staff and the  
3 agency working with the agency, or looking to the values  
4 of the agency in those communications. And I thought  
5 that was very good. And I appreciate the  
6 non-concurrence process. As an agency I appreciate  
7 that we have that process. And I thought that was an  
8 effective way to handle the disagreements as we moved  
9 forward.

10 Again, what Joe and Jerry presented this  
11 morning are items that the staff heard in doing its  
12 exchange of information, as well as in review of the  
13 non-concurrence. And we still believe that, again, as  
14 I stated earlier, we're on what we believe is the right  
15 path as far as handling PRA issues.

16 We believe PRA is an important tool. We just  
17 don't see the linkage to the Subsequent License Renewal  
18 at this point. And we don't see a need to have that  
19 in place as a requirement to ensure safety during the  
20 Subsequent License Renewal period

21 And as I said, with NEI this afternoon,  
22 we've heard their comments before as well. So we  
23 appreciate them engaging with us during public  
24 meetings. So there was no new information that we had.

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1           We do look forward to coming back to a full  
2           committee meeting. I believe we're looking at May time  
3           frame to come back for full committee. And we'd  
4           appreciate any insights that the committee has,  
5           subcommittee has today on what you would like to hear  
6           at that full committee meeting.

7           So, in conclusion, again, I want to thank the  
8           committee for its talk today, and sponsoring an all day  
9           meeting on Subsequent License Renewal. Thank you.

10          CHAIRMAN SKILLMAN: John, thank you. On  
11          the bridge line. Is anybody there, please?

12          MS. THOMAS: Yes. Ruth Tomas is on the  
13          line. And I had a couple of questions.

14          CHAIRMAN SKILLMAN: Hello, Ruth. Go ahead.

15          MS. THOMAS: Hi. Do you anticipate that any  
16          new discoveries and developments will affect the plants  
17          that you outlined?

18          MEMBER BLEY: She's supposed to make  
19          comments.

20          CHAIRMAN SKILLMAN: We understand your  
21          question. Ad we thank you. Do you have any other  
22          comments, please?

23          MS. THOMAS: Yes. I also wanted to ask  
24          about the, I think it's March 24th, where a, yes, it

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1 was in the Federal Register. That there was a ruling  
2 proposed in relation to the cladding and fuel rods.  
3 And the resulting fragmentation of development. And  
4 I didn't hear, well maybe that's more specific than what  
5 you're getting into.

6 CHAIRMAN SKILLMAN: Yes, Ruth, we  
7 understand your comment. And we thank you.

8 MS. THOMAS: Well, what's your response.

9 CHAIRMAN SKILLMAN: We're not going to  
10 respond to your questions. We will capture them for  
11 the record.

12 MS. THOMAS: Okay. Thank you.

13 CHAIRMAN SKILLMAN: Thank you for calling  
14 in, Ruth. Are there any other participants on the  
15 bridge line, please? Hearing none, let's close the  
16 bridge line. Are there any participants in the  
17 audience that wish to make a comment, please? And I  
18 see that there are none.

19 Let me thank NEI and EPRI, and DoE and ORNL  
20 for your work. Thank you to John and to Bo for the work  
21 that you've done to bring your teams together. I  
22 believe this has been a very constructive use of our  
23 day.

24 It's an important topic, maybe one of the

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1 more important topics that we will touch in my short  
2 time on the ACRS. I really appreciate the effort that  
3 has gone into this. There's more to come. With that,  
4 I thank you. And I'm going to adjourn this meeting.  
5 Thank you.

6 MEMBER STETKAR: Did you want to get  
7 comments from the members?

8 CHAIRMAN SKILLMAN: Excuse me. Yes, I do.  
9 Excuse me. Colleagues, comments please.

10 MEMBER RICCARDELLA: I have no comments.

11 CHAIRMAN SKILLMAN: Dennis, comments  
12 please?

13 MEMBER BLEY: No. And Bill had to run to an  
14 airplane. But he said he'll get you his consultant's  
15 report very soon. I've asked all my questions along  
16 the way I think. And it's early on. So we'll see how  
17 it goes forward.

18 CHAIRMAN SKILLMAN: Harold?

19 MEMBER REMPE: Yes. I just wanted to  
20 summarize that I don't believe that design bases can  
21 or should be subject to routine validation during the  
22 tenure of the licenses implied by some of the  
23 presentations.

24 But I do believe that at least the site

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1 related external hazard design bases should be  
2 validated at the time of Subsequent License Renewal.  
3 And that is assuming that they're not already required  
4 to be so validated by the post Fukushima orders, however  
5 that finally sorts itself out.

6 But I just don't believe that during the  
7 tenure of the license we should assume that any change  
8 at all in the site hazards should be recognized as you  
9 go along. I believe in stability from that standpoint.

10 It's just that after 50 years I think it's  
11 time to look and see if there's anything accumulated  
12 that needs to be recognized. And I believe the  
13 discussions today support that. But I want to  
14 summarize it that way.

15 CHAIRMAN SKILLMAN: Thank you, Harold.  
16 John.

17 MEMBER STETKAR: I don't think I have  
18 anything more. I think I already made the points I  
19 wanted to. So, thanks.

20 CHAIRMAN SKILLMAN: Okay. Thank you.  
21 Joy.

22 MEMBER REMPE: Well, I just wanted to add my  
23 thanks to all the staff as well as DoE and EPRI, and  
24 NEI. Again, I think sometimes maybe we take for

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1 granted this non-concurrence process. But I really do  
2 appreciate the opportunity that people have to document  
3 their concerns. And I think it actually shows an  
4 interest by the staff, which I think is nice to see.  
5 So I just felt like commenting on that.

6 There was one thing that I know I heard today  
7 about, well, we might have incomplete knowledge, but  
8 we can always replace a component. And I'm not so sure  
9 that's true with concrete.

10 And so I am very interested in seeing the  
11 results come out from that effort, and learning more  
12 about it. And as we just go forward and discuss the  
13 technical issues on the effects of Subsequent License  
14 Renewal. And that's it.

15 CHAIRMAN SKILLMAN: Thank you, Joy.  
16 Charlie.

17 MR. GUNN: I asked mine going along. And I  
18 got a lot out of the presentation. So, thank you.

19 CHAIRMAN SKILLMAN: I thank you very much.  
20 This meeting is adjourned.

21 (Whereupon, the meeting in the  
22 above-entitled matter was adjourned at 5:33 p.m.)  
23  
24

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# Subsequent License Renewal

Division of License Renewal  
U.S. NRC Office of Nuclear Reactor Regulation  
Division of Engineering  
U.S. NRC Office of Nuclear Regulatory Research  
April 8, 2014



# Agenda

- Regulatory Framework
  - Overview of License Renewal
  - License Renewal Status
  - Lessons Learned
  - Subsequent License Renewal (SLR)
  - Suggested Rule Considerations
  - Non-Concurrence
- Technical Framework
  - Key Technical Issues



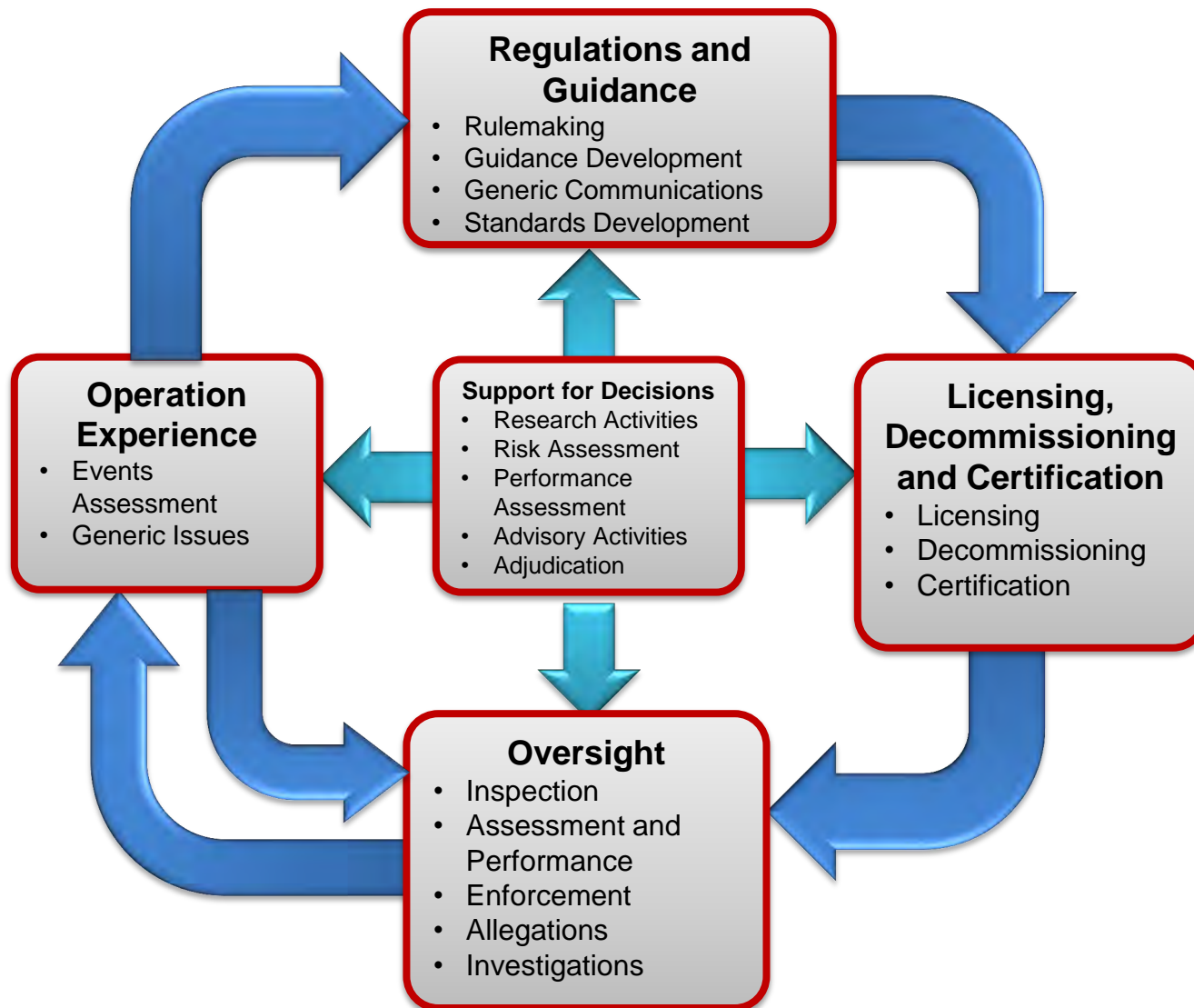
# Regulatory Framework

Division of License Renewal  
U.S. NRC Office of Nuclear Reactor Regulation  
April 8, 2014

# First 40 Years

- **Safety Review**
  - Ensures adequate protection of public health and safety and the environment through the regulatory process (e.g., rulemaking, licensing reviews, inspections, enforcement) and incident response
- **Environmental Review**
  - Comprehensive assessment to evaluate the potential environmental impacts and benefits of the plant

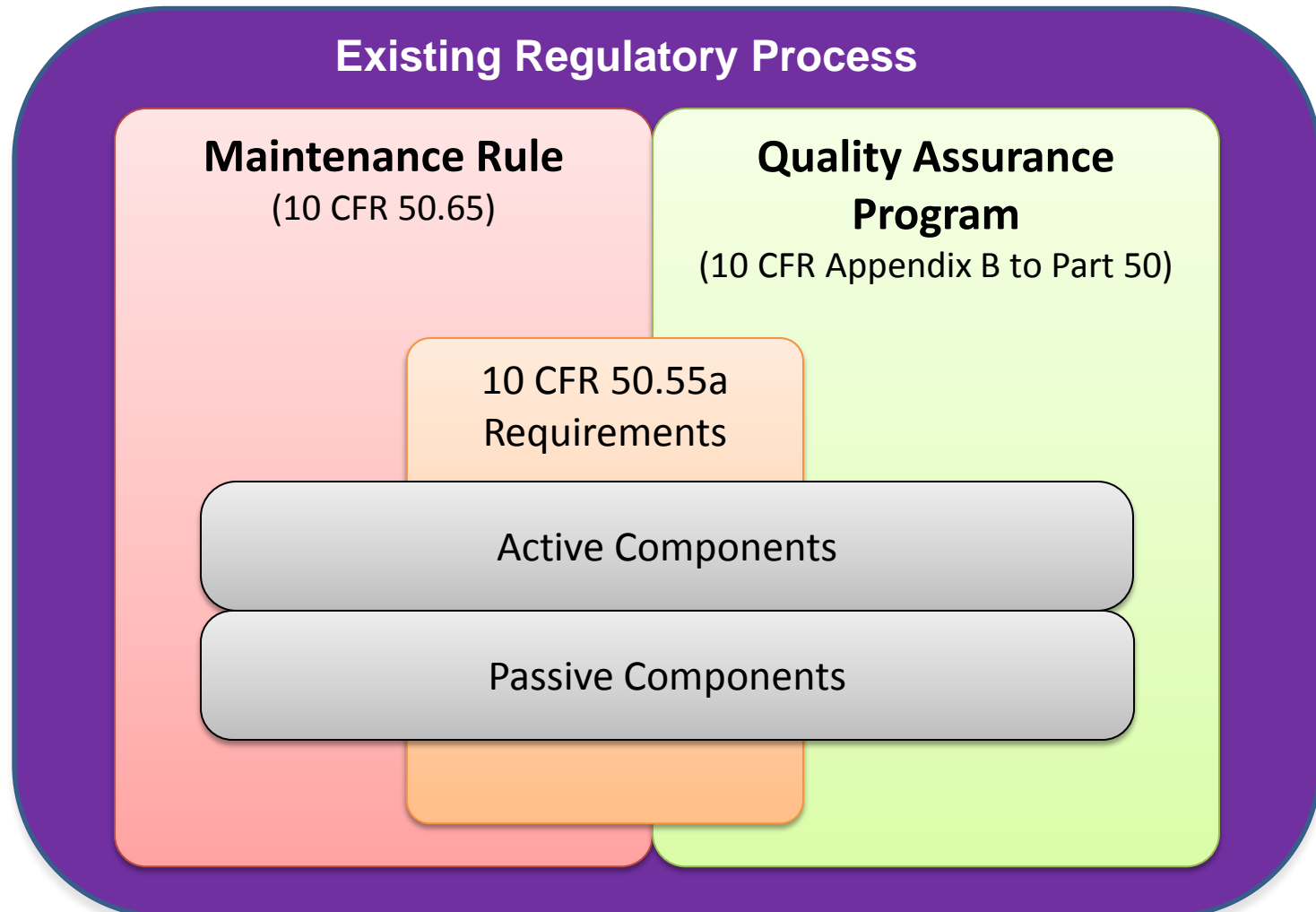
# Safety First 40 Years



# Safety First 40 Years

- Relies on the current regulatory process
- Identification and resolution of generic safety issues
- Current licensing basis (CLB) is constantly updated by changes approved by the staff, mandated by the NRC, and changes volunteered by the licensee

# Safety First 40 Years Aging Management



# First License Renewal

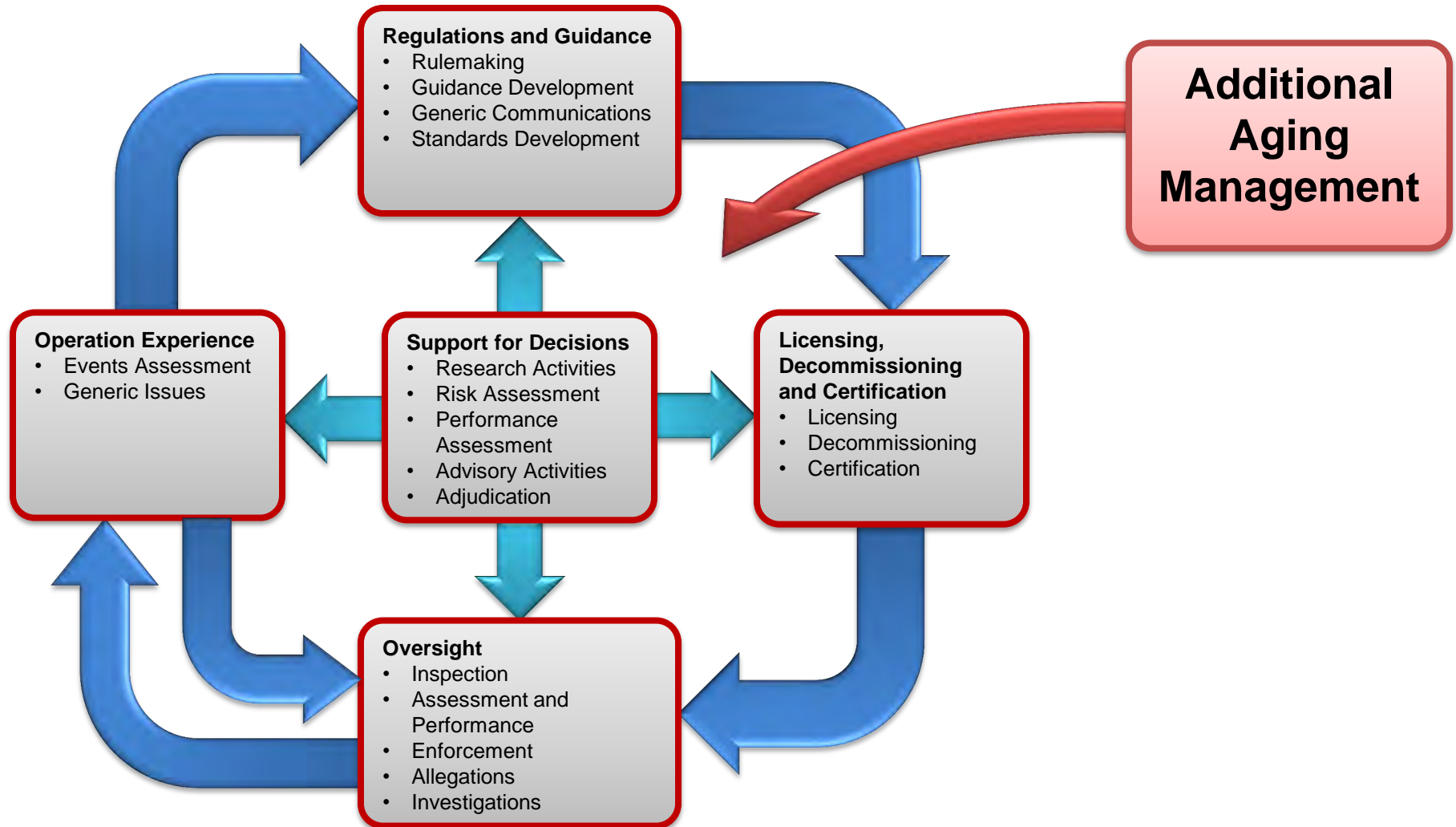
- Safety Review (10 CFR Part 54)
  - Provides reasonable assurance that actions have been or will be taken to manage aging of long lived passive components important to safety throughout the period of extended operation (PEO)
- Environmental Review (10 CFR Part 51)
  - Review of whether the environmental impacts preclude license renewal

# Principles of License Renewal Safety Reviews

- With the possible exception of the detrimental effects of aging on the functionality of certain plant systems, structures, and components, the regulatory process is adequate to ensure that the licensing bases of all currently operating plants provides and maintains an acceptable level of safety so that operation will not be inimical to public health and safety or common defense and security
- Each plant's licensing basis must be maintained during the renewal term, in part through management of age-related degradation
  - 56 FR 64946; December 13, 1991



# Safety First License Renewal



# Safety First License Renewal

## Existing Regulatory Process

### Maintenance Rule

(10 CFR 50.65)

### Quality Assurance Program

(10 CFR Appendix B to Part 50)

10 CFR 50.55a  
Requirements

Active Components

Passive Components

## License Renewal

### Aging Management

(10 CFR 54)

Ensures that the effects  
of aging will be  
effectively managed  
throughout the period  
of extended operation

# License Renewal Status

- 73 units have been relicensed
- 38 units will be in the PEO and eligible for SLR by the end of 2014
- 18 units currently under review
- 9 upcoming applications between 2014 and 2018
- First SLR application expected in 2018
- Older plants will reach the end of 60 years in 2029

# Lessons Learned

- Existing principles for license renewal are effective
- Continuous learning in license renewal
- External stakeholder interaction
- Reviews of applications
- Two revisions to *Generic Aging Lessons Learned (GALL) Report*
- Implementation of aging management programs and activities

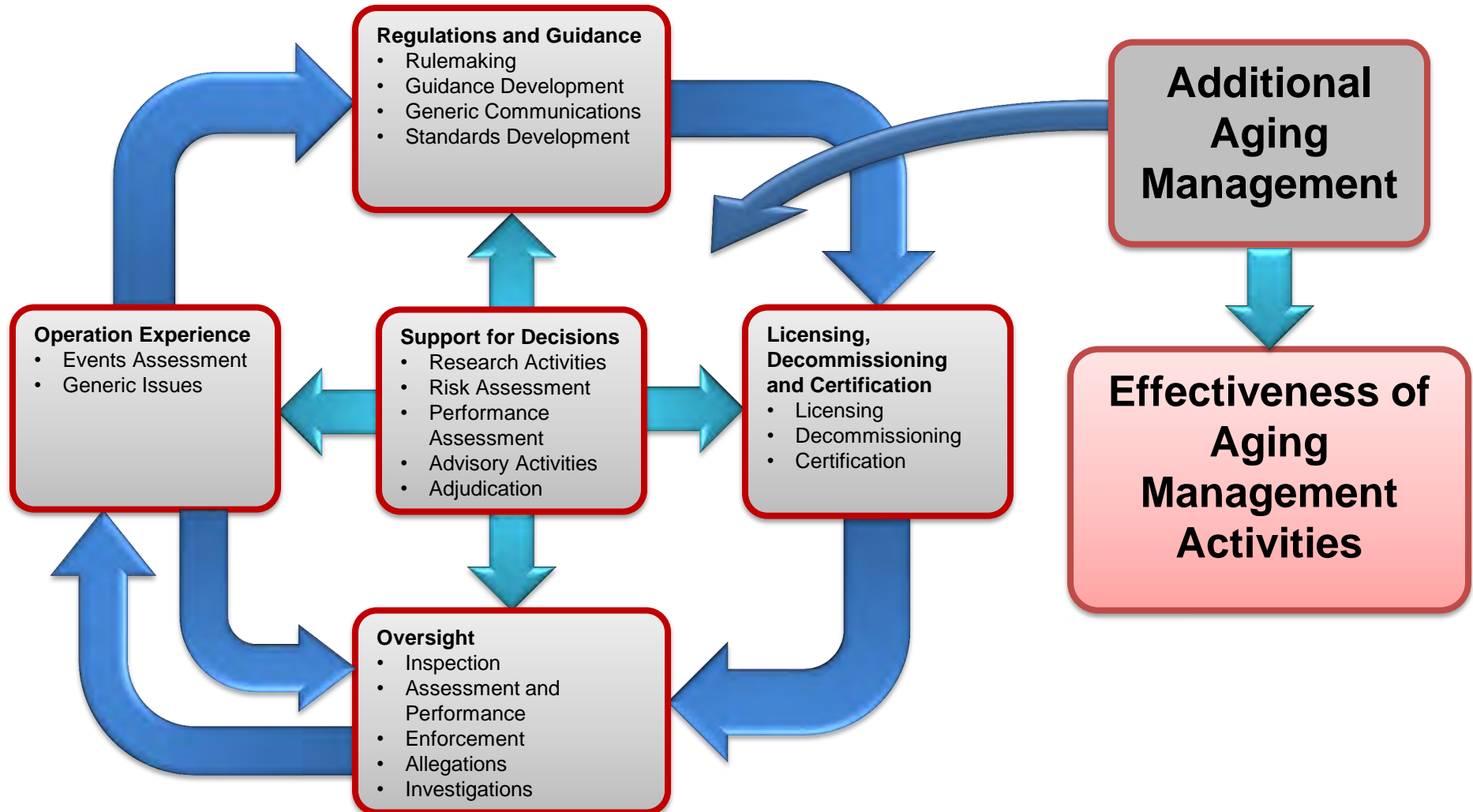
# SLR Key Messages

- Two principles of license renewal will continue to be applied to SLR
- Staff assessment of the current regulatory framework resulted in a dual path for SLR
  - Regulatory framework is addressed in SECY paper
  - Technical framework will continue parallel to regulatory framework
- SLR focuses on lessons learned from first license renewal

# SLR Regulatory Framework Considerations

- Over 60 potential issues identified
- Disposition Criteria:
  - Outside the scope of license renewal
  - Best addressed through guidance
  - Best addressed through rulemaking

# Safety Beyond 60 Years



# Safety Beyond 60 Years

## Existing Regulatory Process

### Maintenance Rule

(10 CFR 50.65)

### Quality Assurance Program

(10 CFR Part 50 Appendix B)

10 CFR 50.55a  
Requirements

Active Components

Passive Components

## License Renewal

### Aging Management

(10 CFR 54)

Ensures that the effects of aging will be effectively managed throughout the period of extended operation

Aging Management Effectiveness



# SECY-14-0016 Overview

- Requests to explore suggested rule changes to the current regulatory framework to support SLR
- Contributes to the NRC's Principles of Good Regulation
  - Independence, **Openness**, **Efficiency**, **Clarity** and Reliability
- Achieves alignment between regulations, guidance and implementation
  - Allows for a stronger basis in our decision making

# SECY-14-0016 Overview

- **Option 1:** No changes to the existing Part 54 regulations
- **Option 2:** Minor editorial changes Part 54
- **Option 3:** Updates Part 54 to expand the scope of the rule
- **Option 4:** Pursues rulemaking for SLR specific changes

# **Suggested Rule Considerations**

## **Option 2: Change scope requirements of 10 CFR 54.4(a)(3) to acknowledge other rule changes**

- 10 CFR 50.61a references alternative fracture toughness requirements to ensure protection against pressurized thermal shock events
- 10 CFR 50.61 is already within scope
- Including 50.61a provides rule consistency

# **Suggested Rule Considerations**

## **Option 2: 10 CFR 54.37(b) “Additional records and recordkeeping requirements”**

- Provides requirements for including in the FSAR newly identified SSCs that should be brought into the scope of license renewal and age managed, or should be evaluated as a time-limited aging analysis after a renewed license has been issued
- RIS 2007-16 provides clarification, but confusion still remains
- Staff proposes to revise Part 54 to reflect how recordkeeping requirements apply to newly identified SSCs

# **Suggested Rule Considerations**

## **Option 3: Add 10 CFR 50.54(hh)(2) to license renewal rule scope**

- Staff proposes to update the rule to bring into scope SSCs needed to comply with 50.54(hh)(2) (loss of large areas due to fires or explosions)
- Needed to ensure functioning of core and spent fuel cooling and containment for 60-80 years of operation

# **Suggested Rule Considerations**

## **Option 3: Clarify Timely Renewal Expectations**

- 10 CFR 2.109 allows applicants who submit license renewal applications no later than 5 years before the expiration of the license to continue to operate past the license expiration date until the staff has made its safety determination
- Aging management activities necessary for the PEO are required to be implemented only after a license is renewed
- These provisions can create a situation where a unit can enter its PEO without a renewed license and without having its aging management programs in place
- Staff proposes to clarify in Part 54 that licensees must have the aging management programs in place before entering the PEO

# **Suggested Rule Considerations**

## **Option 4: Effectiveness of Aging Management Activities**

- Key element for SLR
- Three Components:
  - Self-assessments
  - Report aging-related degradation
  - Report certain changes to SLR activities

# **Suggested Rule Considerations**

## **Option 4: AMP Effectiveness Self-Assessments**

- NRC requires similar self-assessments in other regulations (e.g., maintenance rule, fire protection, emergency preparedness)
- Information from self assessments will
  - Provide information to NRC and the industry
  - Identify areas of focus and inform decision making



# **Suggested Rule Considerations**

## **Option 4: Report Aging-Related Degradation**

- Ensures that licensee's self-assessment consider all relevant aging concerns
- Helps the staff and industry stay abreast of relevant operating experience
- This knowledge is essential for NRC to effectively regulate and oversee aging management

# **Suggested Rule Considerations**

## **Option 4: Report certain changes to SLR activities**

- Ensures that the staff is aware of significant changes to aging-management activities after a license is renewed
- Staff expects changes to AMPs to be covered by 10 CFR 50.59 processes and is assessing revisions needed to ensure that 10 CFR 50.59 processes will provide effective change management to aging management activities during the license renewal period

# **Suggested Rule Considerations**

## **Option 4: Timing of SLR Applications**

- Part 54 allow applicants for SLR to submit an application at the same time that the applicant is entering its first PEO
- The timeframe does not allow the staff to assess the effectiveness of aging management activities from the first PEO
- Staff proposes to revise the rule to allow more operating time in the first PEO before a SLR application is submitted

# Other Rule Considerations

## **Part 50 rulemaking to address potential changes to the current licensing basis**

- Staff proposes to confirm the adequacy of key input parameters to the CLB and environmental surroundings that have changed over time and evaluate the impact of the changes
- Staff will rely on the agency's decision as a result of the post-Fukushima 10 CFR Part 50 rulemaking for SLR

# Non-Concurrence

- A non-concurrence was included with the Commission paper
- Requests that the staff provides the Commission with an option that requires applicants for SLR to include an upgraded probabilistic risk assessment (PRA) assessment in the SLR application

# Non-Concurrence

- **Staff Position:**

- PRAs are not needed to ensure safety during the SLR PEO
- The need for a risk management regulatory framework is not unique to license renewal
- Part 54 currently allows applicants to risk-inform their aging management activities consistent with the Commission Policy Statement on the use of PRA



# Technical Framework

Division of Engineering  
U.S. NRC Office of Nuclear Regulatory Research  
April 8, 2014

# Technical Framework

- Process for developing technical framework
  - Collection of recommendations for changes to GALL and Standard Review Plan (SRP) for SLR
  - Catalogue recommendations in a database for staff expert panels review
  - SLR GALL Production Tool
  - Issue draft GALL-SLR and SRP-SLR in 2015
  - Issue final GALL-SLR and SRP-SLR in 2016



# Technical Framework

- Staff identified technical issues from various sources for consideration in the guidance revision:
  - Aging Management Program (AMP) effectiveness audits
  - Periodic Safety Review (PSR) summary reports
  - Relevant domestic and international operating experience
  - Expanded Materials Degradation Assessment (EMDA)

# Technical Framework

- **AMP Effectiveness Audits**
  - Understand how AMPs have been implemented in PEO
  - Looked at evolution of AMPs in response to operating experience
  - Provided insights to the regulatory framework

# Technical Framework

- **Review of selected PSR summary reports**
  - Limited-scope review of 14 PSR summary reports
  - Identified a few technical issues for consideration in the technical review
- **Relevant domestic and international operating experience**
  - Reviewed to identify potential new aging degradation mechanisms

# Research Activities in Support of SLR

- **Canvas state of knowledge:**
  - Technical workshops
  - International Atomic Energy Agency International Conference on NPP Life Management
  - Nuclear Energy Agency Committee on the Safety of Nuclear Installations Long Term Operations (LTO) activities
- **Periodic interactions through Memorandums of Understanding:**
  - Department of Energy/Light Water reactor Sustainability Program and
  - Electric Power Research Institute/LTO Program
- **EMDA:**
  - Builds on Proactive Materials Degradation Assessment (NUREG/CR6923, February 2007)
  - Extends the assessment to operation beyond 60 years
  - Expands the assessment to include reactor pressure vessel, concrete and cable aging in the assessment

# Key Technical Issues

- **Piping and Internals Degradation Scenarios**
  - High susceptibility, high knowledge scenarios
    - Stress corrosion cracking (SCC) of Alloy 600/82/182 components
    - Irradiation creep of stainless steel core internals
    - Pitting and microbially induced corrosion of carbon steel in secondary and tertiary systems
    - Fatigue of small-bore welds
  - High susceptibility, low knowledge scenarios
    - All related to moderate-to-high fluence effects on degradation of stainless steel core internals
    - Loss of fracture resistance, SCC, and void swelling of bolts and other components



# Key Technical Issues

- **Piping and Internals Degradation Scenarios**



# Key Technical Issues

- **Reactor Pressure Vessel Degradation Scenarios**
  - High susceptibility, high knowledge scenarios
    - Embrittlement of carbon and low-alloy steel vessel shells, weld, and nozzles
    - SCC of Alloy 600/82/182 nozzles and welds
  - High susceptibility, low knowledge scenarios
    - No scenarios identified as high susceptibility and low knowledge
  - Intermediate susceptibility, low knowledge scenarios
    - Environmentally-assisted fatigue of stainless steel cladding and nickel alloy components





# Key Technical Issues

- **Cable Degradation Scenarios**
  - High susceptibility, high knowledge scenarios
    - Thermal aging of neoprene and ethylene propylene rubber cables
    - Long-term irradiation damage
  - High susceptibility, low knowledge scenarios
    - Long-term wetting of low and medium voltage cables

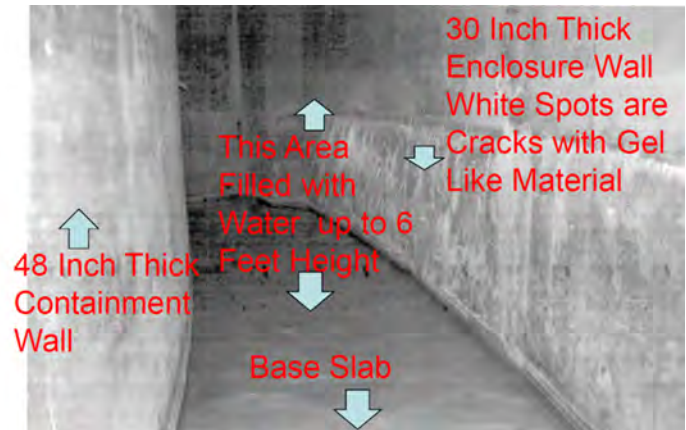




# Key Technical Issues

- **Civil Structures Degradation Scenarios**

- High susceptibility, high knowledge scenarios
  - Freeze-thaw damage of containment and cooling tower
  - Alkali-aggregate reactions
  - SCC of steel reinforcement bar and tendons
- High susceptibility, low knowledge scenarios
  - Irradiation damage to concrete
  - Boric acid corrosion of spent fuel pool concrete
  - Corrosion of the back side of the containment liner



# Summary

- Plants are required to meet their licensing basis during initial licensing, during first license renewal, and during subsequent license renewal
- Regulatory processes are effective for ensuring licensing basis is met and for identifying and resolving any new safety issues throughout plant operations
- Aging management is reviewed during initial licensing, expanded during first license renewal, and further expanded during subsequent license renewal

# Summary

- Suggested SLR regulatory framework creates a more efficient and effective process that results in rule clarity for SLR
- Adequate aging management of technical issues by the industry is critical to enable acceptable understanding of aging management degradation mechanisms and applications for SLR

# Summary

- Principles of License Renewal Safety Reviews are adequate and appropriate for Subsequent License Renewal
  - With the possible exception of the detrimental effects of aging on the functionality of certain plant systems, structures, and components, the regulatory process is adequate to ensure that the licensing bases of all currently operating plants provides and maintains an acceptable level of safety so that operation will not be inimical to public health and safety or common defense and security
  - Each plant's licensing basis must be maintained during the renewal term, in part through management of age-related degradation
- The framework proposed by the staff ensures and maintains safety during the period beyond 60 years
- The principles and processes we discussed are policy matters for which the Commission may provide new direction

# Option for Upgraded PRA in Subsequent License Renewal

Joseph Giitter

Director, Division of Risk Assessment (DRA)

Jerry Dozier

Sr. Risk and Reliability Analyst, DRA

# Why Should PRA be a Consideration for SLR?

## *Overview*

- Consistency with Commission's PRA Policy Statement
- Consistency with other risk-informed guidance and regulations
- Assure safety goals are maintained
- Promote safety-focused inspection and maintenance

# Why Should PRA be a Consideration for SLR?

## *Policy Rationale*

- PRA Policy Statement (“Use of PRA should be increased in ***all*** regulatory matters to the extent supported by “***the state of the art.***”)
  - PRA policy statement issued after Part 54 rulemaking.
  - Part 54 SOC (in response to comments from the State of Illinois) acknowledged that PRA methods would be useful on a plant specific basis to assess the importance of SSCs subject to an aging management review.
- PRA “state of the art” has advanced considerably in the last twenty years. (Example: Risk-informed ISI)



# Why Should PRA be a Consideration for SLR?

## ***Consistency with New Reactors***

- To provide regulatory consistency for combined operating license holders and the existing reactor fleet
  - 10 CFR 50.71(h)(3) requires Combined Operating License (COL) holders to submit an upgraded PRA (one that covers all modes and initiating events) as part of their license renewal application
  - No PRA requirement for current fleet
- An updated PRA requirement would provide consistency with license renewal regulations for New Reactors



# Why Should PRA be a Consideration for SLR?

## ***Scoping Consistency***

- Scope of Active SSCs in maintenance rule and 10CFR50.69 “Risk-Informed Categorization” are risk-informed
- Current scoping of SCCs for LR is based on deterministic analysis of stylized accidents
- An updated plant specific PRA could potentially identify vulnerabilities beyond the limited design basis

# Risk-Informed Safety Classification (50.69)

<b>RISC-1:</b> <ul style="list-style-type: none"><li>•Safety Related</li><li>•Safety Significant</li><li>~25%</li><li>~5000 SSCs</li></ul>	<b>RISC-2:</b> <ul style="list-style-type: none"><li>•Non-Safety-Related</li><li>•Safety Significant</li><li>~1%</li><li>~700 SSCs</li></ul>
<b>RISC-3</b> <ul style="list-style-type: none"><li>•Safety Related</li><li>•Low Safety Significance</li><li>~75%</li><li>~15,000 SSCs</li></ul>	<b>RISC-4</b> <ul style="list-style-type: none"><li>•Non-Safety-Related</li><li>•Low Safety Significance</li><li>~99%</li><li>~60,000 SSCs</li></ul>

(Numbers are approximate values from South Texas Exemption)

As defined in 10 CFR 50.2, Safety-Related SSCs are relied on to:

- Maintain RCS pressure boundary
- Shutdown reactor & maintain safe shutdown condition
- Prevent / mitigate accident which could lead to exposure

Safety Significance is determined using risk metrics & deterministic criteria

# Why Should PRA be a Consideration for SLR?

## ***Surveillance and SSC inspection***

- An appropriately upgraded PRA may be used to proactively identify the most susceptible aging locations with the highest consequences (similar to Risk Informed In-service Inspections)
- Plant risk profile is changing over time. An upgraded plant specific PRA can reveal, in an integrated fashion, which SSCs are most risk significant and where to focus resources.

# Why Should PRA be a Consideration for SLR?

## *Design Input Parameters*

- CLB is based on a stylized scenario that may not represent the greatest risk contributors
- Goal should be to protect the plant against the most risk significant initiators and natural phenomena
- Upgraded PRA that considers all modes/initiators would allow for this in an integrated fashion.

# Why Should PRA be a Consideration for SLR?

## *Design Bases Inspections*

- Option 4 discusses how the staff will seek assurance that changes over time to site parameters that may affect the CLB are understood
- The Region's Component Design Bases Inspection verifies the initial design and subsequent modifications . This procedure prioritizes NRC resources by using risk information and would benefit from having an updated PRA. An updated PRA provides the integrated effect of design changes on risk.

# Why Should PRA be a Consideration for SLR?

## *International and NRC Research experience/insights*

- International efforts are underway to evaluate the use of PRA to evaluate the effects of aging on plant risk
- It will become even more important to understand and characterize risk as plants age beyond 60 years—where constant failure rate assumptions may no longer be valid.

# Why Should PRA be a Consideration for SLR?

## ***Severe Accident Mitigation Alternatives***

- Severe Accident Mitigation Alternatives (SAMA) is currently a significant aspect of License Renewal in the Environmental Report
  - 10 CFR 51.53(c)(3)(ii)(L) does not require a SAMA analysis if it was previously performed (only an evaluation for new and significant information)
  - The SAMA analysis will not be required in SLR
- An updated PRA could provide information regarding the most risk significant modifications to make.

## *Why wait for SLR Rulemaking?*

- Current PRA quality driven by voluntary initiatives
- Uncertain that current staff initiatives (e.g., RMRF) will result in a PRA requirement
- PRA requirement unlikely to pass the backfit rule
- SLR provides a “hard stop” opportunity



# Why Should PRA be a Consideration for SLR?

## **Conclusion**

***Fundamentally, the question is, “Do we look to the past to ensure success for the future—with a hope that we’ve anticipated what the future will hold—or do we try to look into the future to anticipate the probabilities that are likely to exist.”***

# Subsequent License Renewal US Industry Perspective

Briefing for  
Advisory Committee on Reactor Safeguards  
Plant License Renewal Subcommittee  
April 8, 2014

S. Jason Remer  
Nuclear Energy Institute



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# Outline

- Factors Supporting Long Term Operation and SLR
- SLR Built Upon Successful LR Programs
- Industry and Government Preparing for SLR and Long Term Operations
- Aging Management – a Living Process
- Detailed Analysis of SECY Paper
- Summary

# Factors Supporting Long Term Operation and SLR



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# Current Energy Mix

## ■ Nuclear power is a clean, reliable base load energy source

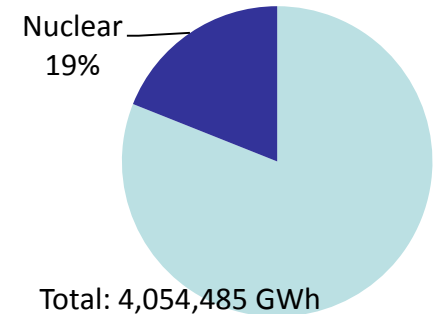
- Provides 19% of U.S. electricity generation mix
- Provides 61% of U.S. emission-free electricity
- Avoids about 700 MMTCO<sub>2</sub> each year
- Helps reduce overall NO<sub>x</sub> and SO<sub>x</sub> levels

## ■ U.S. electricity demand projected to increase ~28% by 2040 from 2011 levels

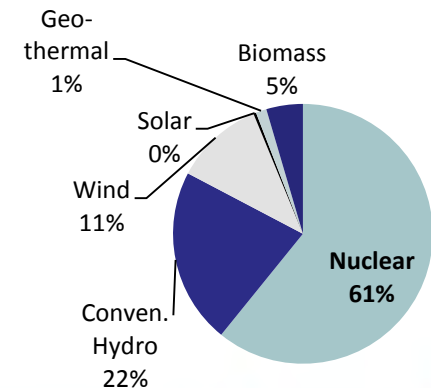
## ■ 100 GWe nuclear capacity - 100 operating plants

- Fleet maintaining close to 90% average capacity factors
- Most expected to apply for license renewal for 60 years of operation

Electricity Production, 2012



Net Non-Carbon Emitting Sources of Electricity, 2012



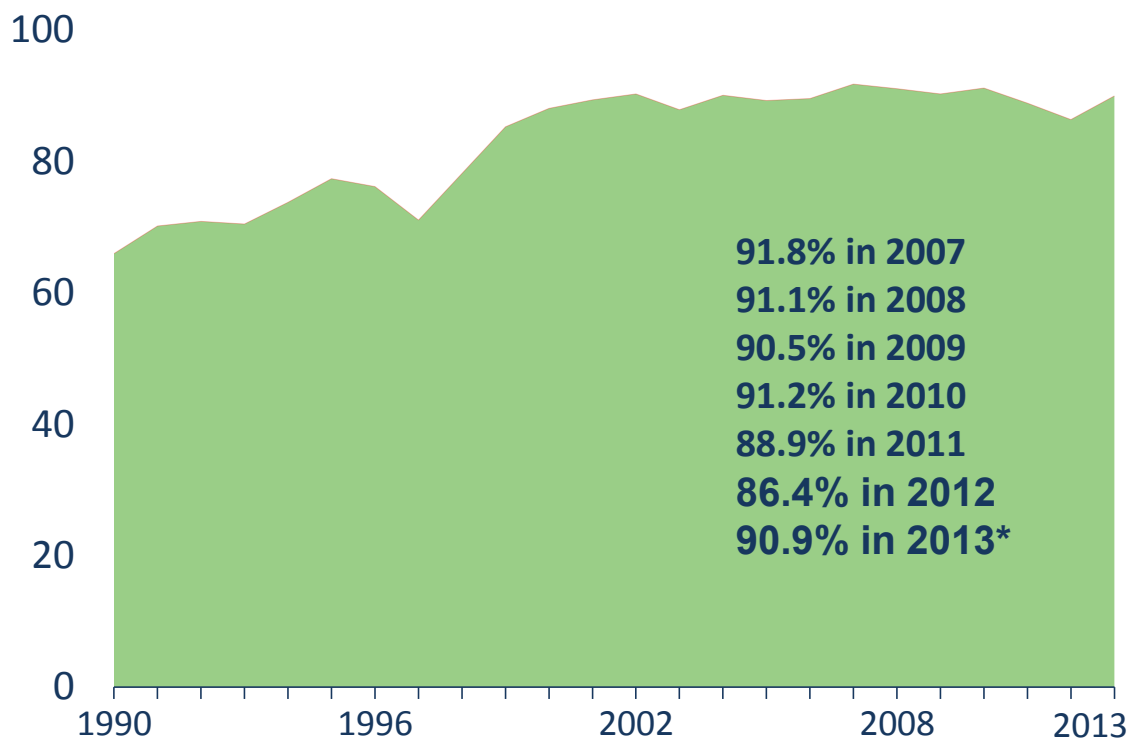
Source: Energy Information Administration

# Sustained Reliability and Productivity

## Highlights

- 2013 average includes San Onofre 2 and 3, which did not operate, and Fort Calhoun, which had a 2% capacity factor for the year. The industry's average capacity factor without those units was 92.1%.
- Number of refueling outages:
  - 2013 = 51
  - 2012 = 63
  - 2011 = 65

## U.S. Nuclear Plant Capacity Factor (Percent)



Source: Energy Information Administration

\* NEI estimate

# U.S. Nuclear Industrial Safety Accident Rate

*One-Year Industry Values*

**For Comparison:**  
**Electric Utilities ~ 2.00**  
**Manufacturing ~ 3.50**



ISAR = Number of accidents resulting in lost work, restricted work, or fatalities per 200,000 worker hours.

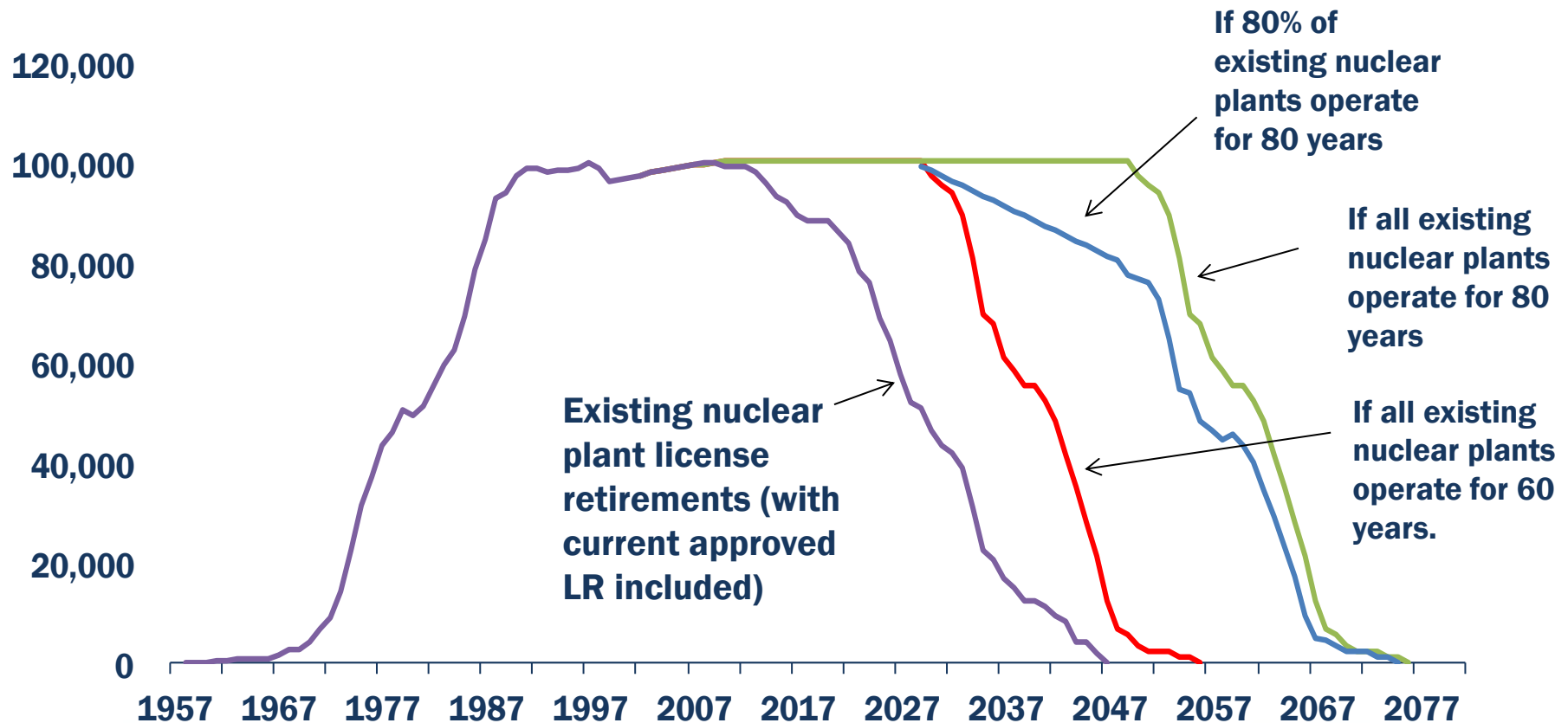
Note: Starting in 2008, data includes supplemental personnel. Source: World Association of Nuclear Operators - Updated: 4/12



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# Projected U.S. Nuclear Power Capacity (Megawatts)

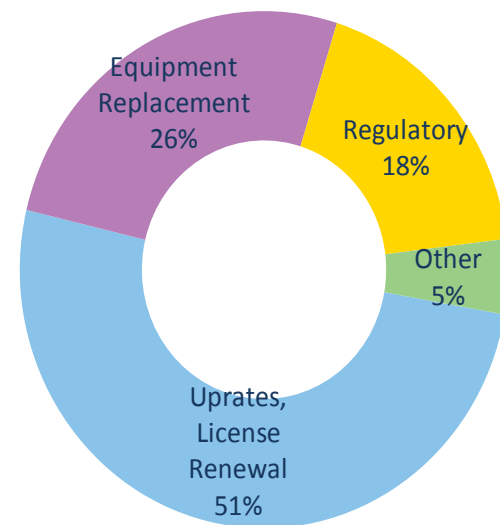
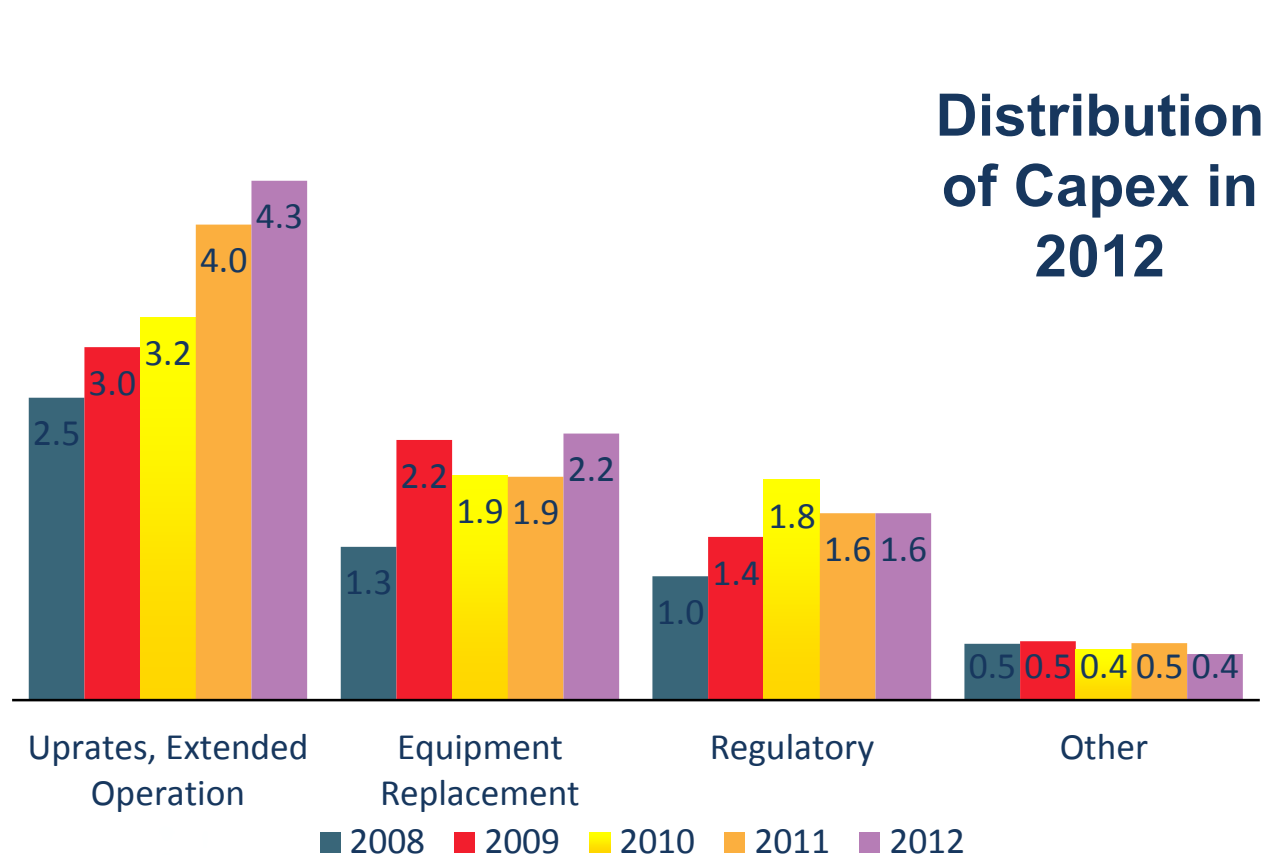


Sources: Energy Information Administration, Nuclear Regulatory Commission Updated: 4/14



# 2008-2012 Nuclear Capital Spending



(2012 Billions of \$)



Source: Electric Utility Cost Group

# Investing in Long Term Operation

## \$724 Million Grand Gulf Nuclear Plant Uprate Will Soon Create 4,000 Jobs

 Nuclear Street News Team Tue, Dec 13 2011 6:28 AM  0

Entergy is preparing for a 13 percent power uprate that will make Grand Gulf the most powerful nuclear plant in the country.



In the process, the \$724 million project in Port Clinton, Ohio, is expected to create 4,000 jobs. The Shaw Group will be doing the work, and the Natchez Democrat reported that project managers can inquire about opportunities by calling 855-696-7272 or [www.shawgrp.com/suppliers](http://www.shawgrp.com/suppliers). Nuclear workers can also inquire about jobs to [hrquestions@shawgrp.com](mailto:hrquestions@shawgrp.com) or 866-727-7272.

The Democrat this weekend quoted an Entergy spokesman saying work is expected to begin in the first quarter. The Nuclear Regulatory Commission anticipates approval in March, according to the agency's website.

## Davis-Besse begins \$600M upgrade

Plant replacing generators, plans to stay open through 2037

BY TOM HENRY  
BLADE STAFF WRITER

OAK HARBOR, Ohio — Barring complications, it's not that important for northwest Ohio residents to know what steam generators are or how they help nuclear power plants generate electricity.

All they need to know is that during the first weekend of February, FirstEnergy Corp. began following through on its commitment to replace the Davis-Besse nuclear plant's two original steam generators, at a cost of \$600 million.

## StarTribune

### Xcel Energy investing \$1.8 billion in two nuclear power plants

Article by: David Shaffer  
Star Tribune  
June 16, 2013 - 8:10 PM

As some U.S. utilities are abandoning old nuclear power plants, Xcel Energy says it's investing \$1.8 billion to extend the life of its 40-year-old Minnesota reactors.

At the company's Prairie Island nuclear plant in Red Wing, Minn., 1,550 contract workers this fall will replace two massive steam generators — at \$280 million, its single most costly improvement project. The plant was completed in 1974 at a cost of \$350 million.



Terry Pickens, Xcel Energy spokesman, stood in front of a steam generator installed at the Prairie Island nuclear plant.

Richard Sennott, Star Tribune

Entergy CEO Ray Lieb said the investment "supports our commitment to remaining an important part of Ohio's economy for many decades to come."

## Nuclear power plant life extension project could cost \$1.17bn

Apr 17, 2012

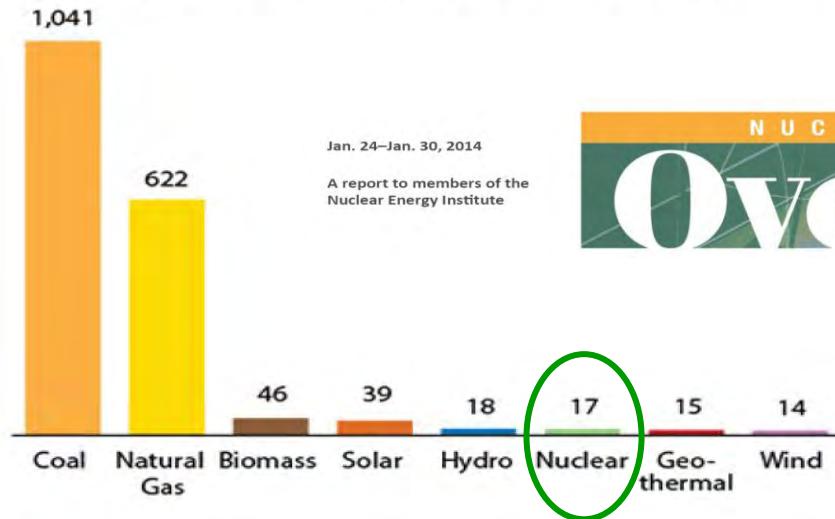
**Indiana Michigan Power (I&M)**, a subsidiary of **American Electric Power (NYSE: AEP)**, filed a proposal with the Indiana Utility Regulatory Commission (IURC) outlining a \$1.17 billion project at the **2,100 MW Donald C. Cook Nuclear Plant** in Michigan. The project is expected to sustain the plant over the 20-year extension of its operating license.

# Environmental Benefits

## Life-Cycle Emissions

Nuclear energy's life-cycle carbon emissions are comparable to those of renewable energy sources.

**Comparison of Life-Cycle Emissions**  
Tons of Carbon Dioxide Equivalent per Ggawatt-Hour

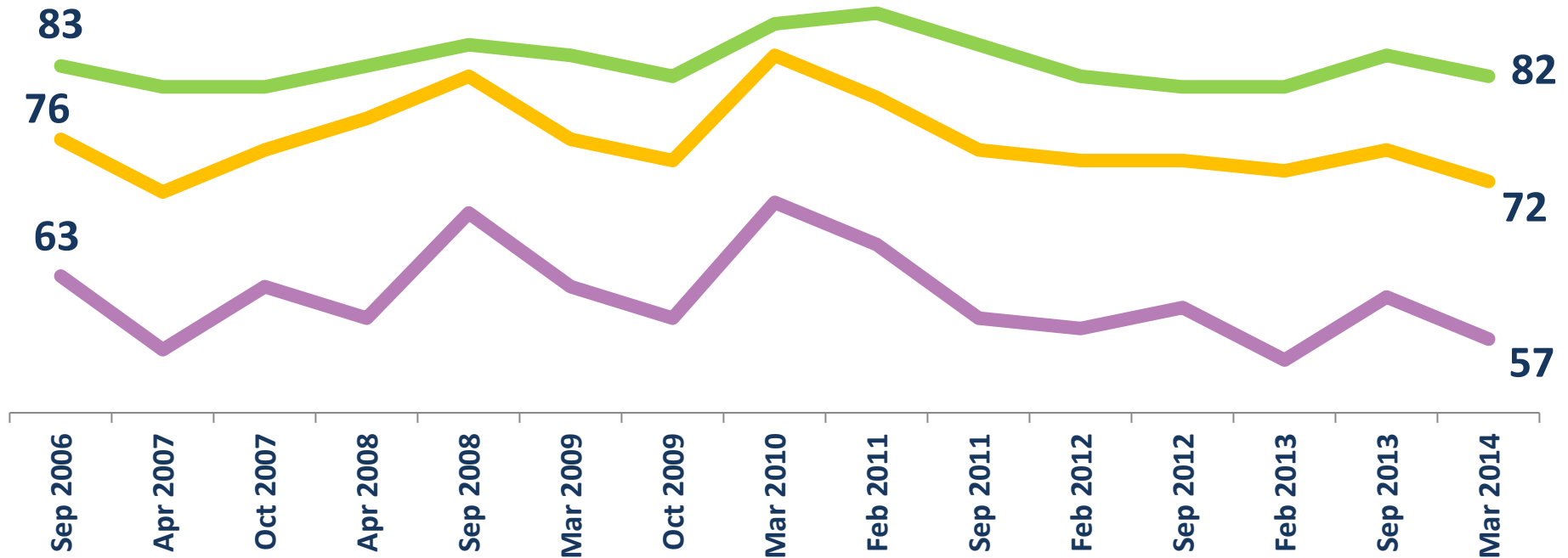


Independent studies show that nuclear energy's "life-cycle" emissions of carbon dioxide are about the same as wind and geothermal power and significantly less than other electricity sources. A life-cycle measurement takes into account the facility's construction, the mining and processing of fuel, routine operation, disposal of used fuel and the ultimate dismantling of the facility—in other words, its entire life cycle.

# License Renewal and New Plants

*% Agree*

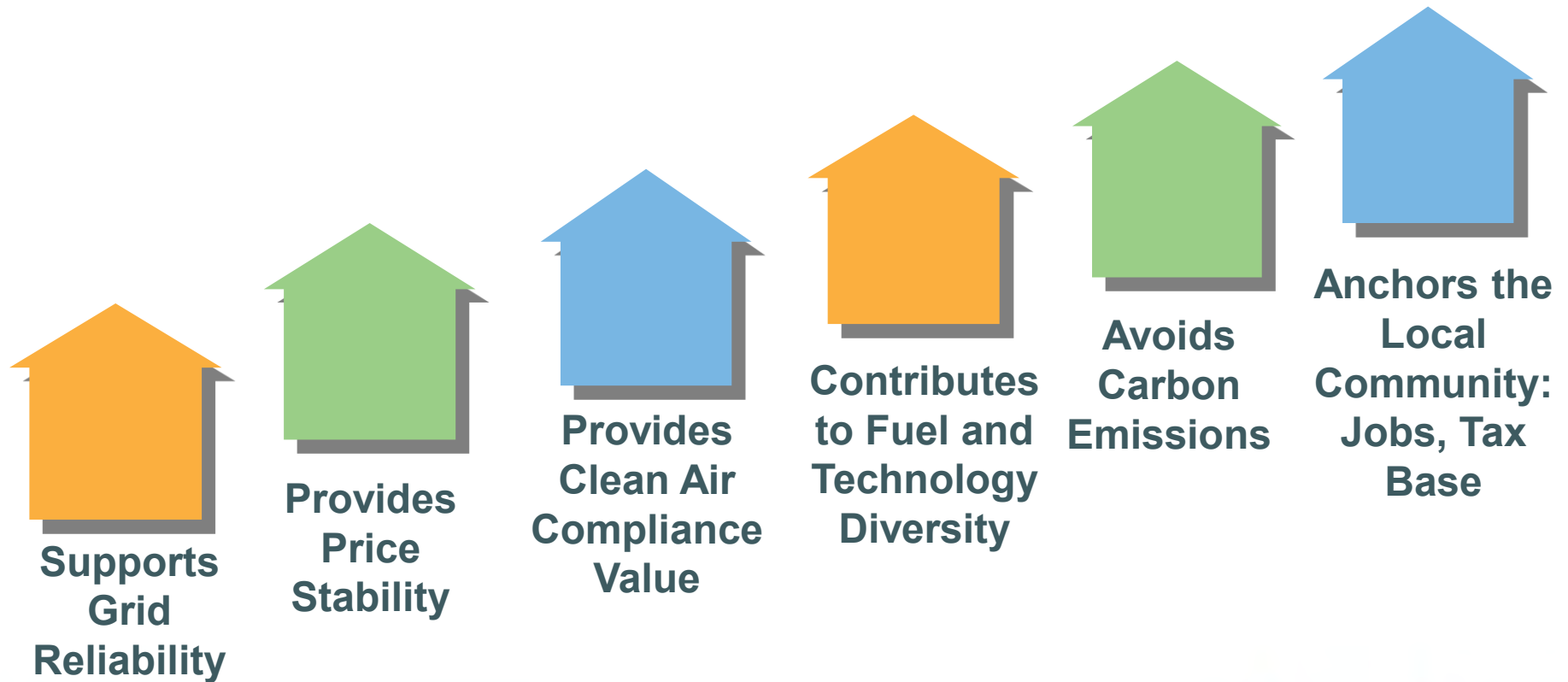
- Renew the license of nuclear power plants that continue to meet federal safety standards
- Electric utilities should prepare now so that new nuclear power plants can be built if needed
- Definitely build more nuclear power plants



Source: Bisconti Research, Inc. with GfK Roper and Quest Global Research

# Nuclear Energy: A Solid Value Proposition

## Safe, Reliable Electricity 24-by-7-by-365 Plus ...





# SLR Built Upon Successful LR Programs



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# License Renewal

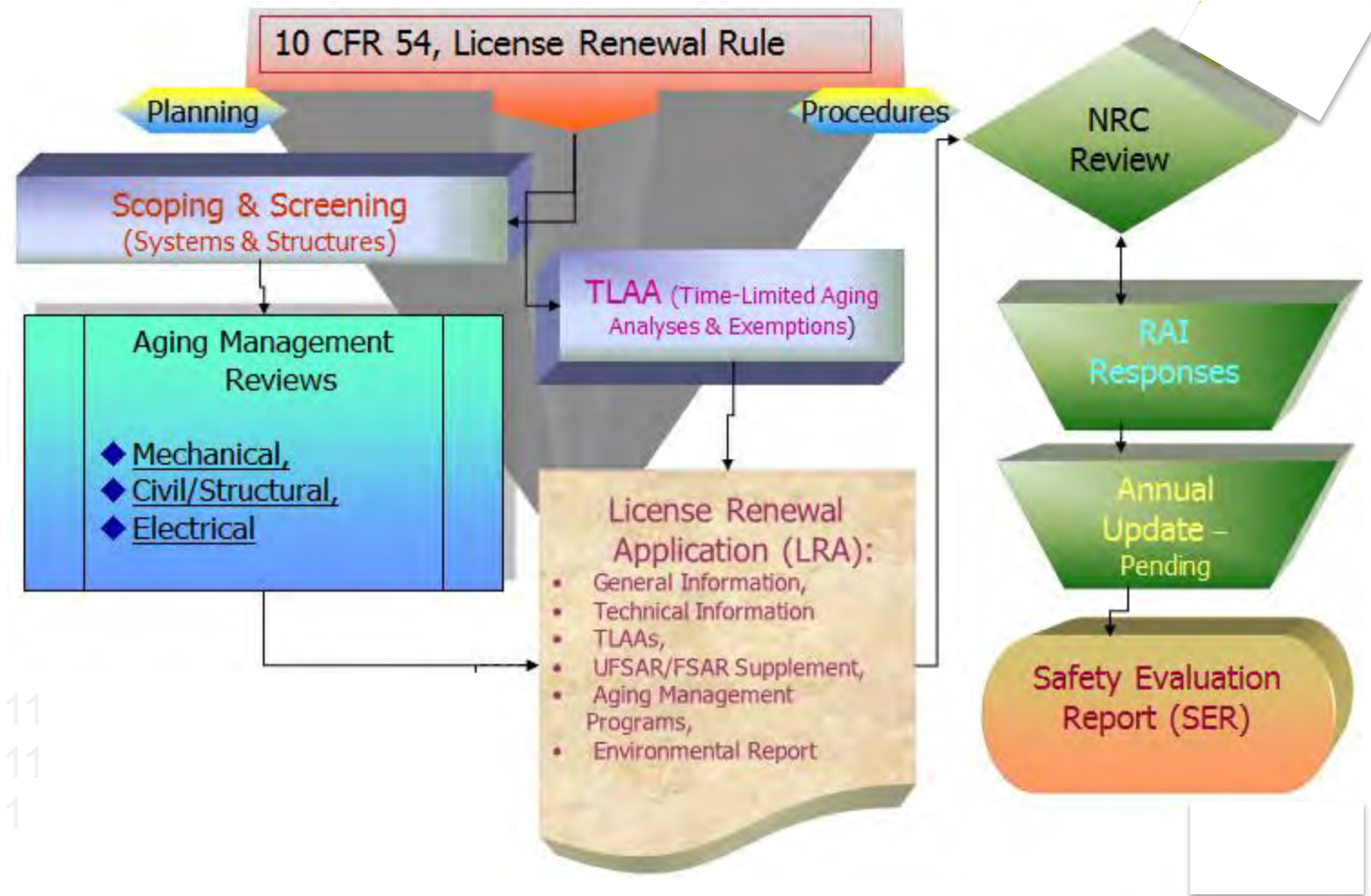
- Atomic Energy Act anticipated and allows for LR and SLR
- NRC process governed by 10 CFR Part 54 and Part 51
  - Original rule issued in 1991, pilot project determined rule was unsuccessful
  - Revised rule issued in 1995, pilot projects successful
- Renewal of original 40 year operating license for additional 20 year terms (i.e., 60, 80, etc. years)
- Aging management for passive, long-lived components and structures; time-limited aging analyses evaluation; environmental impact review
- An option to continue operating existing nuclear power plants
- Two main review areas by NRC: safety, environmental
- Public offered an opportunity to request a hearing

# Foundation of License Renewal

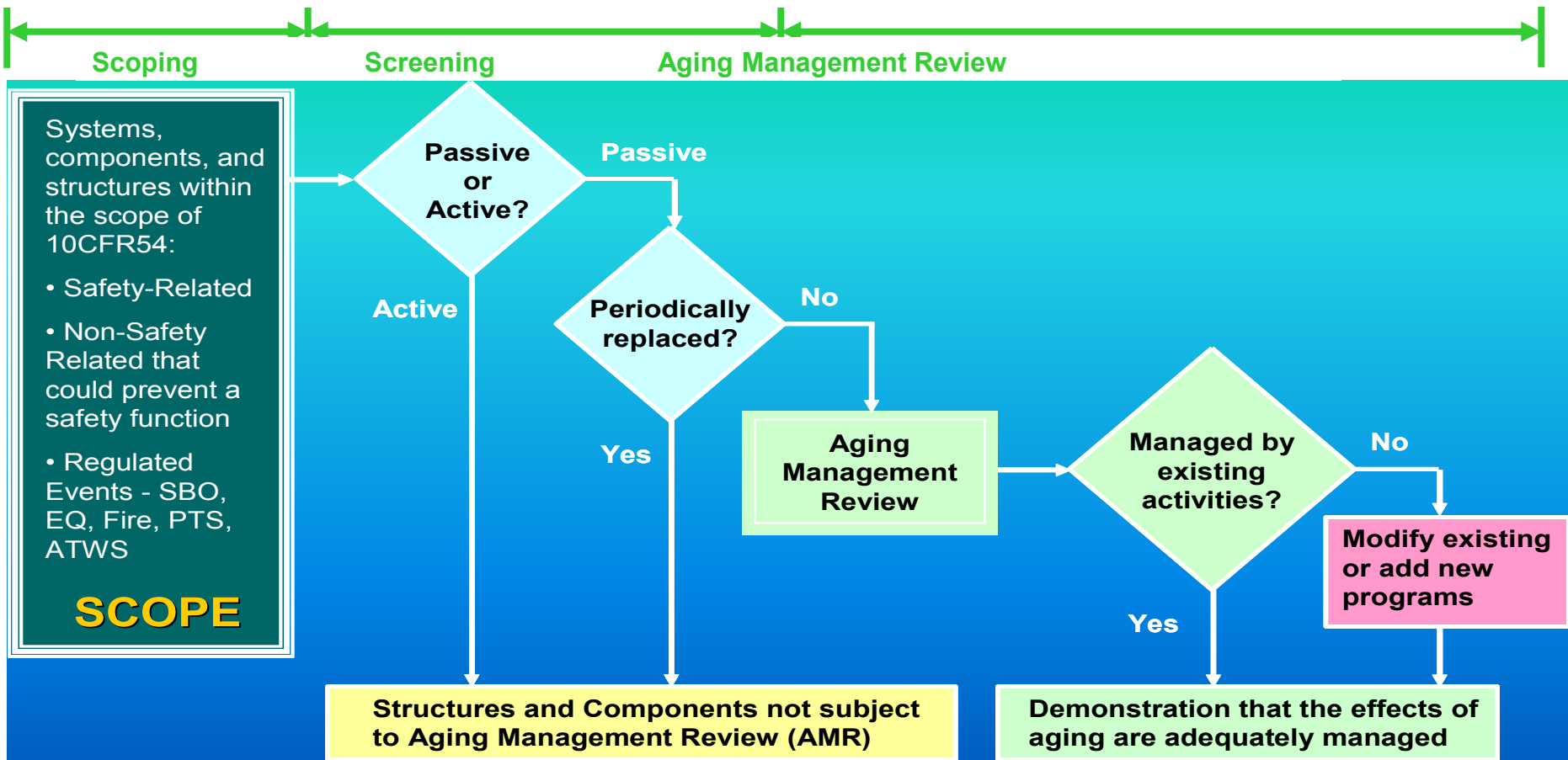
- Two key principles:
  - Current regulatory process is adequate to ensure that the licensing basis of all operating plants provides and maintains an acceptable level of safety so that operation will not be detrimental to public health and safety or common defense and security
  - Each plant's licensing basis is required to be maintained during any renewal term in the same manner and to the same extent as during the original licensing term



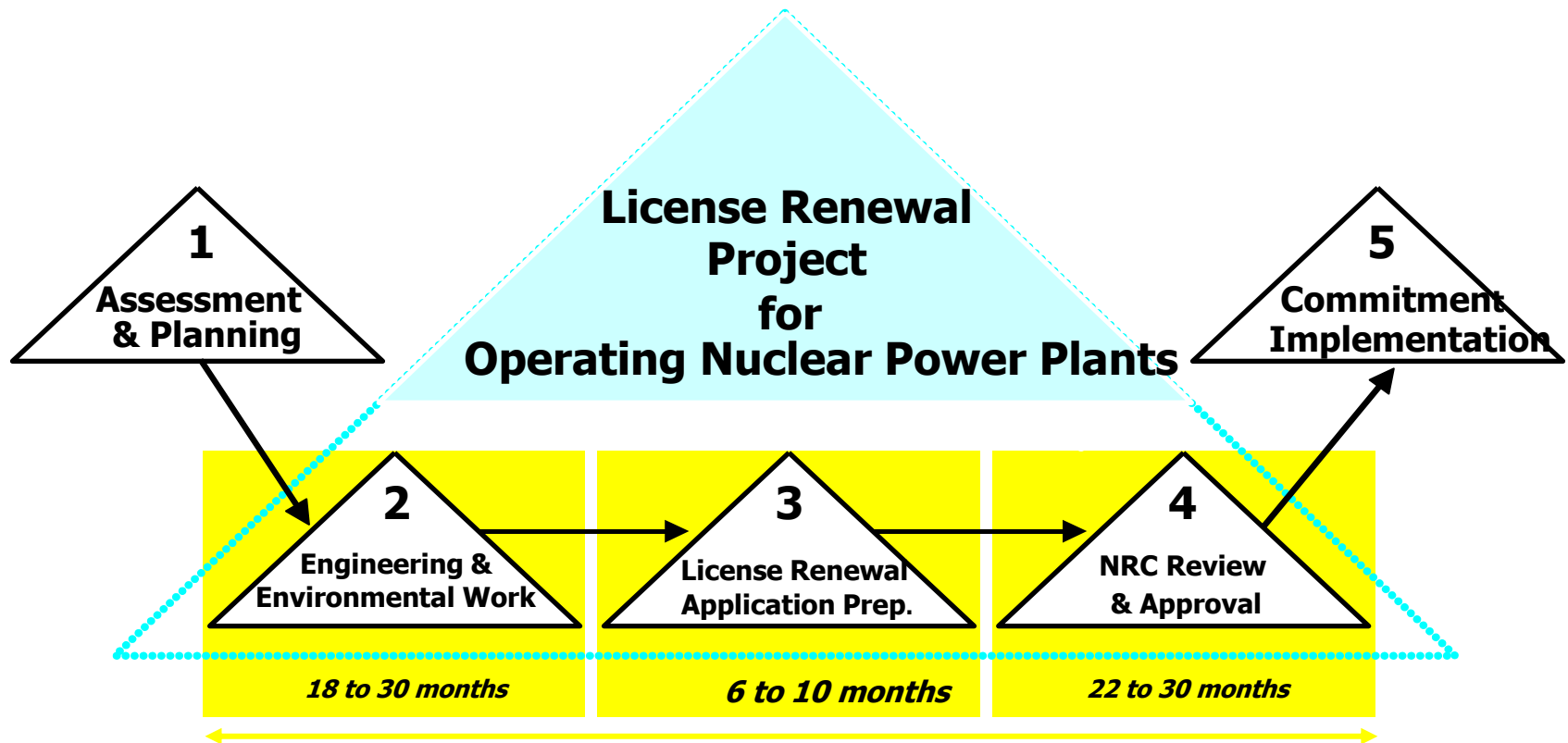
# License Renewal Review Process



# Elements of an Integration Plant Assessment (IPA) for License Renewal



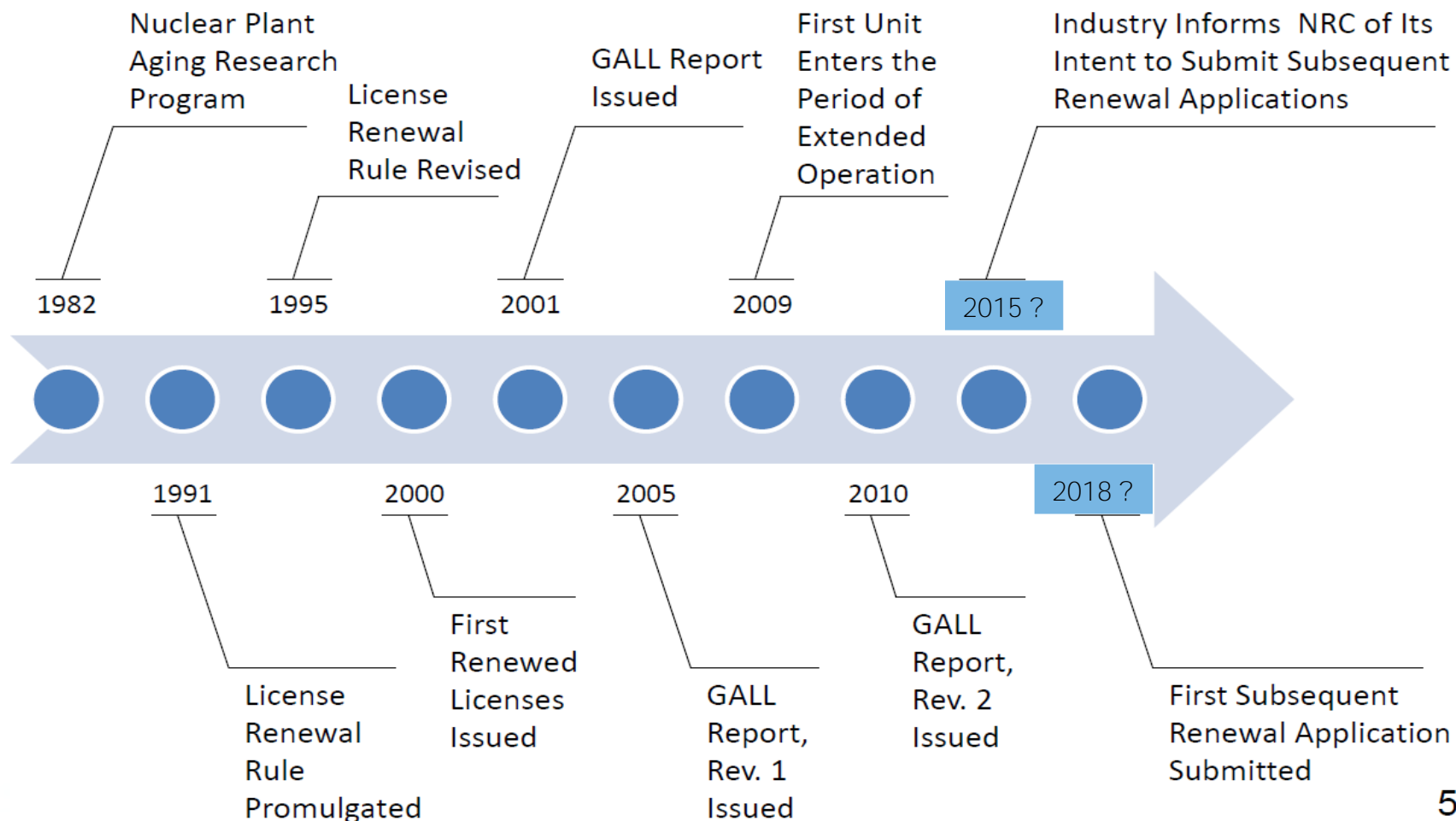
# Typical License Renewal Process Phases



**Typical Cost and Schedule = \$16 to \$25 million and 4 to 6 years\***

\* Not including hearing and implementation Phase (5)

# History of License Renewal Rule

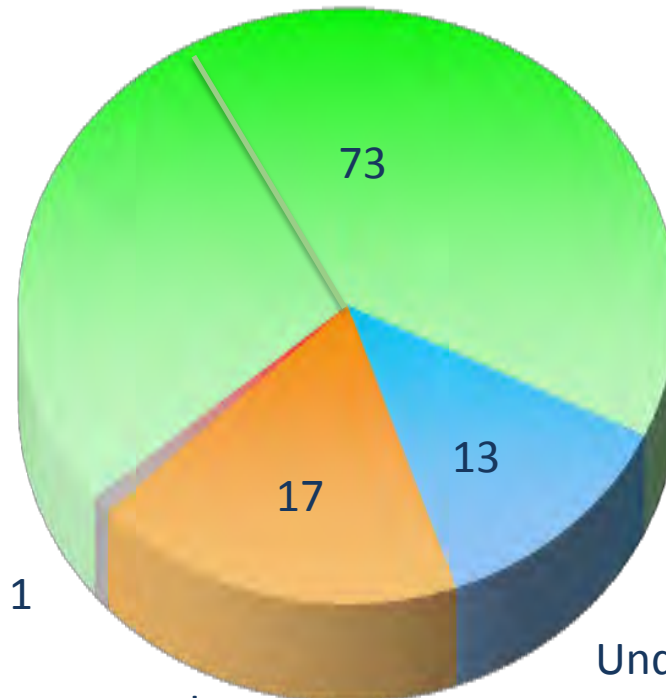


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# Current Situation

Approved



**27 in period of extended operation**

Unannounced 1

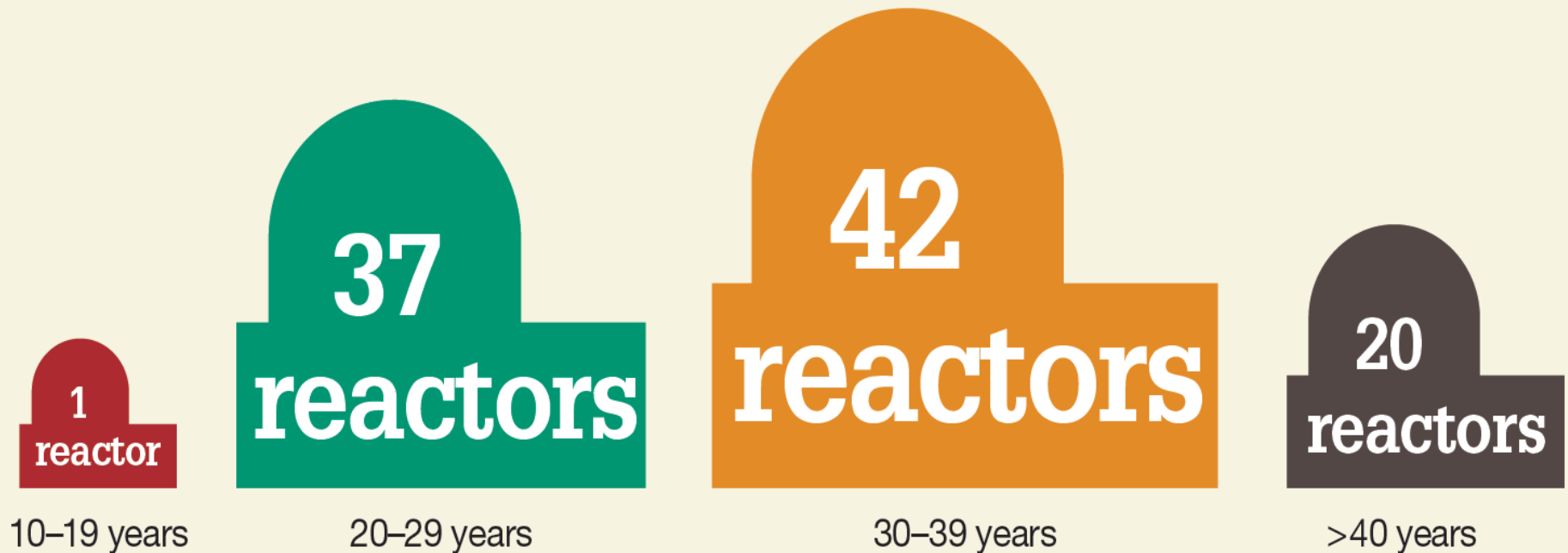
Under NRC Review

Intend to Renew



# U.S. NPPs – Years of Operation

End of NRC FY2013 – NUREG-1350




Note: Ages have been rounded up to the end of the year.

**NOTE: 38 Units  
>40 years by end  
of 2014**

# License Expirations



























































































End of 2013 – NUREG-1350

 License  
Expiration

   
2013–2018  
2

    
2019–2022  
4

     
     
     
     
     
     
     
2023–2030  
27

       
       
       
       
       
       
       
       
       
       
       
       
       
       
       
2031–2049  
67



# Industry and Government Preparing for SLR and Long Term Operations



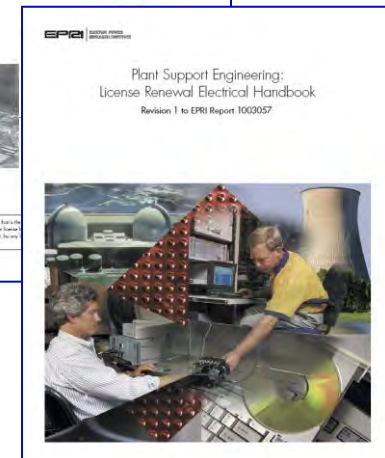
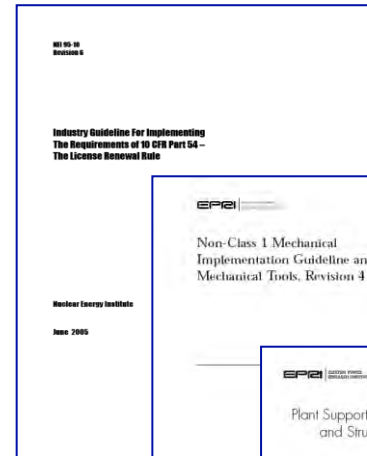
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# U.S. Industry Groups – Supporting SLR

- **NEI LR and SLR Task Force**
  - Regular industry meetings
    - Quarterly industry meetings
    - Quarterly NRC mgmt. meetings
    - SRP & GALL revision recommendations
  - NEI 95-10 industry guidance
  - Industry peer reviews of LRAs
- **NEI License Renewal Working Groups**
  - Mechanical Working Group
    - EPRI Mechanical Tools Doc. Upkeep
  - Electrical Working Group
    - EPRI Electrical Tools Doc. Upkeep
  - Civil/Structural Working Group
    - EPRI Structural Tools Doc. Upkeep
  - Implementation Working Group
    - NRC IP71003, Industry Guidance
  - Subsequent LR Working Group
    - LTO R&D and Licensing Guidance
- **NEI SLR Executive Working Group** [new]
- **ASME Special Working Group – Nuclear Plant Aging Management**

**Goal** – continuous improvement of aging management based on lessons learned and operating experience



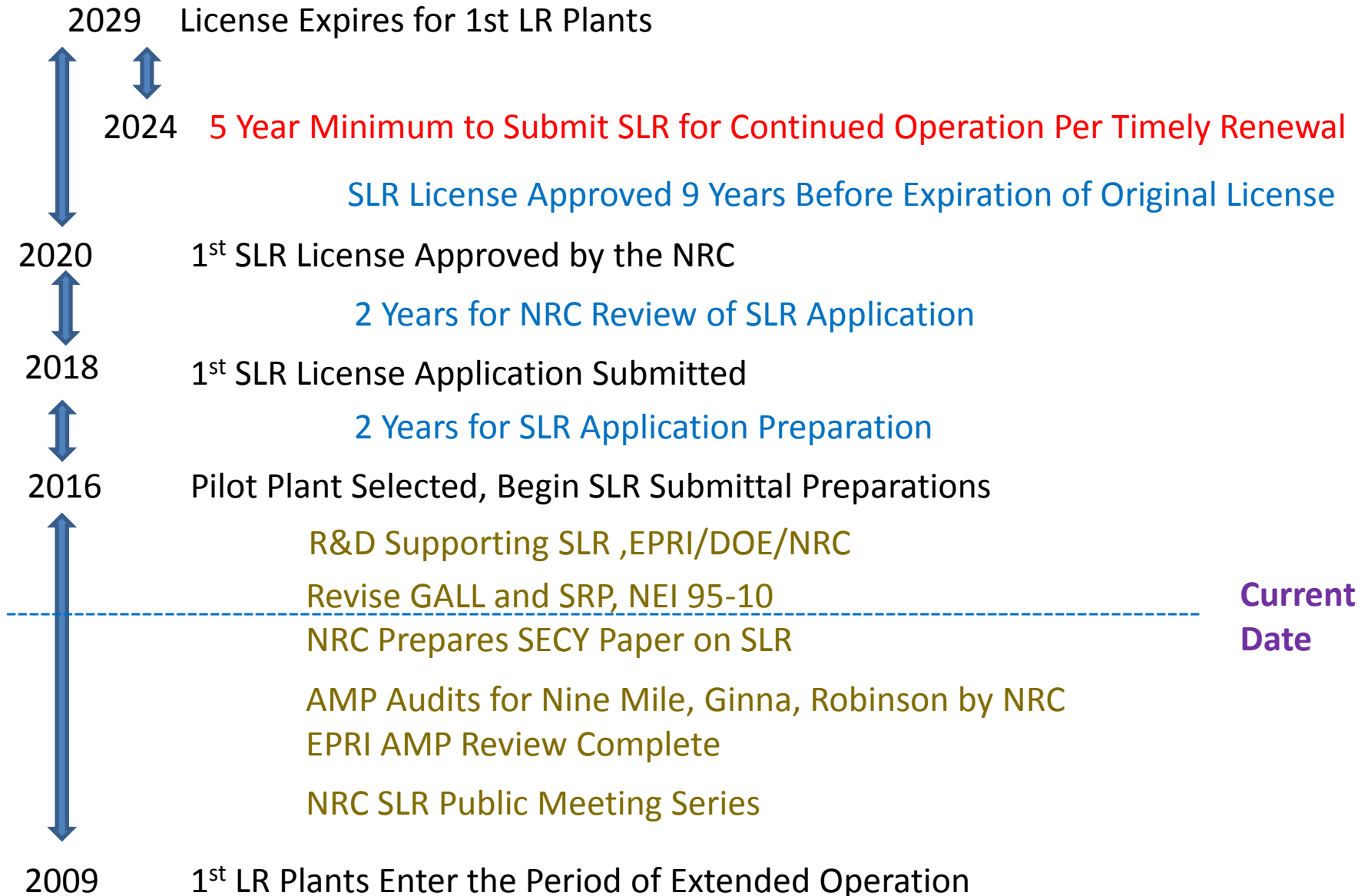
# Close Coordination with Research

- ASME Special Working Group
  - Nuclear Plant Aging Management
- EPRI Long Term Operation (LTO) Program
  - EPRI documents identified in GALL in support of first round of LR
  - Subsequent License Renewal
  - Pilot Programs
- Department of Energy's (DOE) Light Water Reactor Sustainability Program (LWRS)
  - Materials Aging and Degradation
  - Advanced Instrumentation, Information, and Control Systems Technologies
  - Risk-Informed Safety Margin Characterization

# Meetings in Preparation for SLR and LTO

- NRC and DOE sponsored two international conferences on operation beyond 60 years (2008, 2011)
- Third International Conference on Nuclear Power Plant Life Management for Long Term Operation, organized by IAEA
- NEI Long Term Operation/SLR Forum 2013, Keynote speaker – Chairman Macfarlane
- NEI Long Term Operation/SLR Forum 2014, Keynote speaker – Commissioner Svinicki
- NRC, EPRI involvement with IAEA for development of IGALL

# Current SLR Milestone Schedule



# SLR Roadmap

- Schedule for first SLR license approved
- Actions and deliverables
- References actions for all stakeholders
  - Industry, EPRI, DOE, NRC
  - Coordination of R&D activities
- Announcement of lead plant(s) 2015
- 1<sup>st</sup> Application(s) expected 2018

# Aging Management – a Living Process



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# Many AMPs are Based on Mature Plant Programs

XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

XI.M2 Water Chemistry

XI.M3 Reactor Head Closure Stud Bolting

XI.M4 BWR Vessel ID Attachment Welds

XI.M5 BWR Feedwater Nozzle

XI.M6 BWR Control Rod Drive Return Line Nozzle

XI.M7 BWR Stress Corrosion Cracking

XI.M9 BWR Vessel Internals

XI.M10 Boric Acid Corrosion

XI.M12 Thermal Aging Embrittlement of Cast Austenitic

Stainless Steel (CASS)

XI.M16A PWR Vessel Internals

XI.M17 Flow-Accelerated Corrosion

XI.M18 Bolting Integrity

XI.M19 Steam Generators

XI.M20 Open-Cycle Cooling Water System

XI.M21A Closed Treated Water Systems .

XI.M22 Boraflex Monitoring

XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

XI.M24 Compressed Air Monitoring

XI.M25 BWR Reactor Water Cleanup System

XI.M26 Fire Protection

XI.M27 Fire Water System

XI.M29 Aboveground Metallic Tanks

XI.M30 Fuel Oil Chemistry

XI.M31 Reactor Vessel Surveillance

XI.M32 One-Time Inspection

XI.M33 Selective Leaching

XI.M35 One-time Inspection of ASME Code Class 1 Small Bore-Piping

XI.M36 External Surfaces Monitoring of Mechanical Components

XI.M37 Flux Thimble Tube Inspection

XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

XI.M39 Lubricating Oil Analysis

XI.M40 Monitoring of Neutron-Absorbing Materials Other than Boraflex

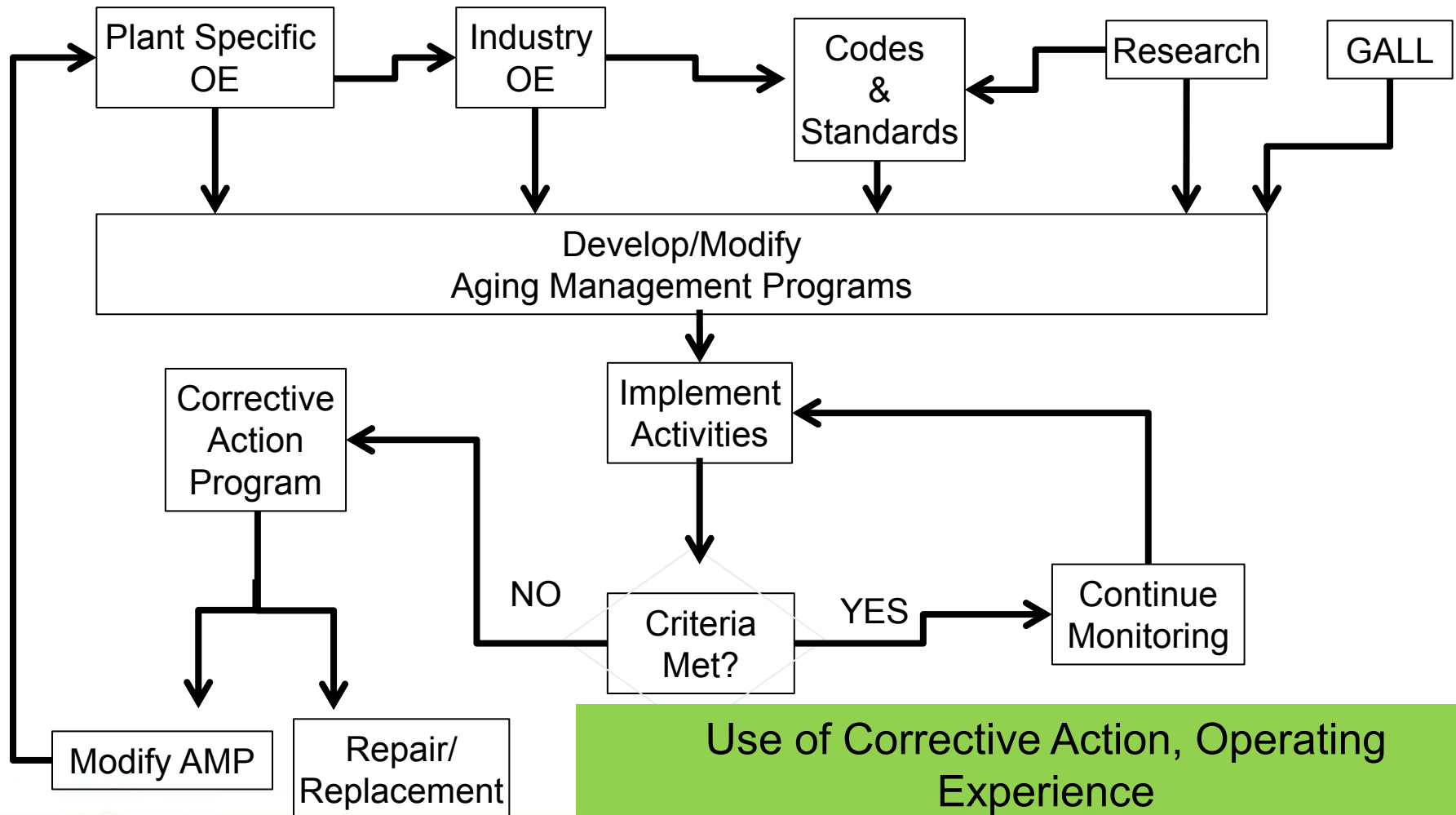
XI.M41 Buried and Underground Piping and Tanks



# License Renewal Entails a Broad View of Plant Programs(GALL 10 Elements)

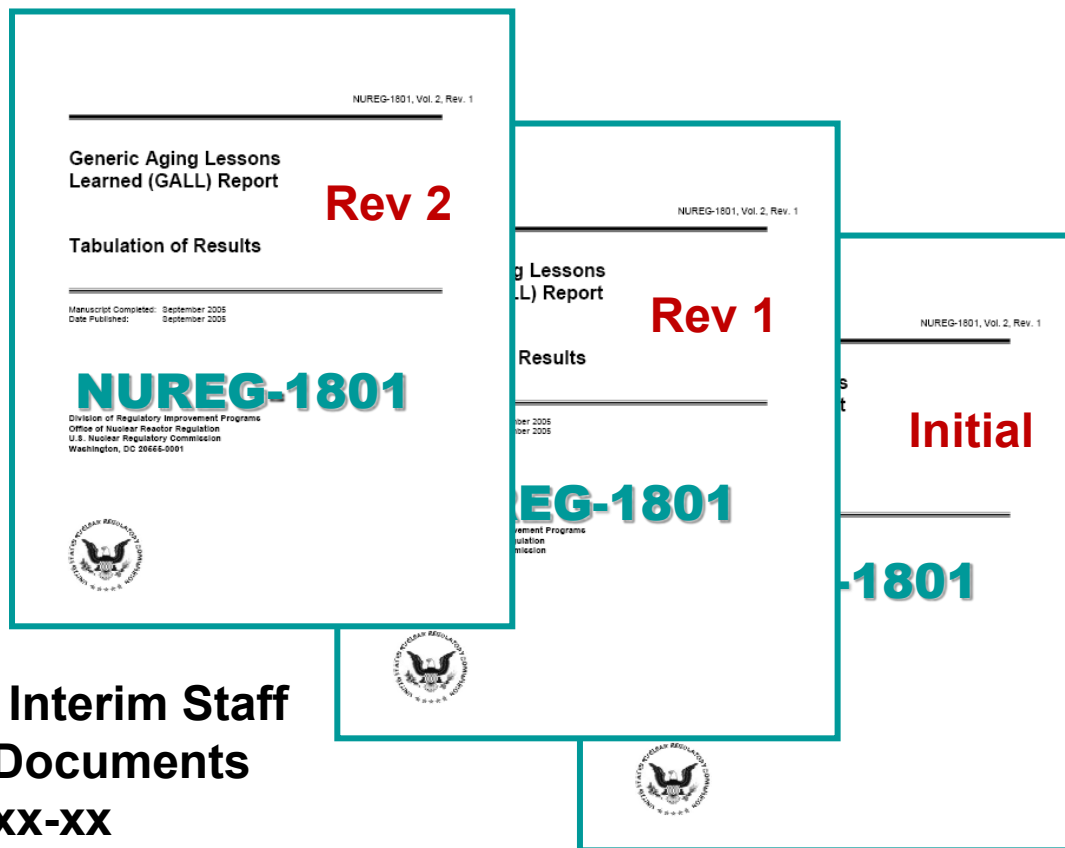
- 1. Scope of Program*
- 2. Preventive Actions*
- 3. Parameters Monitored/Inspected*
- 4. Detection of Aging Effects*
- 5. Monitoring and Trending*
- 6. Acceptance Criteria*
- 7. Corrective Actions*
- 8. Confirmation Process*
- 9. Administrative Controls*
- 10. Operating Experience*

# Developing & Maintaining Effective Aging Management Programs (AMP)



Use of Corrective Action, Operating Experience and ongoing research ensures existing AMPs remain effective for SLR

# Guidance Documents Updated Regularly



**Industry Guidance:  
Application Format  
and Content Updated  
Lessons Learned  
NEI 95-10 Rev 6  
(RG1.188)**

**Ten Active Interim Staff  
Guidance Documents  
LR-ISG-20xx-xx  
23 Previous closed ISGs**



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# Plant Inspection for Aging Management

- NRC IP 71002 LR Site Inspections
- NRC IP 71003 Post Approval Inspections
- Aging management part of normal NRC site inspection procedures and included in ROP
- SLR Audits, Nine Mile, Ginna, Robinson
  - No major deficiencies

# Detailed Analysis of SECY Paper



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# Key Principles for License Renewal

- **Current regulatory process** is adequate to ensure that the licensing basis of all operating plants provides and maintains an **acceptable level of safety** so that operation will not be detrimental to public health and safety or common defense and security
- Each plant's licensing basis is required to be **maintained during any renewal term** in the **same manner and to the same extent** as during the original licensing term

# Agree with DLR Staff Conclusions for Four Items

- License renewal process and regulations are sound and can support subsequent license renewal
- Environmental issues can be adequately addressed by the existing generic environmental impact statement (GEIS)
- Helpful for the NRC to revise its license renewal guidance (GALL, SRP) but not essential
- No need for applicants to include PRA update because no unique nexus to SLR

# Overall Concerns with Rulemaking

- Out of step with “Implementation of the Cumulative Effects of Regulation Process Changes” (SECY-12-0137)
- No significant issue, inspection finding, audit report, implementation difficulty, or operational need to implement rulemaking
- SECY claims of improved efficiency or “more predictable review process” not backed up with any cost-benefit justification or study
- Most changes suggested in SECY not unique to SLR and can be implemented without rulemaking
- For these non-safety significant issues, schedule for rulemaking may impact industry plans and NRC staff resource requirements for SLR application reviews



# Summary of SECY Proposed Changes

- NRC Staff Proposed 4 Options (SECY -14-0016):
  - # 1 – No change to existing 10 CFR 54 regulations
  - # 2 – Minor clarifications to 10 CFR 54 for LR and SLR
    - Editorial update to 10 CFR 54.4(a)(3) to Reference 10 CFR 50.61a (PTS)
    - Clarify Intent of 10 CFR 54.37(b) (NRC updates)
  - # 3 – Update 10 CFR 54 for LR and SLR
    - Define expectations of Timely Renewal (10 CFR 2.109)
    - Revise 10 CFR 54.4(a)(3) to place 10 CFR 50.54(hh) and FLEX equipment in scope of LR
  - # 4 – Rulemaking for subsequent renewal-specific changes
    - Require that Licensees effectively maintain License Renewal activities and report aging-related degradation after a license is renewed
    - Limit the time during which SLR applications can be filed
    - Require verification of continuing validity of certain original design parameters

# Option 1 – 10 CFR 54 is sound

- Part 54 anticipates further rounds of License Renewal
- Existing regulatory processes ensure safe operation
  - 10 CFR 50, Appendix B
  - Aging Management Programs (AMPs)
  - Maintenance Rule
  - ROP process
  - Design basis is maintained
- Process proven through vast experience, 73 renewed licensed, 27 reactor units in PEO
- Reliable, predictable process

## Option 2- Unnecessary Editorial Changes

- “These changes alone may not warrant resource allocation to conduct the rulemaking process” (SECY pg. 6)
- 54.37(b) can be further clarified in a Regulatory Issue Summary (RIS) if necessary
- Would apply to current renewals

# Option 3 – Unnecessary and No Unique Relevance to SLR

- Timely Renewal – Unnecessary Regulation
  - Rare event – one time
  - NRC Inspection Procedure 71013
  - Addressed through current processes
- Commission considered EP equipment in LR rule not in scope (SOC)
- 50:54(hh)(2) equipment and FLEX equipment managed by plant procedures.
- Would apply to current renewals

# Option 4 – Conflicts with Fundamental Regulatory Principles in LR Rule

I. “Explicitly require maintenance of effectiveness ... and reporting age-related degradation.”

- Existing regulatory guidance, GALL review items

- **5. *Monitoring and Trending***

- **10. *Operating Experience***

- Required by 10 CFR 50, Appendix B

- XVI. Corrective Action

Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

# Option 4 – Current Industry Initiatives Underway

- Current industry initiatives underway
  - “Use of Industry Operating Experience for Age-Related Degradation and Aging Management Programs” NEI 14-xx
  - “Aging Management Program Effectiveness” NEI 14-xx
- Not an SLR specific issue – if important, why wait 15 to 20 years to implement

# Option 4 – Significant AMP Experience

## II. Limit the Time During Which SLR Applications Can Be Filed (<20 Years)

- Many Aging Management Programs in place from beginning of plant operation
  - Program improvements made based on OE and research programs (EPRI, DOE)
  - Industry Initiatives – Buried Piping Program
- Significant AMP experience in PEO will be available across industry before 1<sup>st</sup> SLR application is submitted (>40 Reactor-years in PEO now)
- Due to significant economic uncertainty, 20 year planning horizon should be maintained

# Option 4 – Validate Original Design Parameters

- Undermines the two principles of License Renewal
- Matter of current plant operation and addressed through existing NRC Regulatory Processes
- Wasteful and inefficient to address in the SLR process and adding to cumulative effects of unnecessary regulations



# Summary

- The future of US license renewal depends on certainty in the regulatory process
- Existing License Renewal regulation provides a solid foundation for safe operation
- SLR Schedule is tight compared to first round of license renewals and may be compromised by SLR Rulemaking
- Criteria for rulemaking is not supported by increase in safety nor efficiency improvements



# **EPRI Long Term Operations Program R&D for Aging Management**

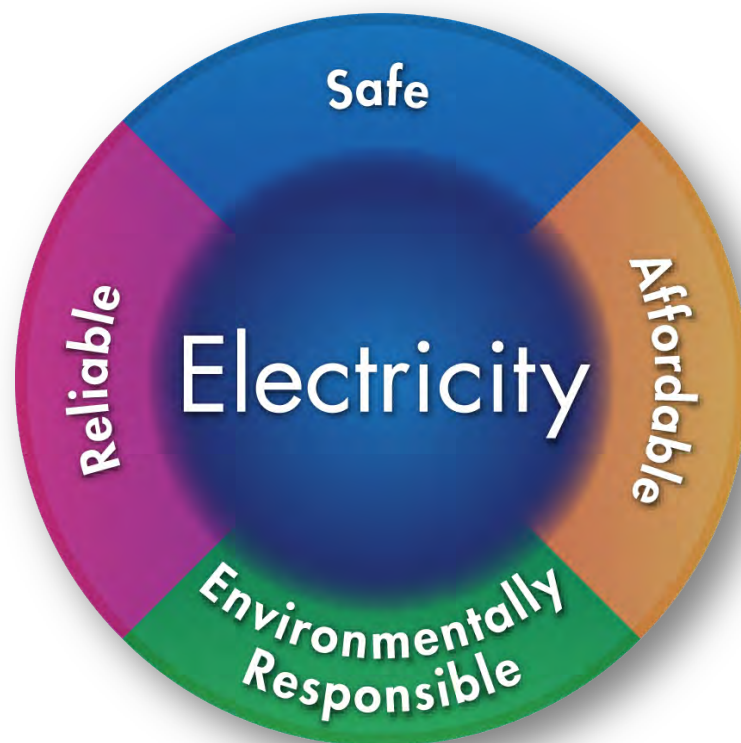
**Sherry Bernhoft**  
EPRI, Program Manager

**ACRS**  
**Plant License Renewal Subcommittee Meeting**  
April 8, 2014

# Together...Shaping the Future of Electricity

## EPRI's Mission

To conduct research, development and demonstration on key issues facing the electricity sector on behalf of our members, energy stakeholders, and society



# Three Key Aspects of EPRI

## Independent

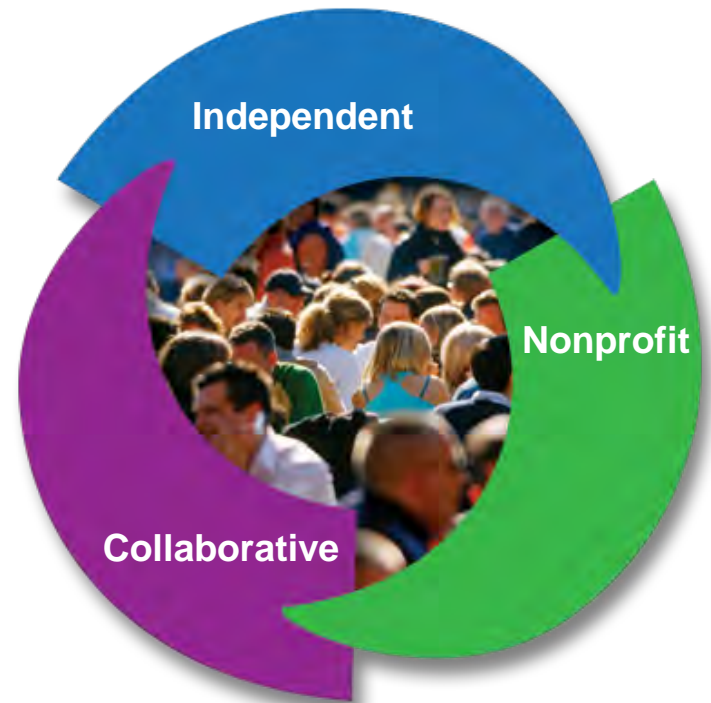
Objective, scientifically based results address reliability, efficiency, affordability, health, safety and the environment

## Nonprofit

Chartered to serve the public benefit

## Collaborative

Bring together scientists, engineers, academic researchers, industry experts



# Nuclear Sector Core Drivers

Maximize the  
safe utilization  
of existing  
nuclear assets

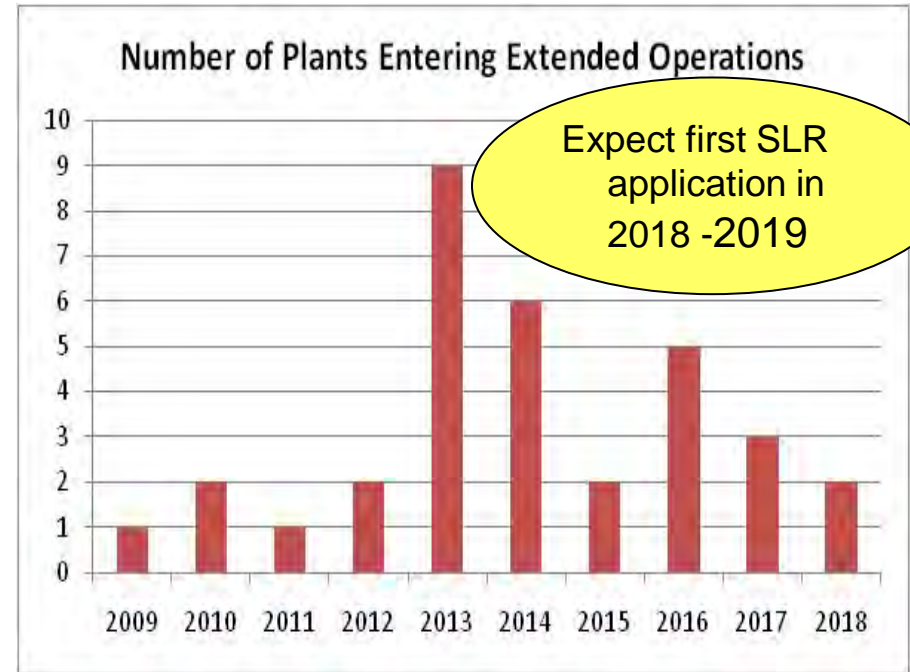
Enable the  
deployment of  
advanced nuclear  
technologies



**Long-term sustainability of nuclear energy**

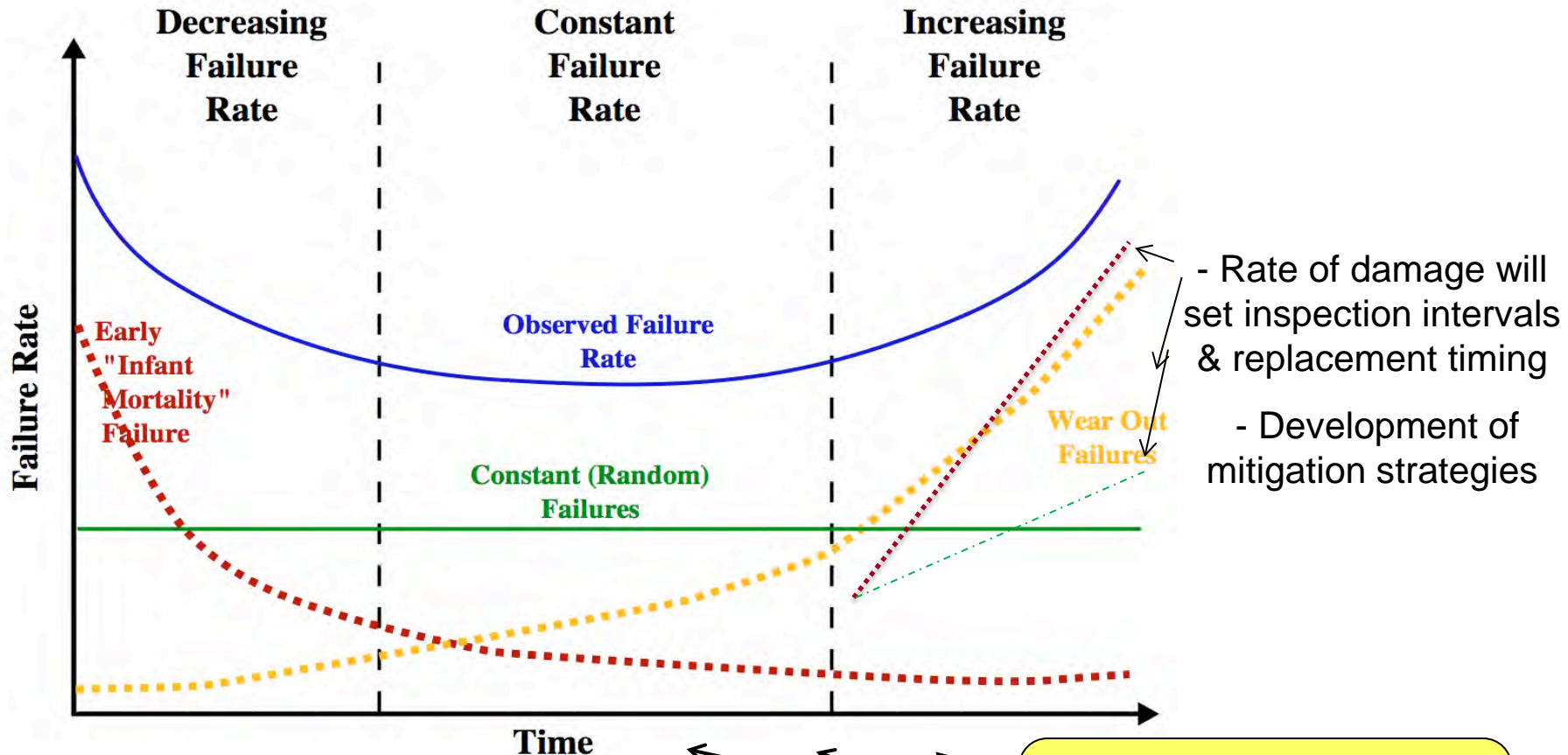
# EPRI LTO Program Goals and Objectives

- Technical basis for safe, reliable plant operation through extended lifetime
- Demonstrated technologies to support long-term plant management
- Research projects integrated with other EPRI programs
- External collaboration: DOE, NRC Research, EDF, NEI, Owners Groups and IAEA





# Aging Management



Typical Bathtub Curve (source: Wikipedia)

**What happens with long-term operations?**

# Basis for Implementation of Aging Management

- R&D to understand aging degradation
  - Mechanism and failure modes
  - Initiation and growth rates
  - Inspection and Evaluation GLs
- Inspection methods
  - Detection and measurement
  - Non destructive examination and qualification
- Mitigation strategies
  - Chemistry
  - Stress relieving techniques
  - Weld overlays
- Condition Monitoring
  - On-line monitoring
  - In-field detection
- Prediction of Remaining Useful Life
  - Health Monitoring software and algorithms
- Repair & Replacement Decisions
  - Life Cycle Management GLs
  - Advanced welding for irradiated materials
  - Integrated Life Cycle Management (ILCM)





# EPRI LTO R&D Focus Areas

- **Aging Management**
  - Primary system metals, welds and piping
  - Reactor pressure vessel
  - Steam Generators
  - Electrical cables
  - Concrete and containment structures
  - Buried piping
  - Coatings
  - **Flow Accelerated Corrosion (FAC)**
- *Opportunities for Modernization*
  - Advanced Instrumentation & Controls
  - Advanced risks and PRA
  - Advanced welding for irradiated materials
  - Non-destructive testing methodologies (NDE)
- *Enabling technologies*
  - Pilot plant projects and demonstrations
  - Integrated Life Cycle Management



# EPRI R&D Projects – Cross Referenced to GALL, Rev 2

- **EPRI Report 3002000576**  
“Assessment of R&D Supporting Aging Management Programs for Long-Term Operations”
- Report cross-references the EPRI R&D Projects to the AMPs
- Three categories of AMPs
  - On-going long-term R&D
  - Established Programs
  - One-time plant specific inspections

## Examples:

- On-going long-term R&D (8)
  - Effects of irradiation
  - Thermal effects
  - Reactor Pressure Vessel embrittlement
- Established Programs (20)
  - Chemistry
  - Steam Generator Inspections
  - FAC
- Plant Specific (22)
  - Fuel oil
  - Fire Protection System

# Category 1 Summary – On-Going R&D for LTO

GALL AMP ID	AMP Name	Potential LTO Impact on AMP
<b>XI.M9</b>	BWR Vessel Internals	Irradiation and environmental effects on material performance
<b>XI.M11B</b>	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	Environmental effects on material performance
<b>XI.M12</b>	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal aging and possible irradiation effects on material performance
<b>XI.M16A</b>	PWR Vessel Internals	Irradiation and environmental effects on material
<b>X.M31</b>	Reactor Vessel Surveillance	Neutron fluence on reactor pressure vessel materials
<b>XI.S6</b>	Structures Monitoring	ASR susceptibility and irradiation effects on material properties
<b>XI.E1</b>	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Combined effects of thermal and radiation exposure
<b>XI.E2</b>	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used In Instrumentation Circuits	Combined effects of thermal and radiation exposure



# R&D for Aging Management

## Category 1 Aging Management Programs:

- BWR Vessel Internals

- Cracking of Ni-Alloys

- Thermal Aging of CASS

- PWR Vessel Internals

- Reactor Pressure Vessel Surveillance

- Electrical Cables

- Concrete and Containment Structure



# **RCS Metals**

# Industry Materials Issue Management

- Industry spends > \$50M per year on Materials
- Industry Initiative NEI 03-08
  - Proactive management of material degradation issues
  - Communication of OE to Industry and NRC
- EPRI Program Areas:
  - BWR Vessels Internal Program (BWRVIP)
  - Materials Reliability Program (MRP – for PWRs)
  - Steam Generator Management Program (SGMP)
  - Non-Destructive Examination Program (NDE)
  - Primary System Corrosion Research (PSCR)
  - Water Chemistry Control
  - Welding & Repair Technology (WRTC)
- Extensive International collaboration

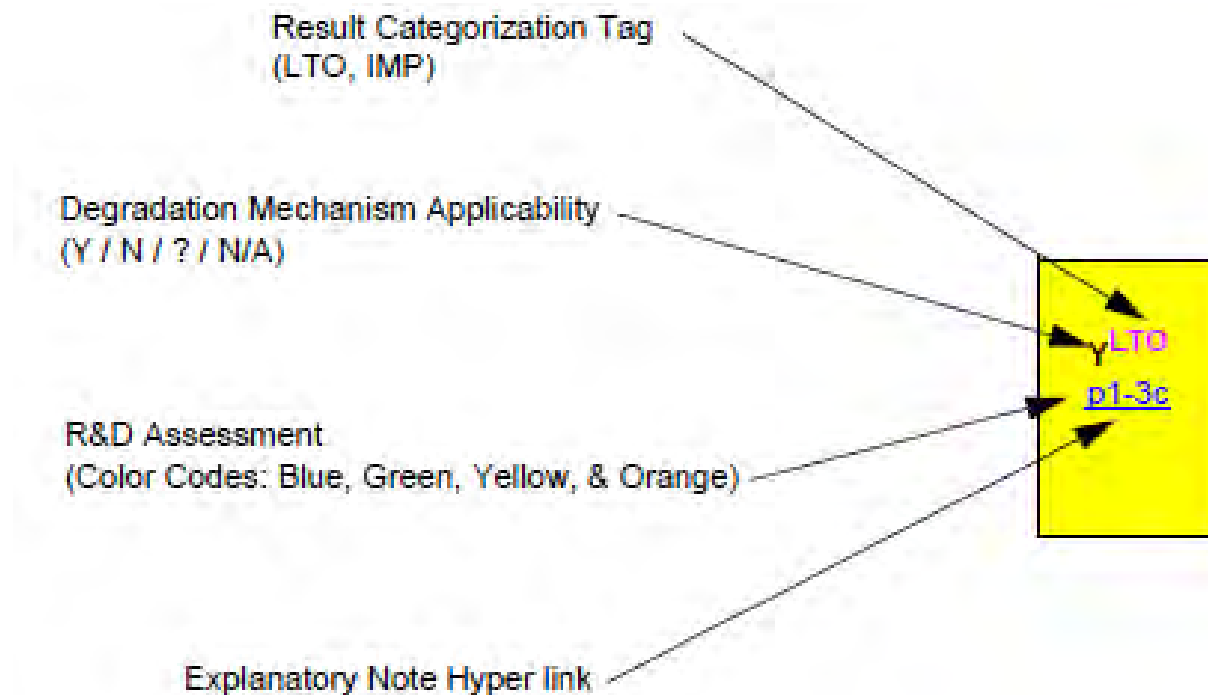
# Integrated Materials Issues Strategic Plan

- Systematic Approach to Managing Materials
  - Identify vulnerabilities
  - Assess condition (inspect & evaluate)
  - Mitigate degradation mechanism
  - Repair or replace as required
- Approach Used:
  - Materials Degradation Matrix (MDM) and Issue Management Tables (IMTs)
  - Updated on a routine frequency
  - Expert solicitation

In 2010 LTO 'Flags' were added to the MDM



# Color Chart Presentation of MDM Results



<b>Blue</b>	lack of data to establish degradation applicability
<b>Green</b>	well characterized, little or no additional research is needed
<b>Yellow</b>	ongoing R&D efforts to resolve uncertainties in near-term time frame
<b>Orange</b>	insufficient R&D to resolve uncertainties in a near-term time frame



# Example MDM Results-- BWR Reactor Internals

Table 4-2: BWR Reactor Vessel Internals

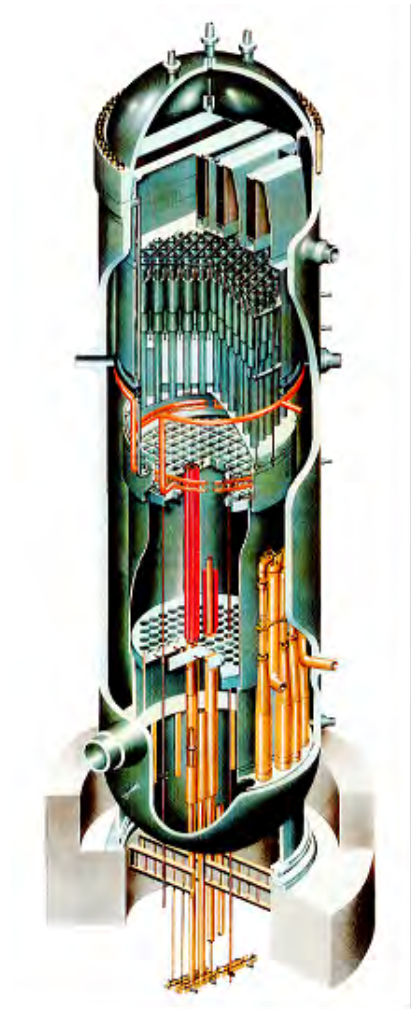
MATERIAL	DEGRADATION MODE													
	Corrosion				Wear	SCC		Fatigue		Reduction in Fract Properties		Irradiation Effects		
	Wstg	Pitting	FAC	Foul	Wear	IG/TG	IA	HC	EAf	Th	Env	Emb	VS	IC / SR
STRUCTURAL COMPONENTS & WELDS														
<u>SS: 300 Series Base Metal &amp; HAZ</u>	N	N	N	Y b2-4a	YIMP b2-5a	Y b2-6a	Y LTO b2-7a	YIMP b2-8a	Y LTO b2-9a	N	Y b2-11a	Y b2-12a	N	Y b2-14a
<u>SS: Welds &amp; Clad</u>	N	N	N	Y b2-4b	YIMP b2-5b	Y b2-6b	Y LTO b2-7b	YIMP b2-8b	Y LTO b2-9b	Y b2-10b	Y b2-11b	Y b2-12b	N	Y b2-14b
<u>Cast Austenitic Stainless Steel</u>	N	N	N	N	N	Y b2-6c	Y LTO b2-7c	YIMP b2-8c	Y LTO b2-9c	YIMP b2-10c	Y b2-11c	Y LTO b2-12c	N	N
<u>Ni-Alloy: A600 Base Metal &amp; HAZ</u>	N	N	N	N	N	Y LTO b2-6d	N	YIMP b2-8d	Y LTO b2-9d	N	Y b2-11d	N	N	N
<u>Ni-Alloy: A182 Welds &amp; Clad</u>	N	N	N	N	N	Y LTO b2-6e	N LTO b2-7e	YIMP b2-8e	Y LTO b2-9e	N	Y b2-11e	N	N	N
<u>Ni-Alloy: A82 Welds &amp; Clad</u>	N	N	N	N	N	Y LTO b2-6f	N LTO b2-7f	YIMP b2-8f	Y LTO b2-9f	N	Y b2-11f	N	N	N
FASTENERS & HARDWARE														
<u>SS: 300 Series</u>	N	N	N	N	N	Y b2-6g	Y b2-7g	YIMP b2-8g	Y LTO b2-9g	N	Y b2-11g	Y b2-12g	N	YIMP b2-14g
<u>SS: XM-19</u>	N	N	N	N	N	Y b2-6h	Y LTO b2-7h	YIMP b2-8h	Y LTO b2-9h	N	Y b2-11h	Y LTO b2-12h	N	Y LTO b2-14h
<u>Ni-Alloy: X-750</u>	N	N	N	N	N	Y b2-6i	Y LTO b2-7i	YIMP b2-8i	Y LTO b2-9i	N	Y b2-11i	Y LTO b2-12i	N	Y LTO b2-14i

# Materials Degradation Issues Identified for LTO

- Increased neutron fluence effects
  - RPV embrittlement
  - Core internals
    - Threshold stress for IASCC initiation
    - Reduction in toughness properties
    - Void swelling
  - Impact on core periphery materials (fluence and temperature)
- Late life Stress Corrosion Cracking (SCC) initiation
- Fatigue usage
  - Increased fatigue cycles
  - Environmental effects on fracture properties

# XI.M9 BWR Vessel Internals

- BWR Vessel Internals Program (BWRVIP)
- Issue: Prediction of SCC initiation and growth trends with increased neutron fluence and exposure to the environment
- BWRVIP is ***a living issue program*** with utility and OEM (GE) membership
  - Extensive R&D has been completed on modeling and understanding IASCC in the BWR environment
  - The AMP on reactor internals references 32 BWRVIP documents
  - BWRVIP documents are updated based on Operating Experience, inspection results and research



# BWRVIP Guidelines to Manage Degradation

<b><u>Component</u></b>	<b><u>Assessment (I&amp;E) Guidelines</u></b>	<b><u>Inspection Guidelines</u></b>	<b><u>Repair/Replace Design Criteria</u></b>	<b><u>Mitigation Recommendations</u></b>
Core shroud	BWRVIP-76, R1	BWRVIP-03	BWRVIP-02-A/-04-A	BWRVIP-62, R1/-190
Core spray	BWRVIP-18, R2	BWRVIP-03	BWRVIP-16-A/-19-A/-34	N/A
Shroud support	BWRVIP-38	BWRVIP-03	BWRVIP-52-A	BWRVIP-62, R1/-190
Top Guide	BWRVIP-26-A	BWRVIP-03	BWRVIP-50-A	N/A
Core Plate	BWRVIP-25	BWRVIP-03	BWRVIP-50-A	BWRVIP-62, R1/-190
SLC	BWRVIP-27-A	BWRVIP-03	BWRVIP-53-A	BWRVIP-62, R1/-190
Jet pump assembly	BWRVIP-41	BWRVIP-03	BWRVIP-51-A	BWRVIP-62, R1/-190
CRD guide/stub tube	BWRVIP-47-A	BWRVIP-03	BWRVIP-17/-55-A/-58-A	BWRVIP-62, R1/-190
In-core housing/dry tube	BWRVIP-47-A	BWRVIP-03	BWRVIP-17/-55-A	BWRVIP-62, R1/-190
Instrument penetrations	BWRVIP-49-A	BWRVIP-03	BWRVIP-57-A	BWRVIP-62, R1/-190
LPCI coupling	BWRVIP-42-A	BWRVIP-03	BWRVIP-56-A	N/A
Vessel ID brackets	BWRVIP-48-A	BWRVIP-03	BWRVIP-52-A	BWRVIP-62, R1/-190
Reactor pressure vessel	BWRVIP-74-A	N/A	N/A	N/A
Primary system piping	BWVIP-75-A	N/A	N/A	BWRVIP-62, R1/-190
Steam dryer	BWRVIP-139-A	BWRVIP-03	BWRVIP-181	N/A
Access hole cover	BWRVIP-180	BWRVIP-03	TBD	BWRVIP-62-, R1-190
Top guide grid beam	BWRVIP-183	BWRVIP-03	BWRVIP-50-A	N/A
Bottom head drain line	BWRVIP-205	N/A	BWRVIP-208	N/A

# BWRVIP Ongoing and Future Efforts

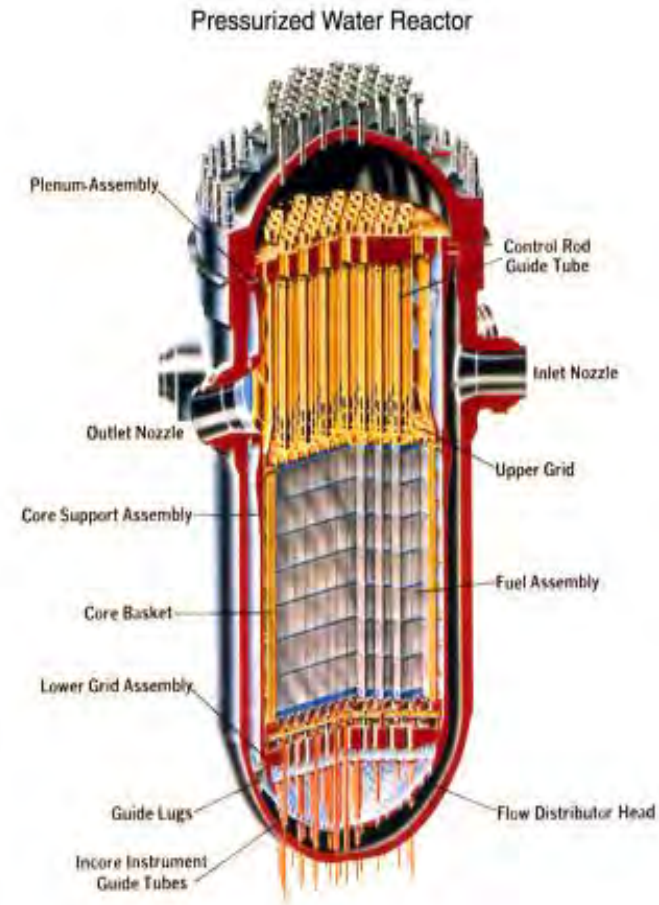
- Continued international collaboration to develop fundamental mechanistic understanding of IASCC
  - Reduce uncertainties in current modeling
  - Improved correlations for crack-growth rate studies
  - Continued support for mitigation, repair and replacement strategies
- Harvesting of materials from retired plants to assess fracture toughness
  - Zorita materials work is co-funded with NRC Research
- Plant shroud material sample testing

The BWRVIP technical reports are updated based on OE, inspection results and research



# XI.M11B Cracking of Ni-Alloy

- Materials Reliability Program (MRP)
- Issue: PWR nickel-alloy cracks and boric acid that may leak from such cracks
- MRP **is a living issue program** with utility membership. Work is reflected in the ASME Section XI Code Cases:
  - N-722: Visual examinations
  - N-729-4: RPV head penetration examination
  - N-770-2: PWR butt-weld examinations
- MRP has assessed the impacts of leakage on wastage rates
- NDE technique has been developed for head penetrations
- MRP reports have have been published covering the crack-growth rate models and incorporated into the ASME Code, Section XI



# Ongoing/Future Efforts on Ni-Based Alloys

- Future updates on crack-growth rate models
- Peening is available as a mitigation tool for PWSCC
- Bottom mounted nozzle (BMN) work continues including evaluation of a plant boat sample
- Future R&D on BMN inspection technology
- Alloy 690 initiation and cracking testing

R&D will continue to provide additional insights to refine the crack growth rate models

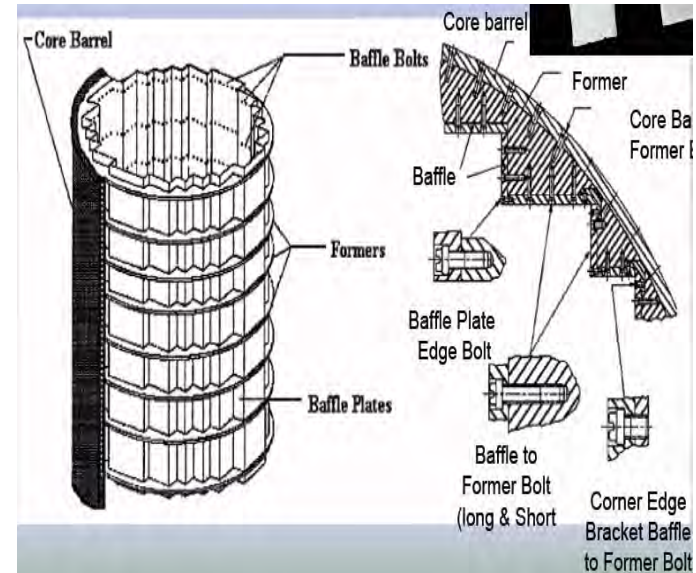
# XI.M12 Thermal Aging Embrittlement of CASS

- Issue: Thermal aging of pipe and components outside RPV
- Irradiation embrittlement is addressed for the PWRs under XI.16A and BWRs under XI.M9 internals aging management programs
- EPRI technical reports for aging management of CASS
  - Thermal Aging in PWRs
  - Thermal Aging and Neutron Embrittlement
  - Flaw Tolerance Evaluation for CASS
- A joint BWRVIP-MRP working group formed to address:
  - Screening criteria
  - Evaluate uncertainties
  - Evaluate fracture parameters
  - Interacting with the NRC staff on guidance development



# XI.M16A PWR Vessel Internals

- Materials Reliability Program
- Issue:  
Prediction of IASCC and void swelling with increased fluence levels
- MRP-227-A provides a comprehensive examination program for PWR internals
  - Evaluation acceptance criteria methodology in WCAP-17096
  - Not formally in the GALL report but the NRC has developed an Interim Staff Guidance
- Supporting MRP reports:
  - Model for IASCC
  - Thermal Aging and Neutron Embrittlement Assessments
  - Void Swelling Studies



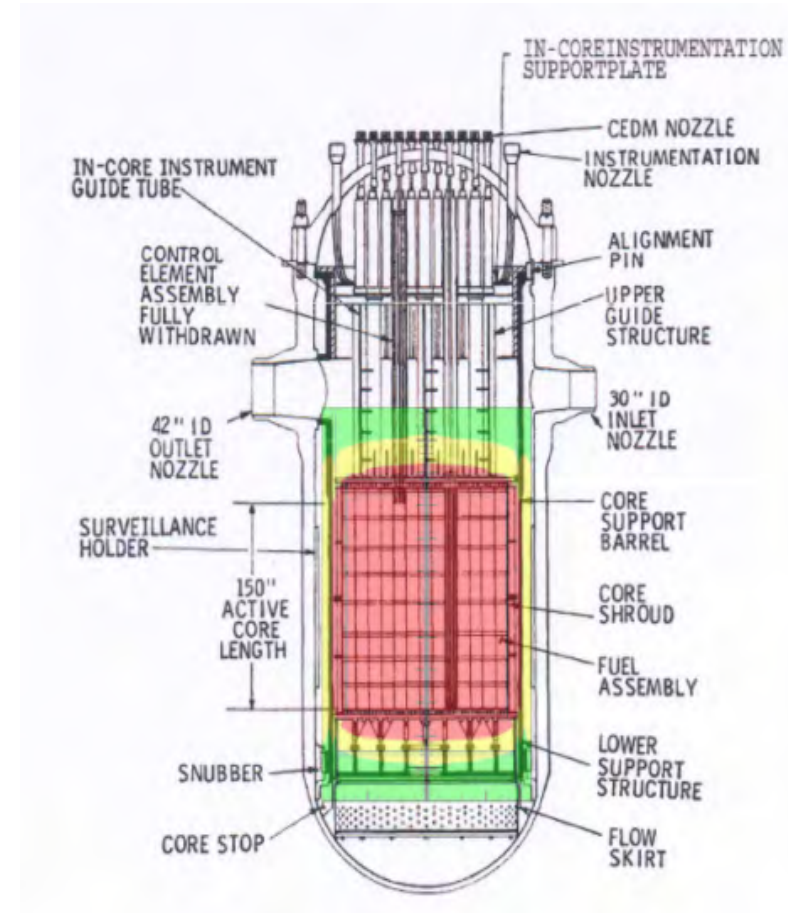
# Ongoing/Future Efforts on PWR Internals

- Revision to MRP-227-A to incorporate additional research results, new guide card wear criteria and initial round of inspection results
- Zorita harvested materials testing
- GONDOLÉ void swelling
- Halden crack-growth rate work
- IASCC testing on Baffle Former Bolts

MRP reports based on R&D and OE exists to provide the technical basis for Aging Management and are in the NRC ISG

# XI.M31 Reactor Vessel Surveillance

- Issue: Need to monitor fracture toughness of the RPV and nozzles due to irradiation
- BWRVIP Integrated Surveillance Program (ISP)
- MRP reports:
  - RPV Integrity Primer
  - Embrittlement Trend Correlation Master Curve
  - Static Tensile Testing of Pressure Vessel



# Ongoing/Future Efforts on RPV

- Extension or replacement of the BWR ISP
- PWR Coordinated RV Surveillance Program
- PWR Supplemental Surveillance Program (PSSP)
- Atomic Probe Tomography test of irradiated samples
- MRP and PWROG will evaluate:
  - Impacts for components in the extended beltline weld region

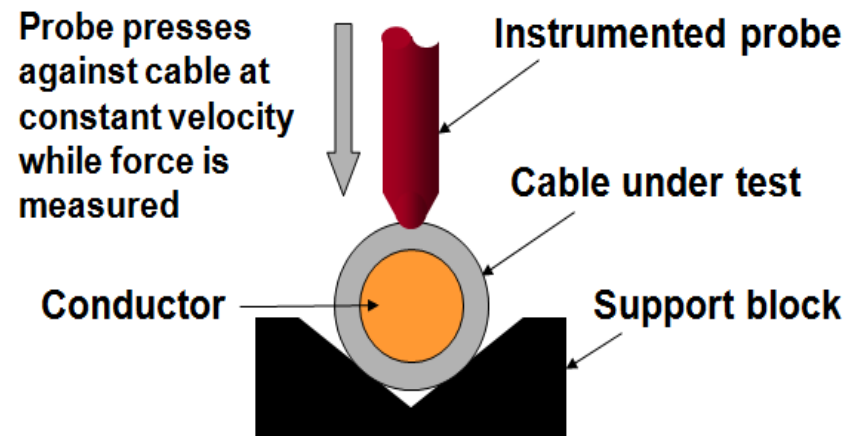
EPRI reports based on R&D and OE exists to provide the technical basis for Aging Management



# Electrical Cables

# XI.E1 and XI.E2 Insulation Materials for Cables

- EPRI Plant Engineering
- Issue: Thermal and radiation exposure of the cable insulation materials
- EPRI Cable Aging Management is a **living issue program** with previous extensive R&D efforts on cable aging management
  - License Renewal Electrical Handbook
  - Cable Aging Reports
  - MV Aging Management Guidelines
  - Life Cycle Management Planning Source Books
  - Multiple reports on results of forensic testing on reported cable failures





# Ongoing/Future Efforts for Cable R&D

- Presentation to NRC on cable R&D for LTO – 4/30/2014
- Integrated DOE-LWRS, EPRI and NRC RES roadmap
- Submergence
  - On-going work based on operating experience
- Material degradation and harvesting of field aged cables
  - Developing harvesting guidelines
- Condition monitoring
- Improved life-time predictions
  - Correlation to actual in-plant temperature and radiation levels
- Develop guidelines for lead plant support with SLR
- Tool box for cable aging management



# **Concrete and Containment Structure**



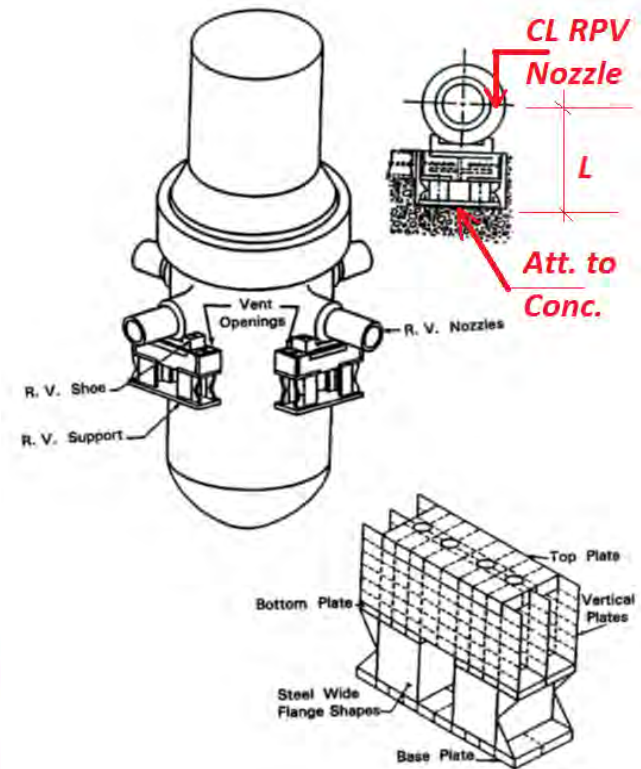
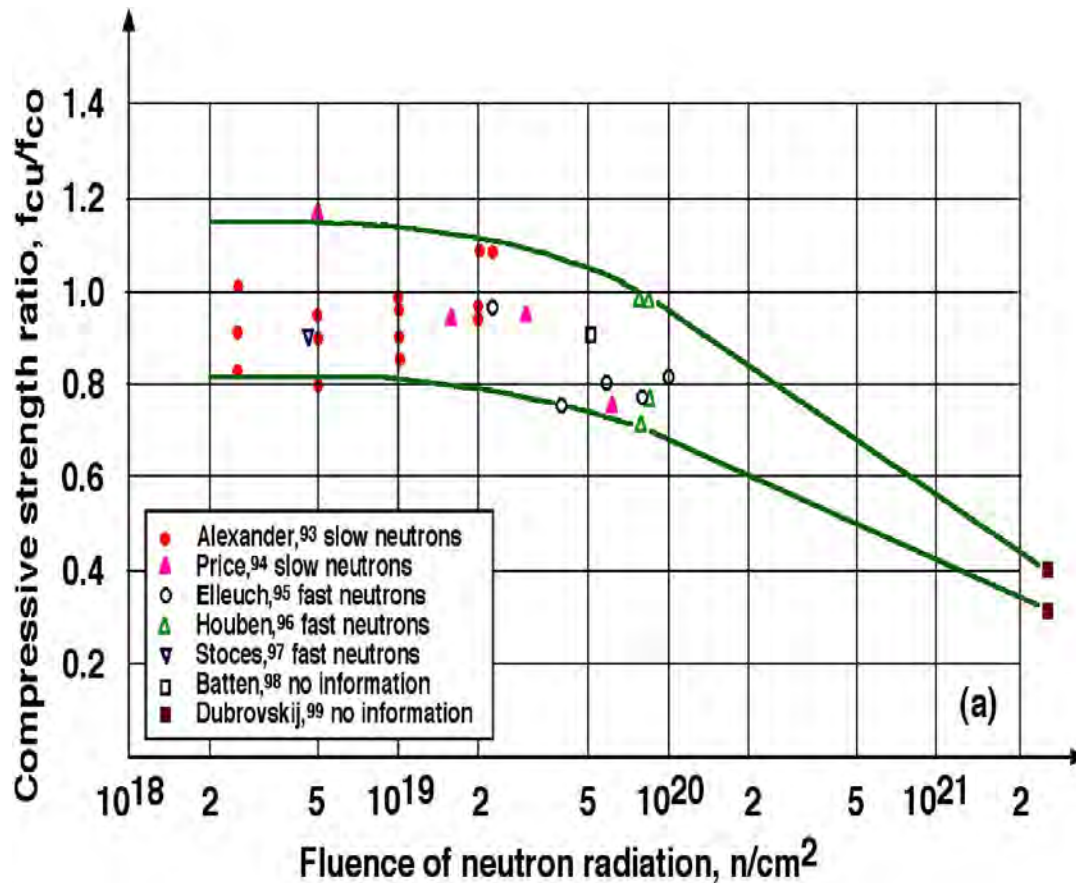
# XI.S6 Structural Monitoring



- Concrete R&D for LTO presented to NRC December 2013
- 2010 prioritized Issue Management Table
- 2012 formed a utility member Advisory Group
- Issues:
  - Impact of Alkali silica reaction (ASR) on structural integrity
  - Impacts of irradiation and gamma heating
  - Creep
- Projects
  - Extensive data collection completed regarding irradiation effects on concrete
  - ASR technical support
  - Mechanistic model of Boric Acid attack on Spent Fuel Pools

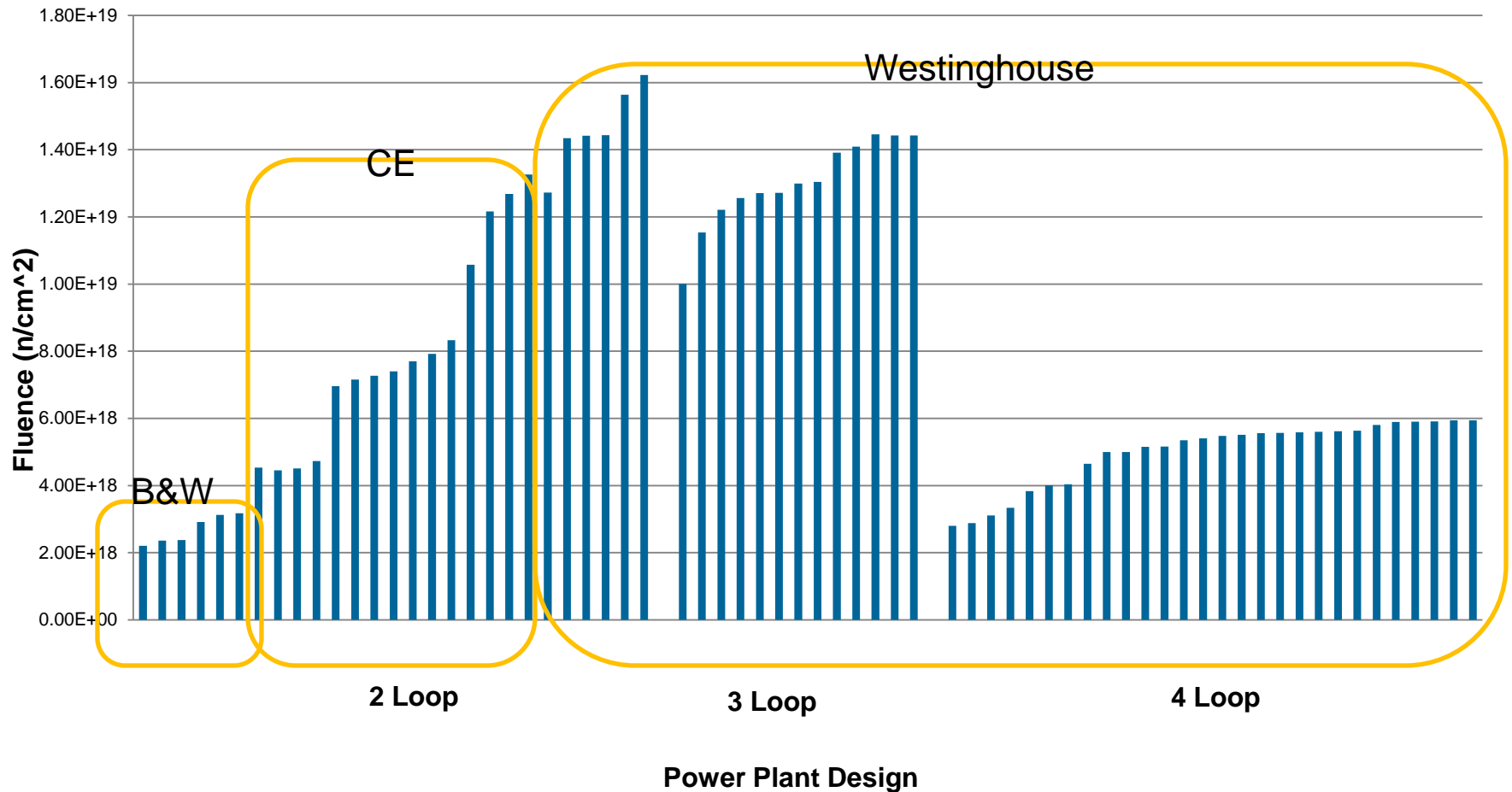
# Irradiation Damage In Concrete – Previous Work

- Hilsdorf Curve – Effect of neutron irradiation on compressive strength



# PWR 1T Fluence for 80 y Operation ( $E > 1$ MeV)

Select W 73.6 EFPY 1T Fluence Values (PWRs)



# Ongoing/Future Efforts for Concrete R&D

- Integrated DOE-LWRS and EPRI Roadmap
- Alkali Silica Reactions (ASR)
  - Mapping of potential at-risk aggregates
  - Testing method and NDE development
  - LWRS has lead on mechanistic model and structural integrity
- Irradiation and gamma heating effects
  - Completed extensive literature search
  - Thermal and accelerated radiation testing in 2014
- Creep Fatigue
  - Large database from Department of Transportation
  - Application to NPP civil structures
- Boric Acid Impacts on SFPs
  - Mechanistic models of BA attach on concrete and rebar being developed
- Tool box for concrete and concrete structure repairs



# R&D for Aging Management

Category 2 Aging Management Programs - Examples:

- Steam Generators

- Buried and Underground Piping & Tanks

- Flow Accelerated Corrosion

- Water Chemistry

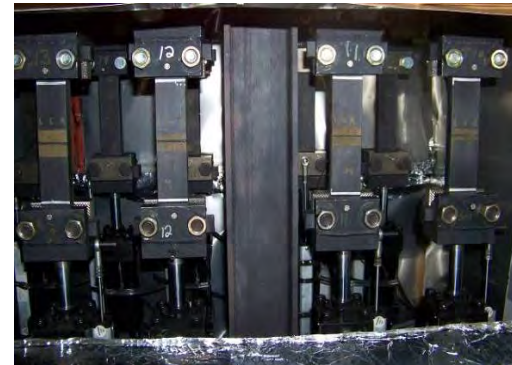
# XI.M 19 Steam Generator Program

- Utilities are required by Technical Specifications to establish a steam generator program
  - All US utility programs are modeled after NEI 97-06 which references the following six EPRI SGMP guideline documents
    - Steam Generator Integrity Assessment Guidelines
    - Steam Generator In-Situ Pressure Test Guidelines
    - Steam Generator Examination Guidelines
    - Steam Generator Primary-to-Secondary Leak Guidelines
    - PWR Primary Water Chemistry Guidelines
    - PWR Secondary Water Chemistry Guidelines
- These guidelines incorporate a balance of prevention, mitigation, inspection, evaluation, repair and leakage monitoring
- These same 6 guidelines are referenced in the GALL (XI.M 19)



# XI.M41 Buried and Underground Piping and Tanks

- Industry Initiative developed in response to operating experience
  - Implementation managed by NEI 09-14
- Utility Implementation
  - Programs developed
  - Inspections in progress
  - Long range asset management plans being developed
- Continuing EPRI R&D Projects (Buried Pipe, Tanks, Cathodic Protection, and Coatings)
  - Programmatic support and Guidance
  - Corrosion analysis
  - Inspection methodology advancements
  - Mitigation Strategies
  - Repair and replacement options



# XI.M17 Flow Accelerated Corrosion (FAC)

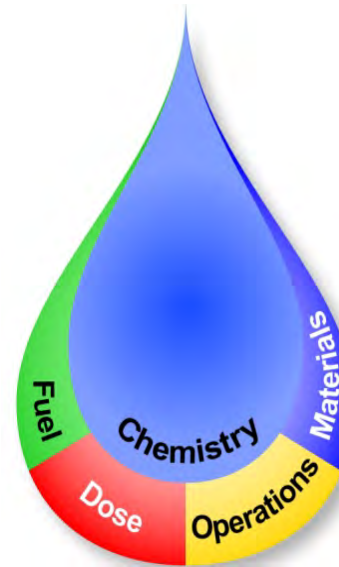
- Industry Programs developed in response to operating experience
  - Implementation managed by NRC GL 89-08
  - Programmatic Guidance in EPRI NSAC-202L
- Utility Implementation
  - Mature Programs
  - Long history of Inspections
  - High Wear Systems replaced with resistant materials
  - Operating experiences shared in active industry user's group (CHUG)
- Continuing EPRI R&D Projects
  - Programmatic Optimization
  - Knowledge Transfer
  - FAC and Erosion analysis
  - Inspection methodology advancements





# XI.M2 Water Chemistry

- Water Chemistry Guidelines are a part of NEI 03-08
- Goals:
  - Materials integrity and mitigations of corrosion
  - Fuel reliability and performance
  - Radiation dose control
  - Plant-specific optimization
- GL Updates and revisions
  - Based on operating experience, US and International
  - Recent R&D
  - Inspection results
  - Continuous improvements



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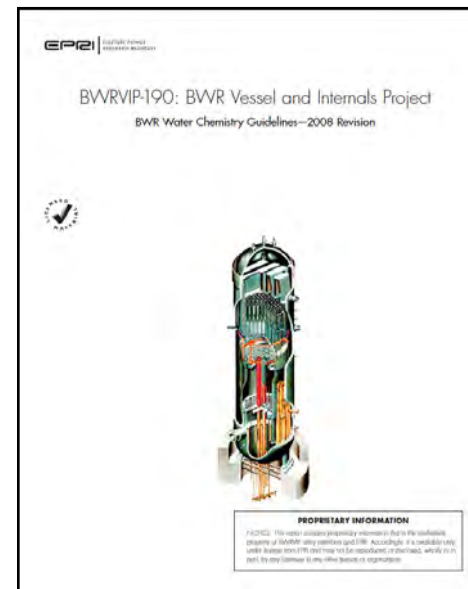
Pressurized Water Reactor Primary Water  
Chemistry Guidelines

Volume 1, Revision 6



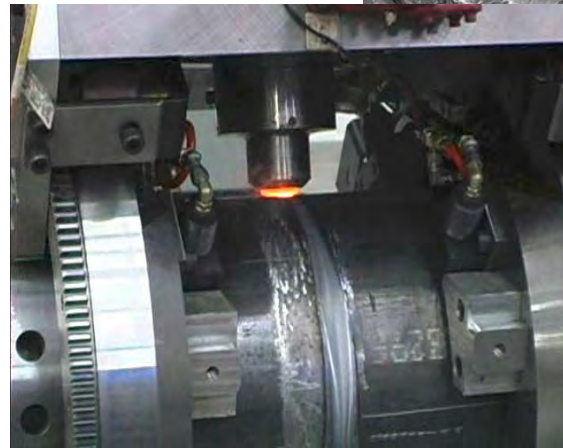
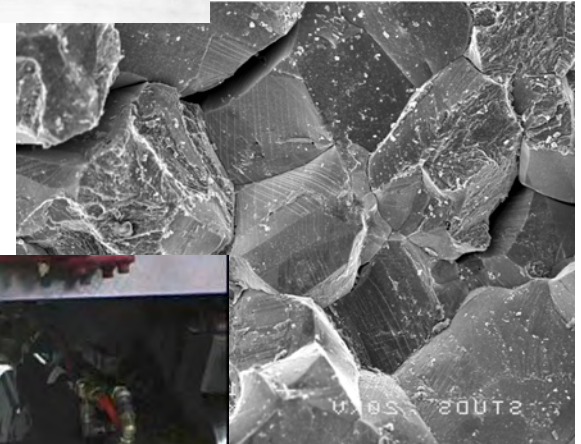
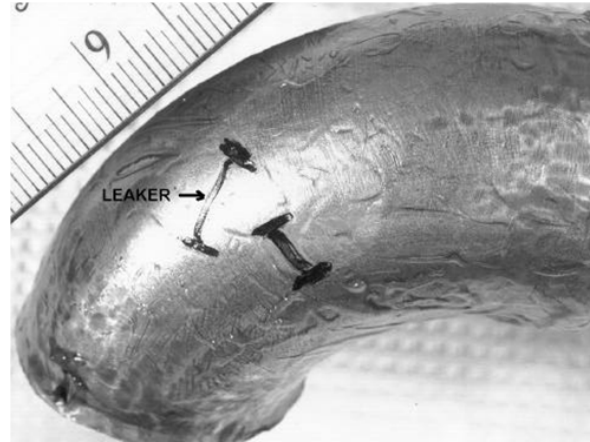
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# Summary – Technical Basis for Robust Aging Management

- R&D to understand aging degradation
- Inspection methods
- Mitigation strategies
- Condition Monitoring
- Prediction of Remaining Useful Life
- Repair & Replacement Decisions





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**ENERGY**

**Nuclear Energy**

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## **Light Water Reactor Sustainability (LWRS)**

Richard Reister, LWRS Program Manager

Office of Light Water Reactor Technologies  
Office of Nuclear Energy  
U.S. Department of Energy

April 8, 2014



# Goals and Objectives

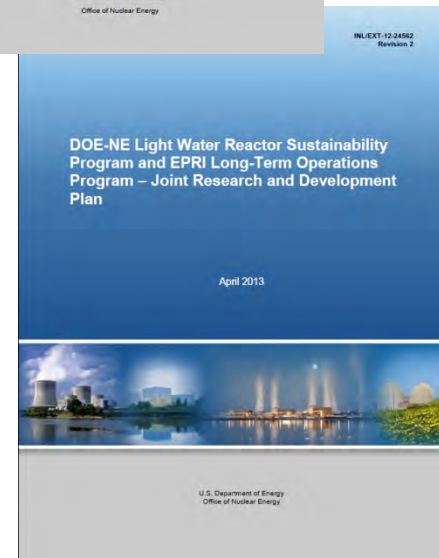
## ■ NE R&D Objective

- Develop technologies and other solutions that can improve the reliability, sustain the safety, and extend the life of current reactors

## ■ Program Goals

- Develop the fundamental scientific basis to understand, predict, and measure changes in materials and systems, structures, and components (SSCs) as they age in environments associated with continued long-term operations of the existing reactors
- Apply this fundamental knowledge to develop and demonstrate methods and technologies that support safe and economical long-term operation of existing reactors
- Research new technologies to address enhanced plant performance, economics, and safety.

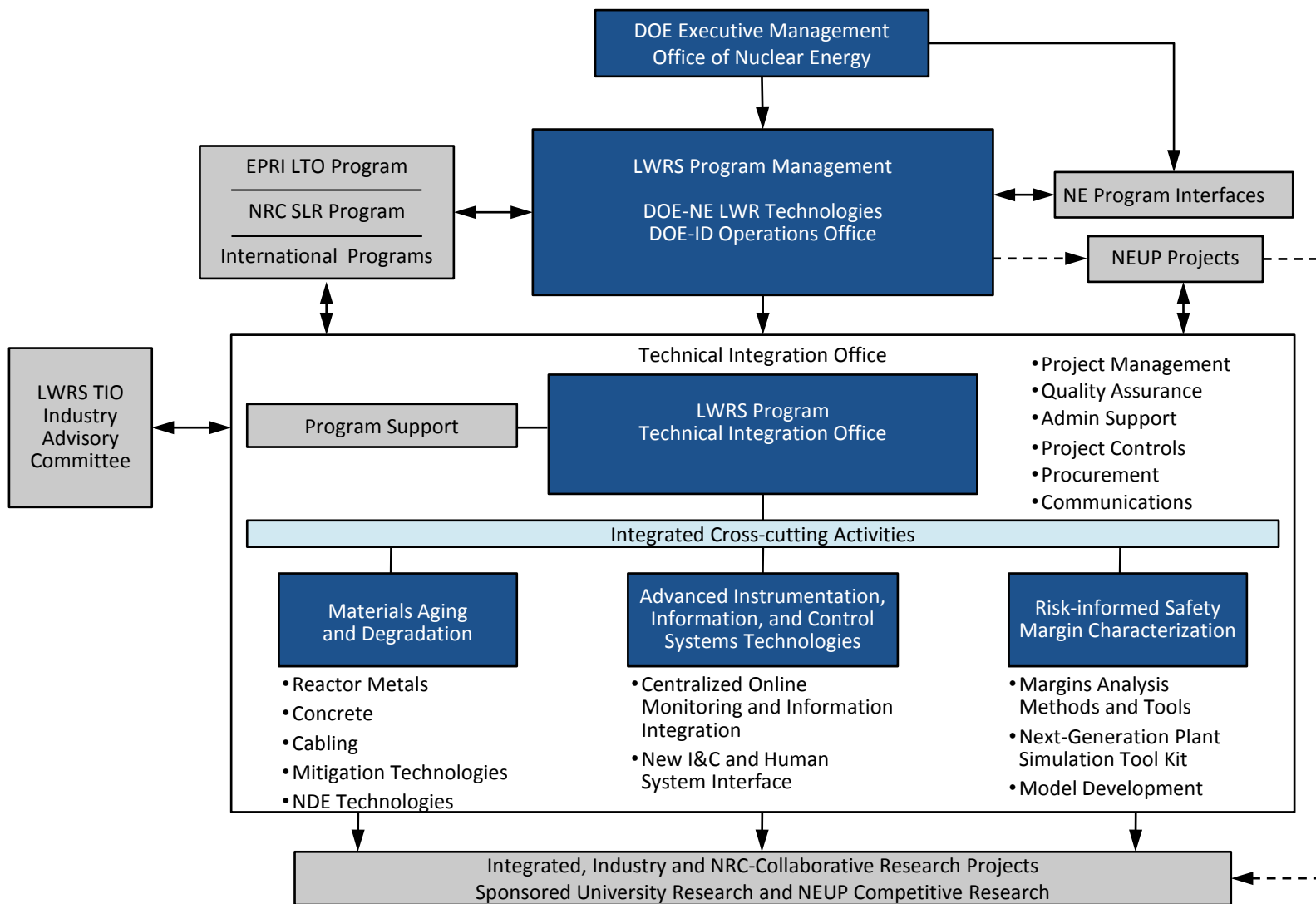
**Program Plans Available on web site: [inl.gov/lwrs](http://inl.gov/lwrs)**







# LWRS Program Organization





# Advanced Instrumentation, Information, and Control (II&C) Systems Technologies

- Address long-term aging and reliability concerns of existing II&C technologies and develop and test new technologies
- Establish a strategy to implement long-term modernization of II&C systems.
- Need to develop the scientific and technical bases to support safe and efficient plant II&C modernization.





# Risk-Informed Safety Margin Characterization (RISMC)

## ■ Margins Analysis Techniques

- Develop techniques to conduct margins analysis, including methodology for carrying out simulation-based studies of margin

## ■ Simulation components of the RISMC Toolkit

- RELAP-7
  - Systems code that will simulate behavior at the plant level
  - Advanced computational tools and techniques to allow faster and more accurate analysis
- Simulation Controller (RAVEN – Risk Analysis Virtual ENvironment)
  - Provides input on plant state to RELAP-7 (including operator actions, component states, etc.)
  - Integrates output from RELAP-7 with other considerations (e.g., probabilistic and procedures information) to determine component states
- Aging Simulation (Grizzly)
  - Component aging and damage evolution will be modeled in separate modules that will couple to RELAP-7 and RAVEN





# Materials Aging and Degradation

- **Increased lifetime leads to increased exposures**
  - Time at temperature
  - Stress
  - Coolant
  - Neutrons
- **Extending reactor life to 60, 80 years or beyond may increase susceptibility and severity of known forms of degradation**
- **New mechanisms of materials degradation are possible**

- **Develop the scientific basis for understanding and predicting long-term environmental degradation behavior of materials in nuclear power plants – detect and characterize aging degradation processes**
- **Provide data and methods to assess the performance of systems, structures, and components essential to safe and sustained NPP operations**



# Assuring material performance under subsequent license renewal will require several key elements

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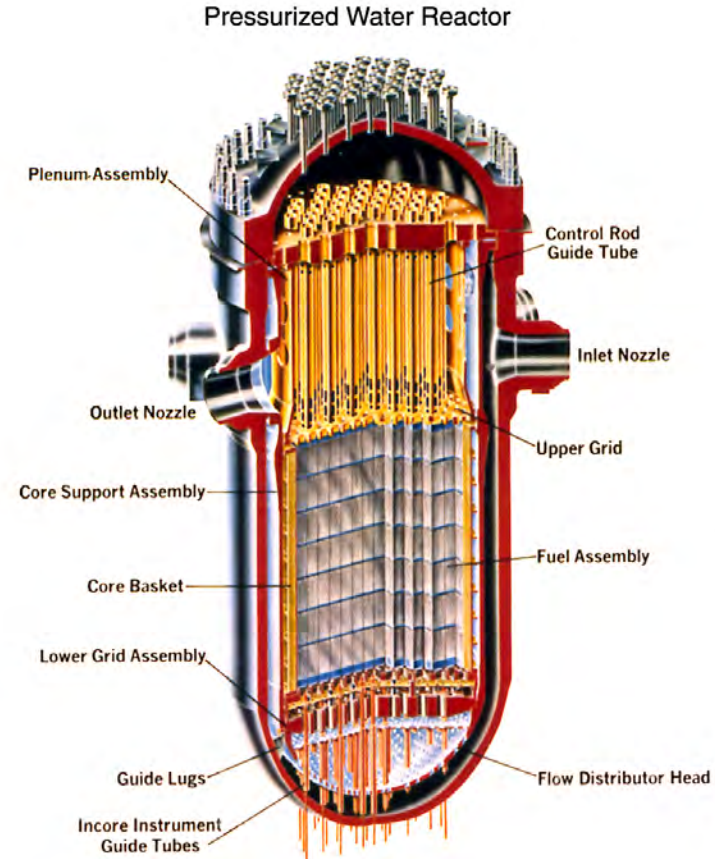
- ***Measurements of degradation:*** High quality data will provide key information for mechanistic studies, but has value to regulators and industry on its own.
- ***Mechanisms of degradation:*** Basic research to understand the underlying mechanisms of selected degradation modes will lead to better prediction and mitigation.
- ***Modeling and simulation:*** Improved modeling and simulation efforts have great potential in reducing the experimental burden for life extension studies. These methods can help interpolate and extrapolate data trends for extended life.
- ***Monitoring:*** While understanding and predicting failures are extremely valuable tools for the management of reactor components, non-destructive monitoring must also be utilized.
- ***Mitigation strategies:*** While some forms of degradation have been well-researched, there are few options in mitigating their effects. New technologies may overcome limits of degradation in key components and systems.



# Materials Aging and Degradation

## ■ Develop the scientific basis for understanding and predicting materials aging and degradation within components, systems, and structures

- Reactor metals (RPV's, internals, steam generators, balance of plant, and weldments)
  - Mechanisms of IASCC
  - High-fluence effects on RPV steel
  - Crack initiation in Nickel based alloys
- Concrete
  - Concrete aging for long term operation
  - Monitoring tools for concrete
- Cabling
  - Assessment of cable aging issues
- Mitigation, repair, and replacement technologies
  - Weld repair techniques
  - Post irradiation annealing
  - Advanced replacement alloys



# Materials Aging and Degradation Research to Support Long-Term Operation Decisions



Light Water Reactor Sustainability R&D Program

Thomas. M. Rosseel and J. T. Busby

Oak Ridge National Laboratory

*with a host of contributors*


ACRS

Plant License Renewal Subcommittee Meeting

April 8, 2014



# Presentation Outline:

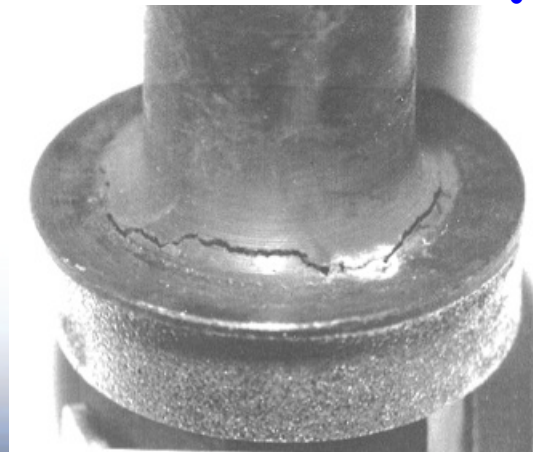
- Materials Pathway overview
- Key activities within Materials Aging and Degradation pathway of the LWRS Program
- Partnerships
- Examples of research
  - Concrete
  - Cabling
  - Metals
  - Weld Repair
  - Integrated Research

# Understanding Materials Aging & Degradation is a Key Requirement for Subsequent License Renewal

- Increased lifetime leads to increased exposures to
  - Time at Temperature
  - Stress
  - Coolant
  - Neutrons
- Extending reactor life to 60, 80 years or beyond may increase susceptibility and *severity of known forms of degradation*
- New mechanisms of materials degradation are also possible (unknown unknowns)
  - **Perform Gap Analysis**

## STRATEGIC GOALS:

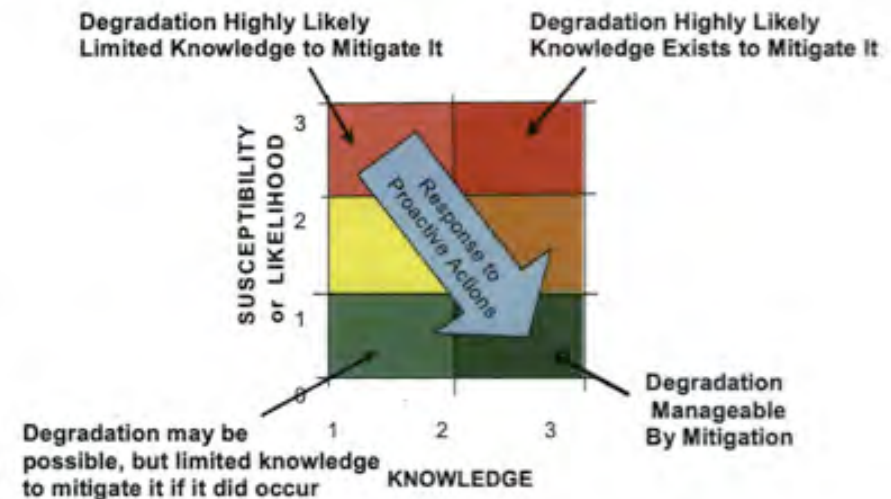
- Develop the scientific basis for understanding and predicting long-term environmental degradation behavior of materials in nuclear power plants
  - Provide data and methods to assess the performance of systems, structures, and components essential to safe and sustained NPP operations
  - Develop means to detect and characterize aging degradation processes
- Develop technologies for mitigation of key forms of degradation





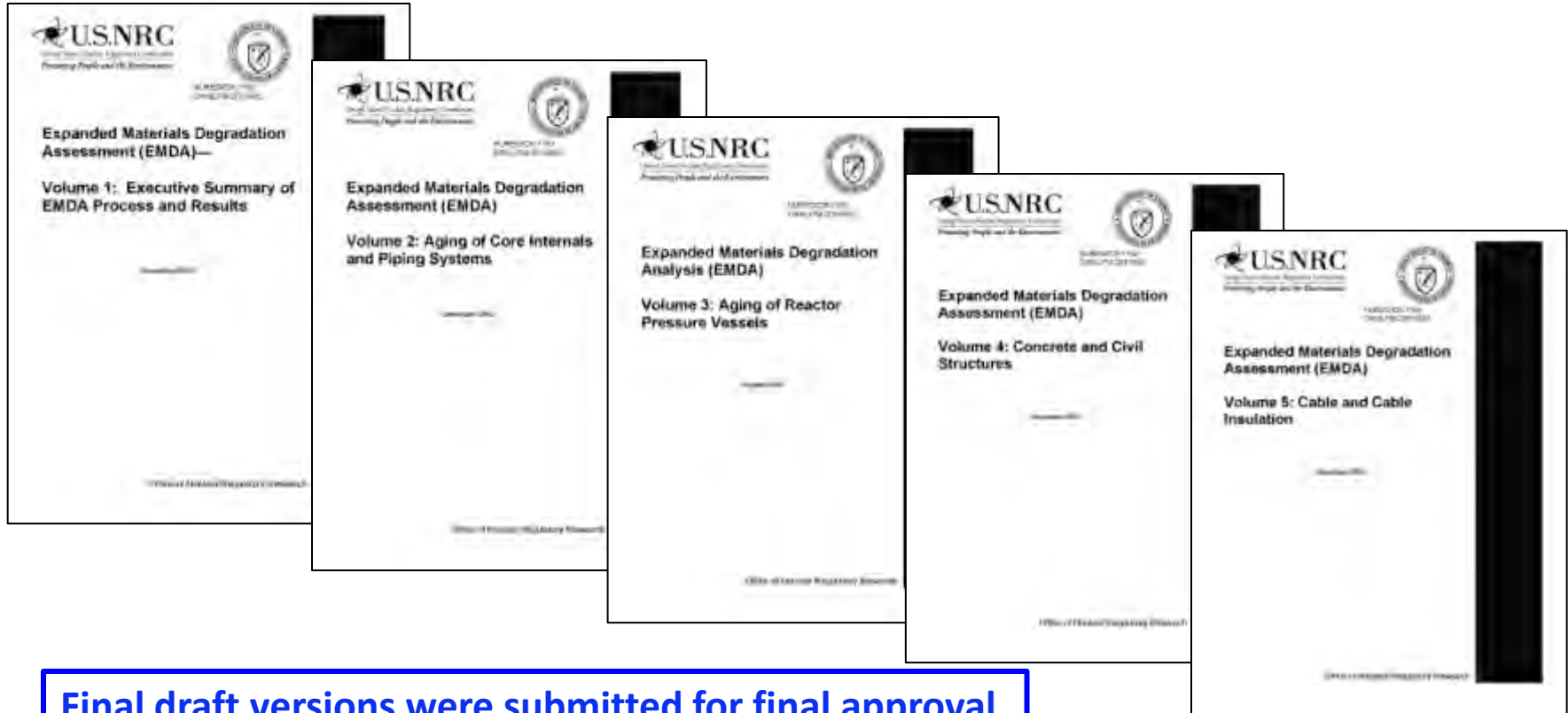
# Given the complexity of the reactor systems and materials degradation, a prioritization tool for research was needed

- “Knowing the unknowns” is a difficult problem that must be addressed.
- This is a particularly difficult issue for such a complex and varied material/environment system.
- An organized approach similar to the US NRC’s Proactive Materials Degradation Assessment (PMDA) (NUREG/CR-6923) has been utilized.
- Together with the U.S. NRC, the LWRS Program is working to expand the initial activity to encompass broader systems and longer lifetimes
  - Core internals and primary piping
  - Pressure Vessel
  - Concrete
  - Cabling



**P**roactive **M**aterials **D**egradation  
**A**ssessment Matrix

NRC and DOE have investigated issues of reactor aging beyond 60 years to identify possible knowledge gaps



Final draft versions were submitted for final approval and publication as a NUREG in December 2013. All technical issues resolved



# LWRS Materials Aging and Degradation research encompasses the entire plant

Concrete Degradation  
& Non-Destructive  
Evaluation(NDE)

Repair welding

Environmental Fatigue  
& NDE

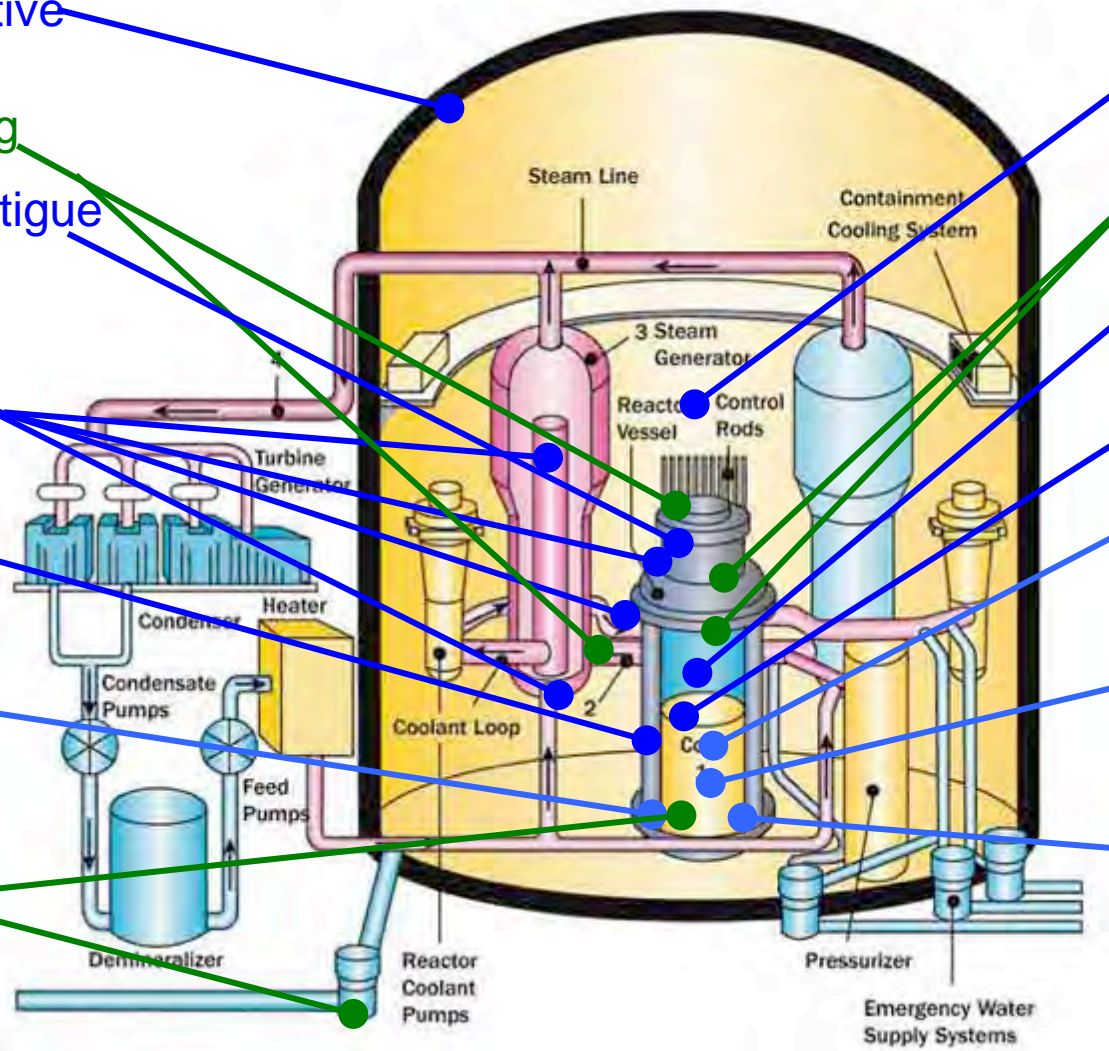
Crack initiation in  
Ni-base alloys  
& NDE

High Fluence  
effects on RPV  
& NDE

Surrogate  
materials and  
attenuation

Advanced  
replacement  
alloys

Typical Pressurized-Water Reactor



Analysis of cable  
degradation  
& NDE

Thermal  
annealing  
Mechanisms of  
IASCC

High Fluence  
IASCC

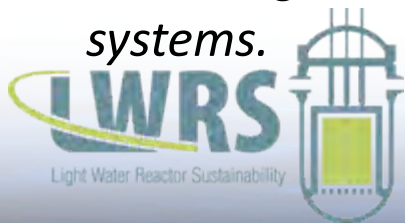
Swelling of core  
internals

High fluence  
phase  
transformations

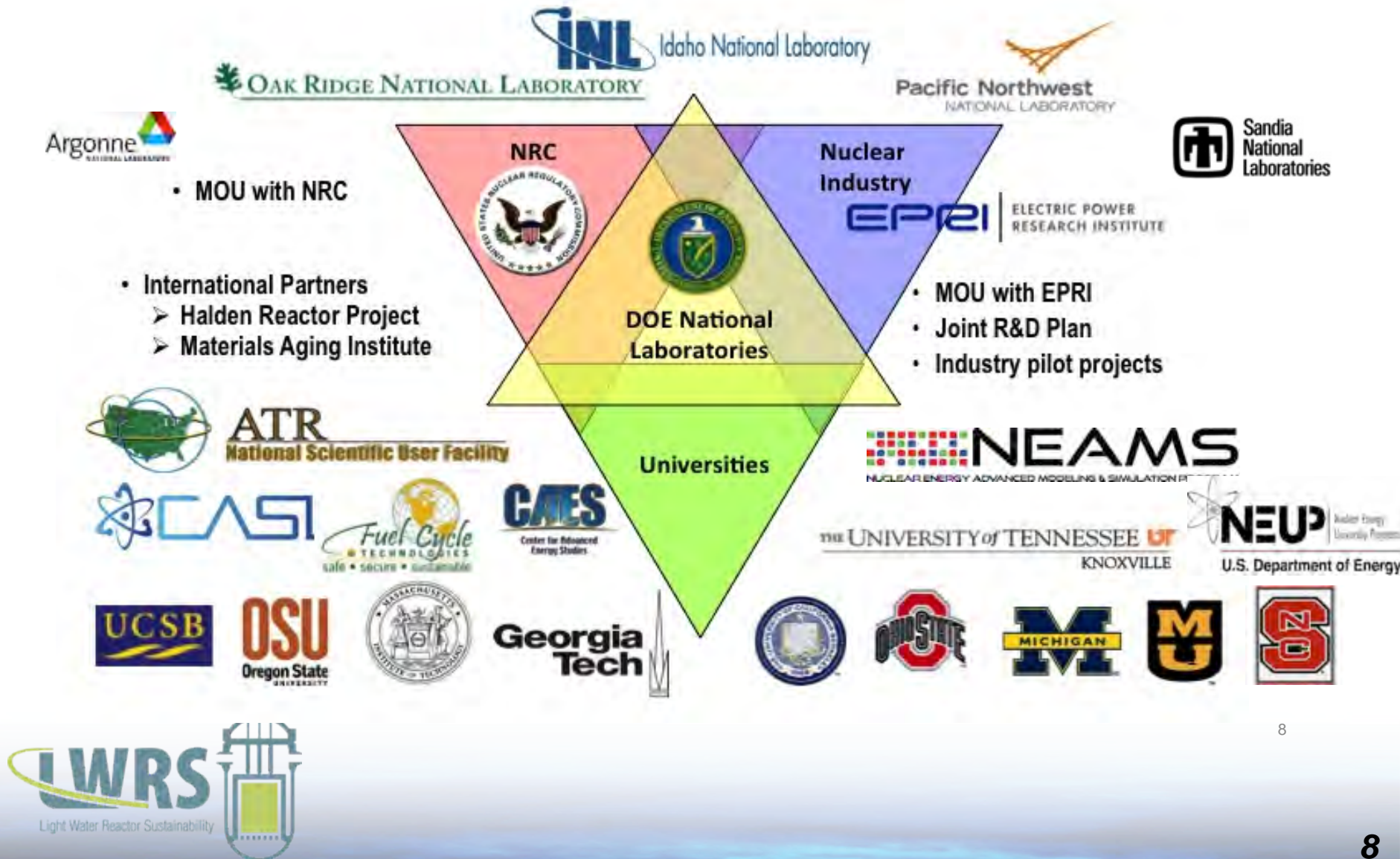
Cast Stainless  
Aging

# Materials Aging and Degradation tasks provide results in several ways:

- **Measurements of degradation:** *High quality data will provide key information for mechanistic studies, but has value to regulators and industry on its own.*
- **Mechanisms of degradation:** Basic research to *understand the underlying mechanisms of selected degradation modes* will lead to better prediction and mitigation.
- **Modeling and simulation:** *Improved modeling and simulation efforts have great potential in reducing the experimental burden for life extension studies.* These methods can help interpolate and extrapolate data trends for extended life.
- **Monitoring:** While understanding and predicting failures are extremely valuable tools for the management of reactor components, *non-destructive monitoring will provide valuable data and insights.*
- **Mitigation strategies:** While some forms of degradation have been well-researched, there are few options in mitigating their effects. *New technologies may overcome limits of degradation in key components and systems.*



# LWRS Program has a diverse set of partners

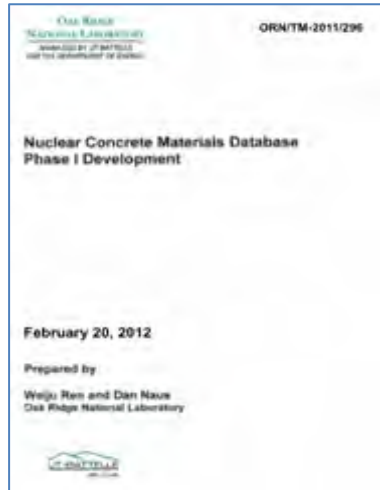


# Concrete and Civil Structures Research and Concrete NDE





# Nuclear Concrete Materials Database (NCMDB) and Irradiated Concrete

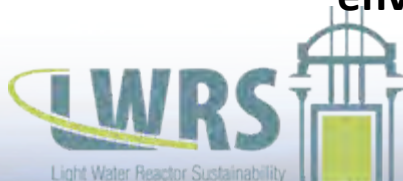


ORNL/TM-2011/296



**Concrete coring to obtain samples for evaluating effects of aging and environmental stressors**

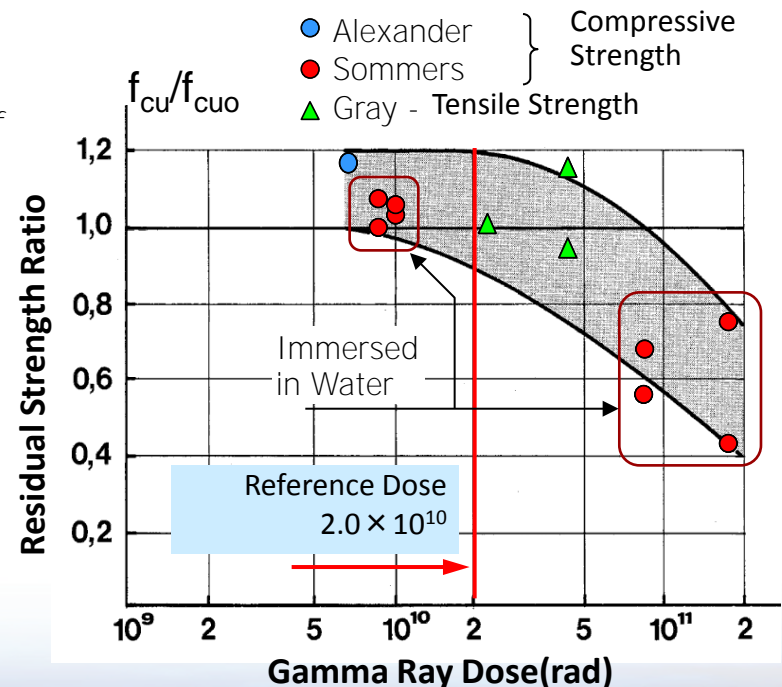
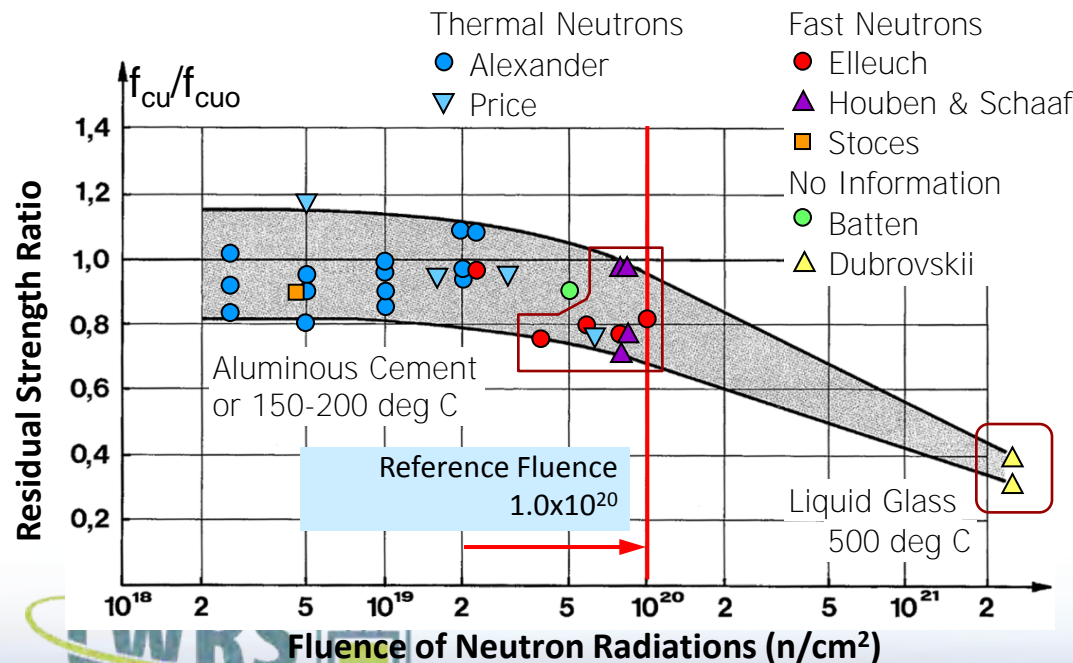
- **Phase I of NCMDB has been completed**
- Data and information for populating the NCMDB are from literature sources and testing samples from aged facilities
  - Aging
  - Elevated temperature
  - Irradiation
  - Migration of hostile species (e.g.,  $\text{Cl}^-$ ,  $\text{SO}_4$ ,  $\text{CO}_2$ )
- **Concrete irradiation damage working group formed with EPRI**
  - Developed roadmap and multi-path strategy for addressing irradiated concrete issues.
  - Organized International Irradiated Concrete Information Exchange Framework Meeting (March 2014)



# Interaction of Radiation and Concrete – Compressive Strength (I)

- Experimental studies in literature have concentrated on specific strength reduction levels at specific levels of radiation intensity
- Much of testing was done in 1960's and 1970's using cube specimens having various compositions to study the effects of thermal-neutron irradiation
- Tests generally were performed on samples subjected to both neutron- and gamma irradiation, with few addressing gamma irradiation alone (difficult to produce gamma radiation without neutron)

Critical exposure levels in Codes are generally based on experimental data collected by Professors Hilsdorf, Kropp & Koch (ACI SP-55, 1978)

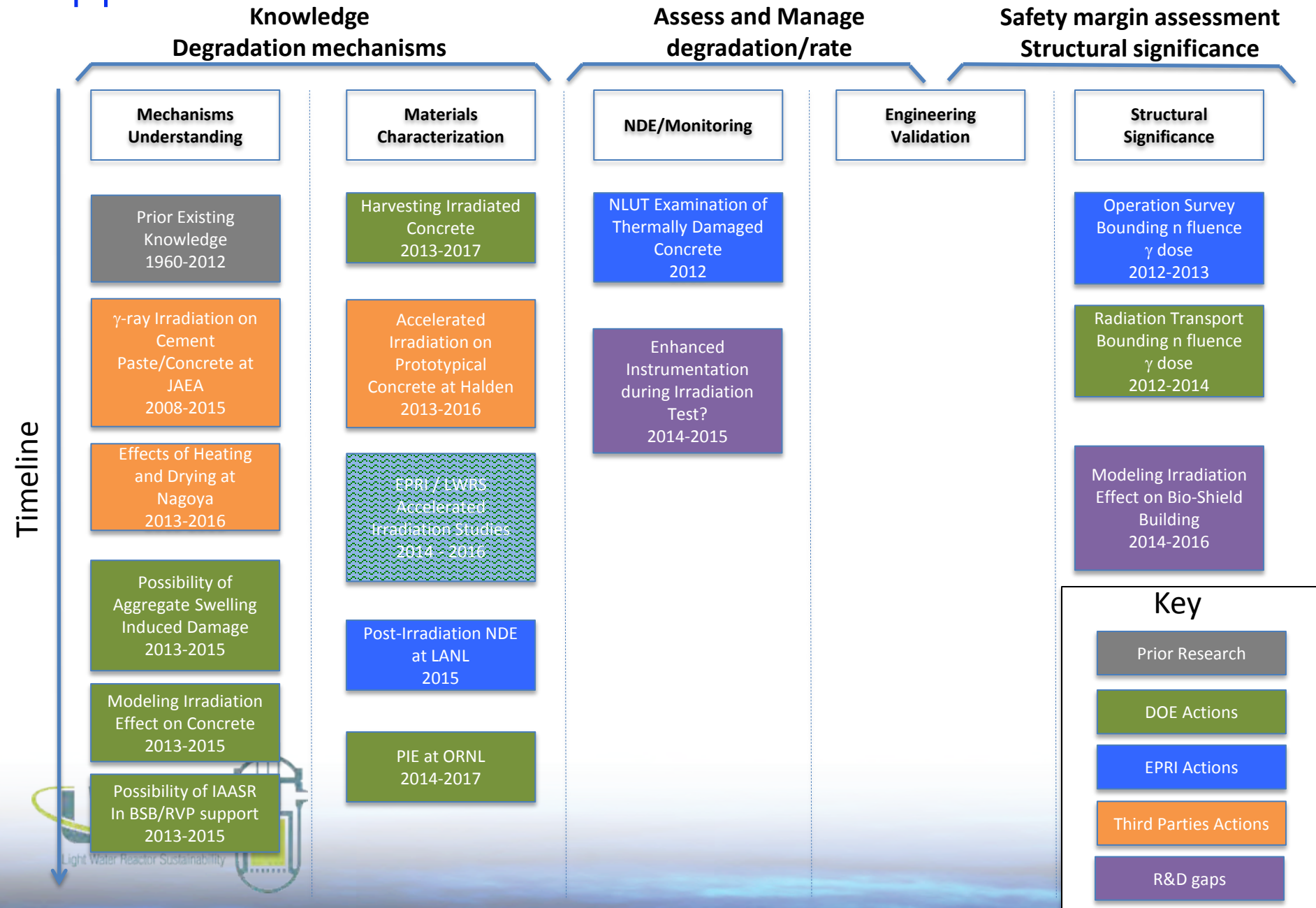


[Kontani et al reevaluation]

# Interaction of Radiation and Concrete – Compressive Strength (II)

- **Large Gaps in information:**
  - Neutron fluence cutoff energy (develop dpa model),
  - Composition of concrete (complex material),
  - Irradiation temperature,
  - Gamma-ray dose, etc.
  - Model to understand how radiation affects concrete
- **Applicability to NPP concrete is uncertain;**
  - More data needed
  - Better understanding and control of variables
  - Robust understanding of the effects of radiation

# DOE – LWRS / EPRI – LTO Road Map for research to support irradiation effects of concrete





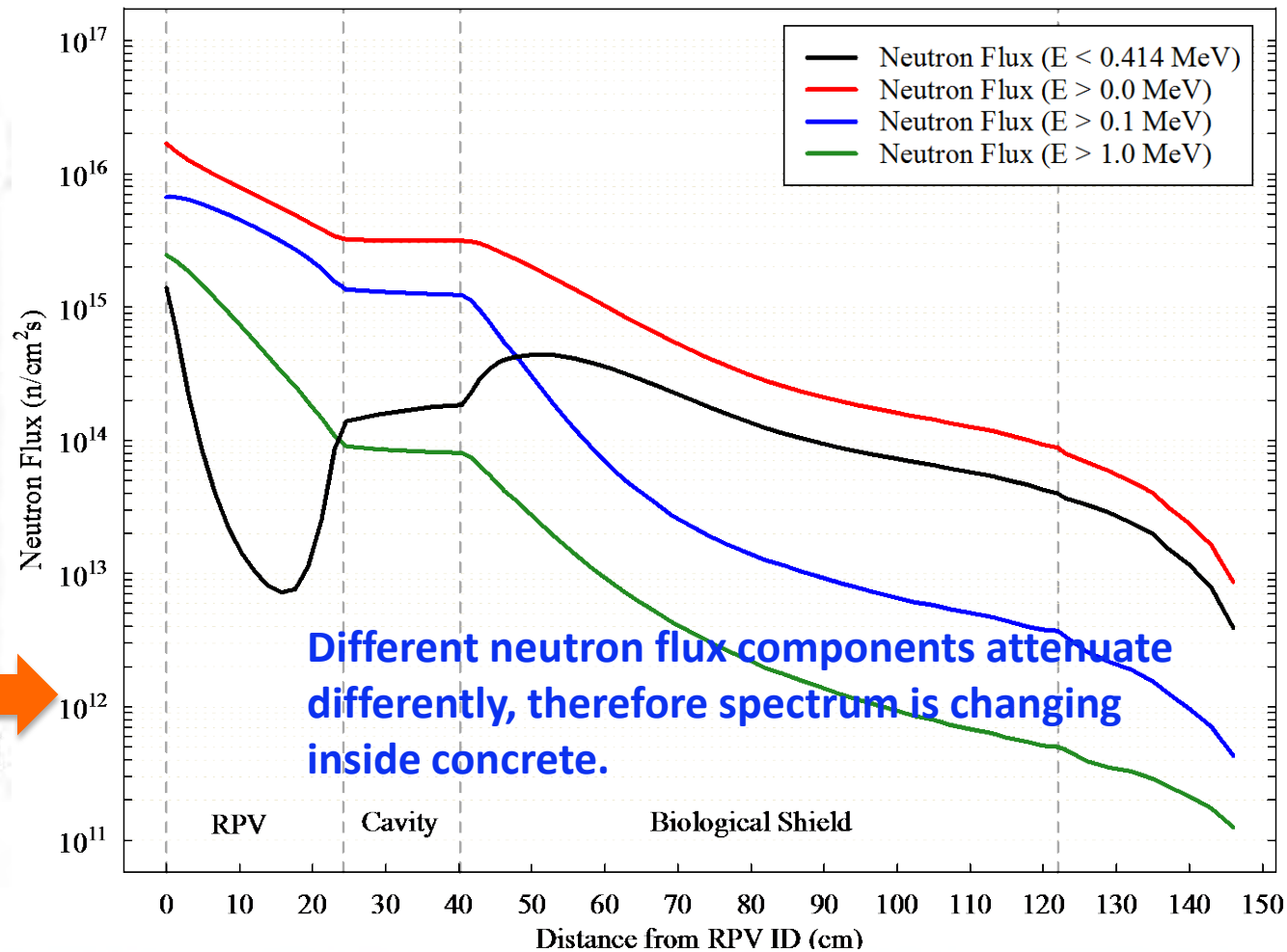
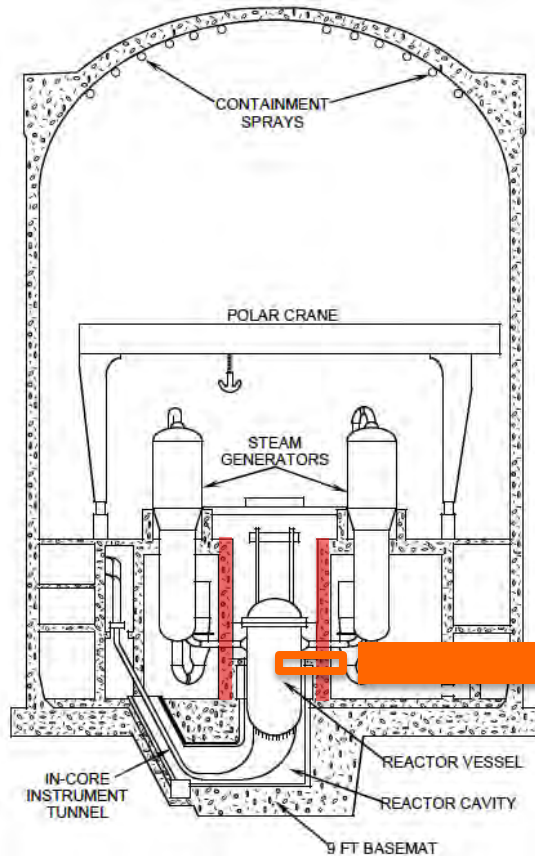
# Effects of Radiation on Concrete: the LWRS Project Strategy

- Characterize radiation fields in concrete structures in NPPs and determine the bounding values of neutron fluence and gamma-ray dose in the biological shield concrete at 80 years of operation and beyond.
- **Obtain more data** on the effects of neutron and gamma irradiation as well as extended time at elevated temperature on concrete.
  - Irradiate prototypical concrete to levels equal to or greater than expected in extended service (accelerated irradiation studies) and evaluate possible degradation.
  - Harvest and test irradiated concrete from decommissioned plants (US and international).
- Develop a more robust fundamental understanding of the effects of radiation on concrete.
- Establish a collaborative research effort with international partners.



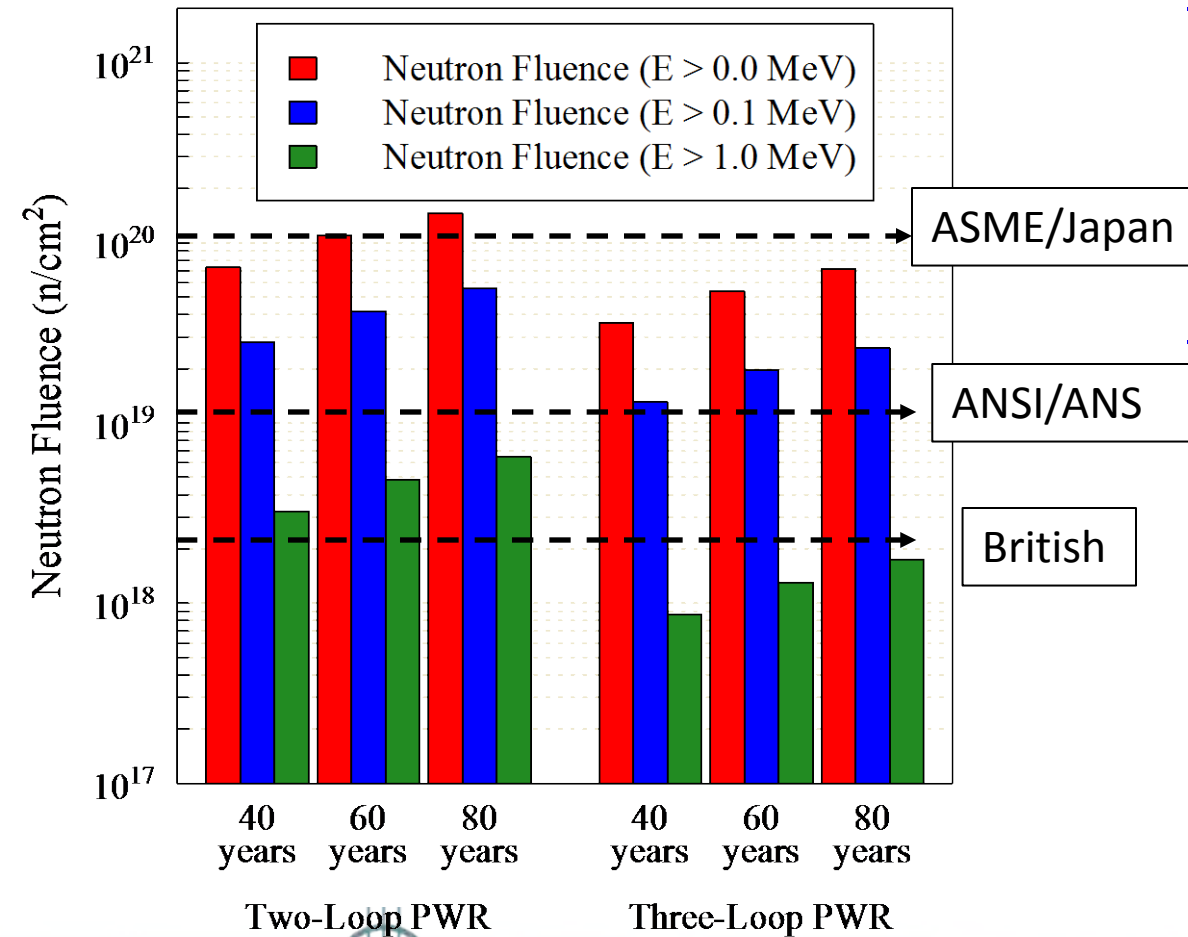
T. M. Rosseel, ORNL

# Neutron Flux Profile Radially From the Reactor Core



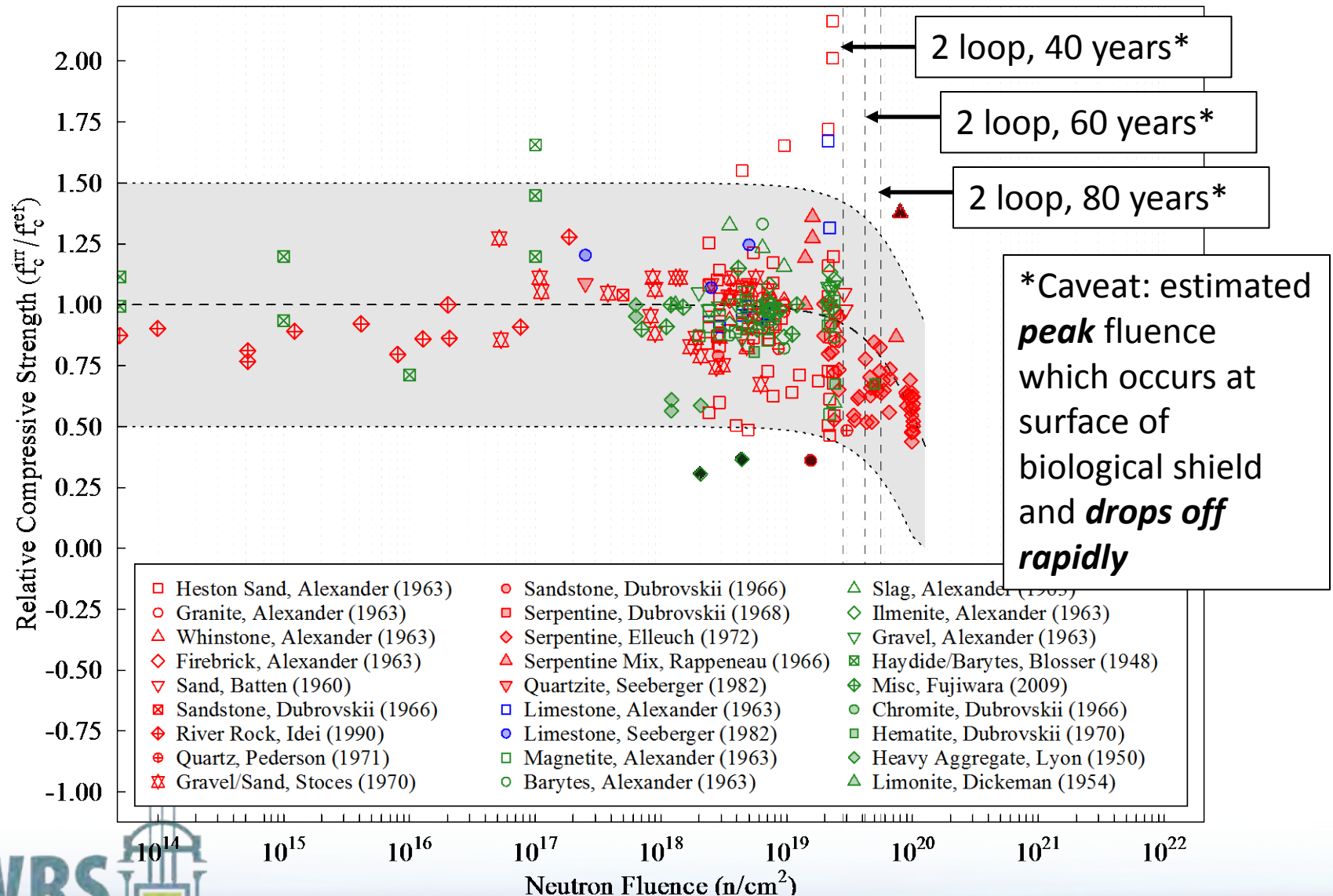
Distribution of neutron flux for given neutron energy cut-offs in a three-loop PWR in the radial direction from the core.

# Variance of Expected Peak Neutron Fluences in the Bio Shield for Different Cut-off Energies



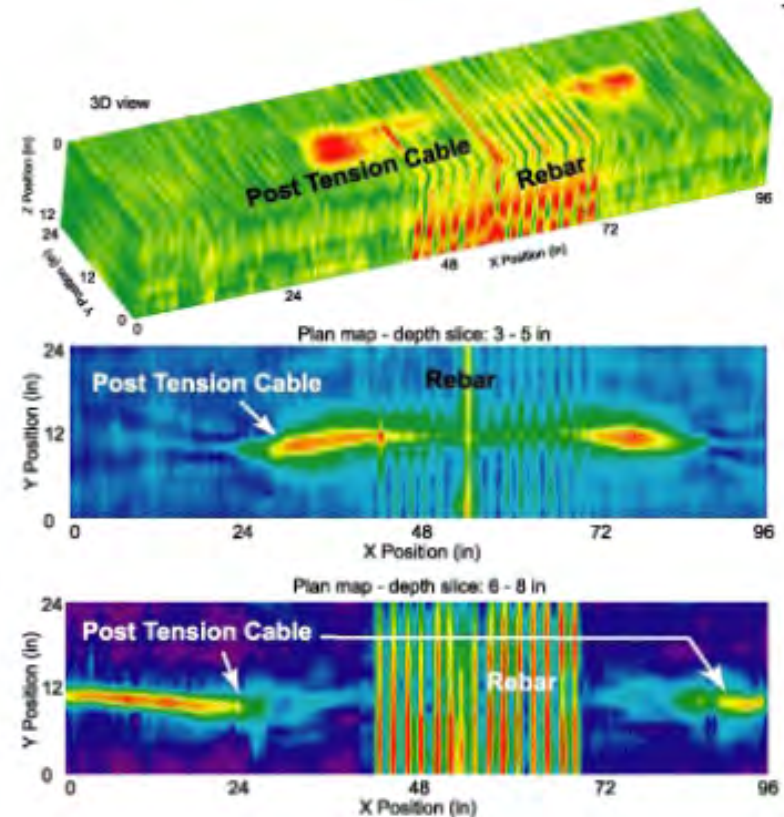
- Values reported here serve as a guide, since fluence will change depending on plant configuration, fuel loading scheme, capacity factor, etc.
- Determining which energy cutoff, if any, is correct for the fluence determination is crucial for the assessment of the concrete degradation, in particular for the operation during extended plant life

# Re-examine compressive strength literature



# NDE development is being integrated with materials research

- Continued work on crack and crack precursor detection development
- Developed NDE Roadmaps
  - **Concrete**
  - Cables
  - Fatigue damage
  - Reactor pressure vessel
- Roadmaps were assembled based on a variety of sources
  - Assessed key degradation modes
  - Interacted with materials experts
  - Assembled an expert panel and hosted a workshop
- Roadmaps are available on the LWRS website

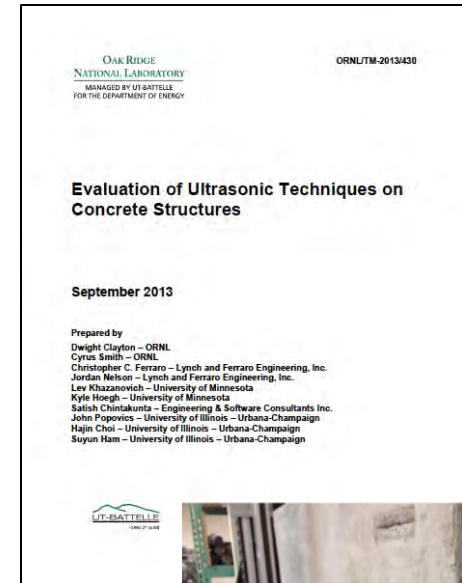


Ground Penetrating Radar



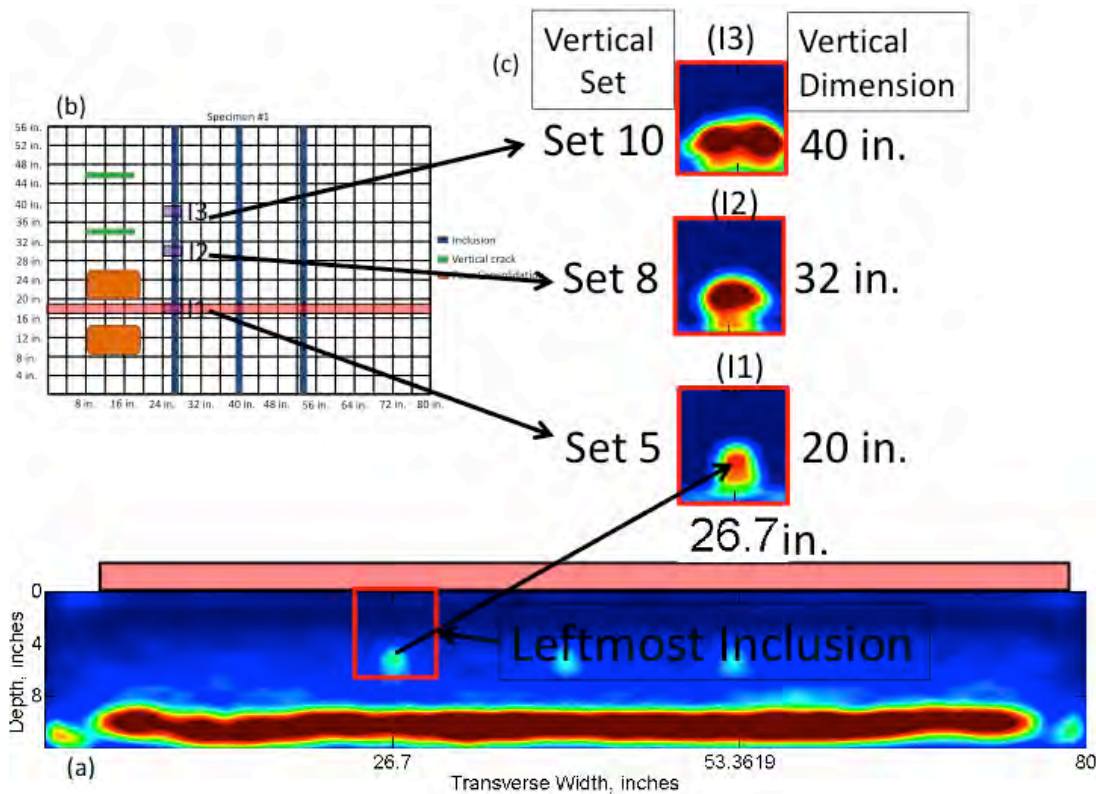
# Concrete NDE Techniques

- ORNL, the University of Minnesota, and Engineering & Software Consultants tested ultrasonic nondestructive examination techniques to perform volumetric imaging on thick reinforced concrete sections.
- Seven ultrasonic techniques were tested on specimens fabricated by the University of Florida for the Florida Department of Transportation's nondestructive examination validation facility at their State Materials Office in Gainesville, Florida.
  - **Specimens included a rebar detection block and a void and flaw detection block**
  - **Generally, all techniques performed well on the two selected test specimens though each method has some limitations and shortcomings**
  - **Each technique has situations where it performs very well and other situations where it is somewhat lacking in performance, providing a baseline performance indication of each technique**
- The ultimate solution to volumetric imaging of a thick concrete section might be a fusion of data from various technologies

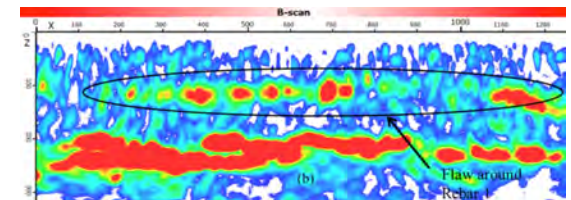


Ground Penetrating Radar Scans and Ultrasonic Scans of Concrete Samples Were Performed at the University of Florida

Using advanced signal processing techniques, additional details can be determined about embedded defects



Ultrasonic data with post-processing

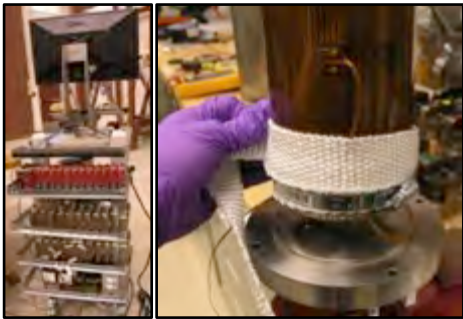


Original ultrasonic data

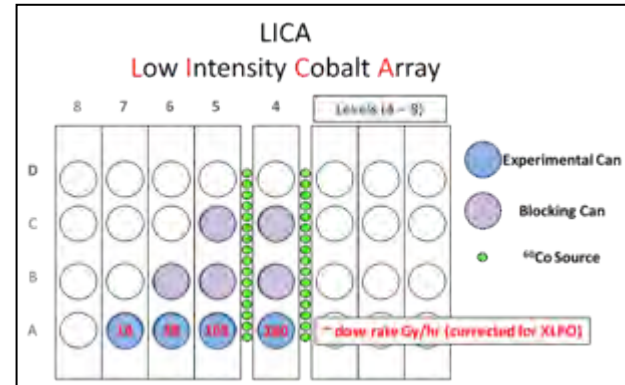
# Cable Insulation Degradation



# Cable aging research has focused on both service and lab materials



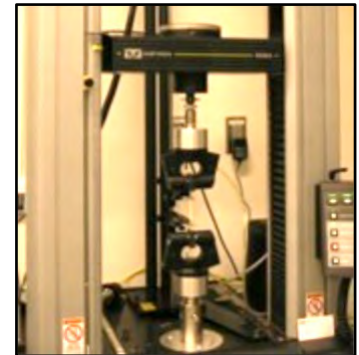
**Finalized LICA  
Facility Updates**



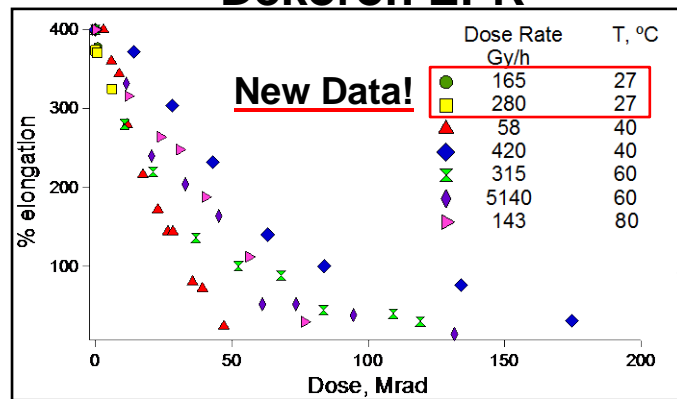
**Performed Dosimetry  
and Updated  
Experimental Plan**

**Initiated Long-Term  
Aging Experiments**

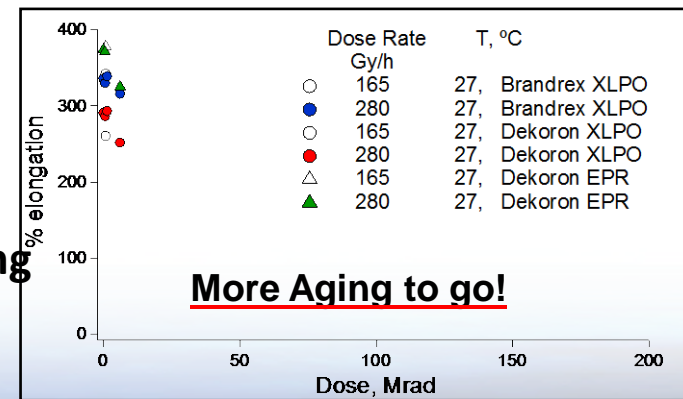
**Tensile Tested  
Virgin and Aged  
Specimens**



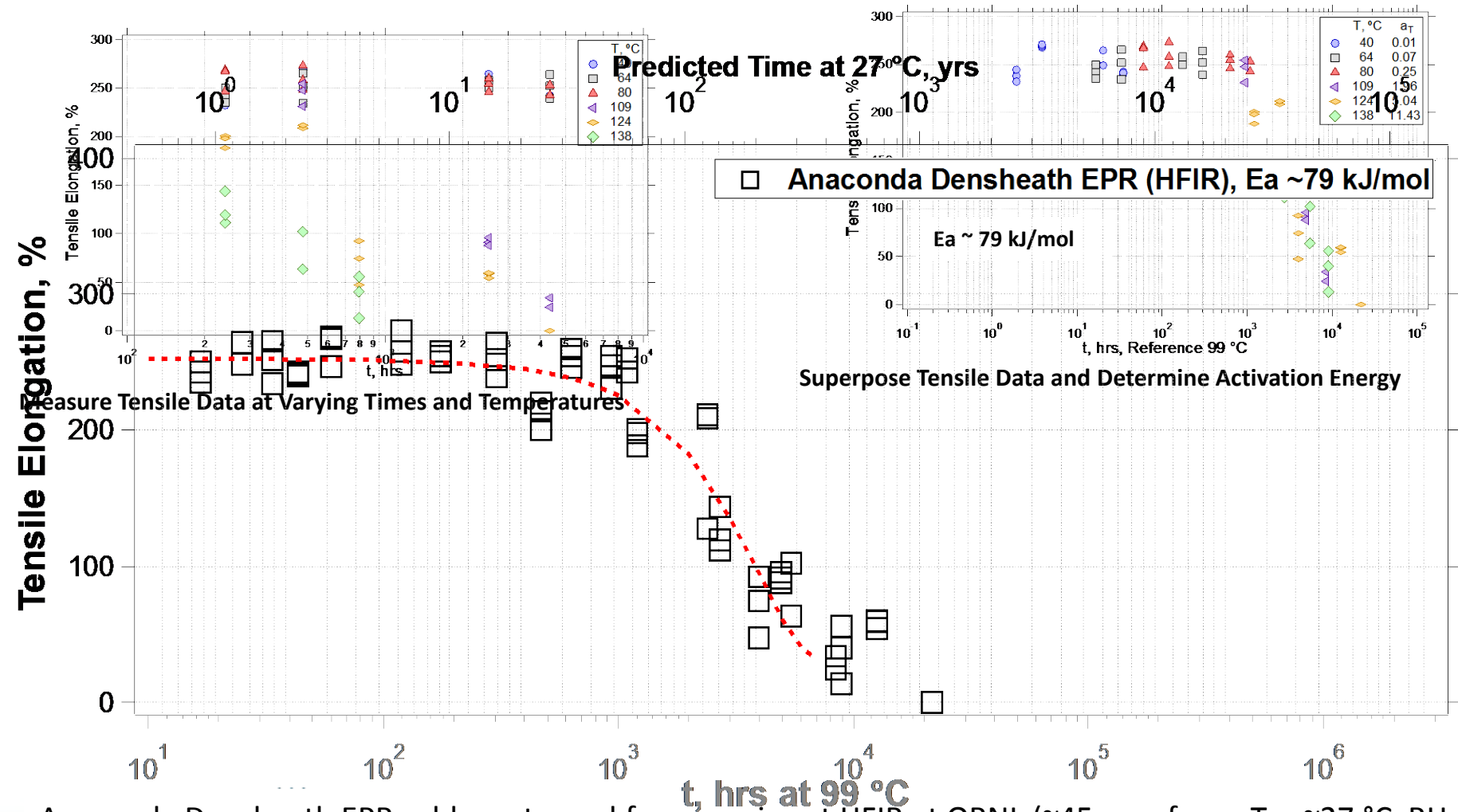
**Dekoron EPR**



**Analyzed Aging  
Data**



# Accelerated aging has continued on service cable materials



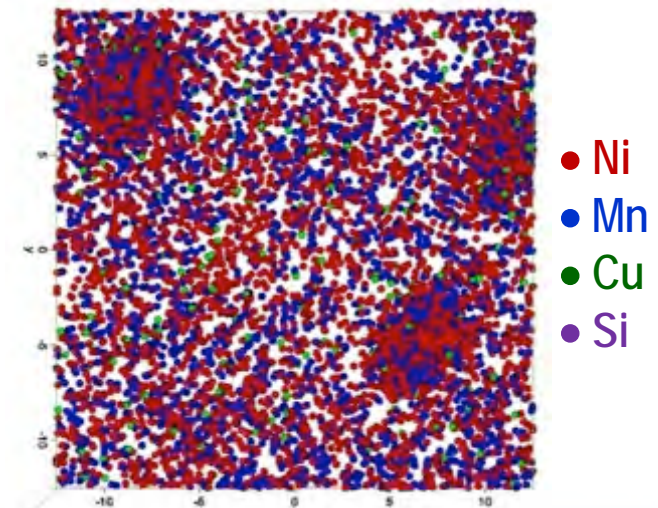
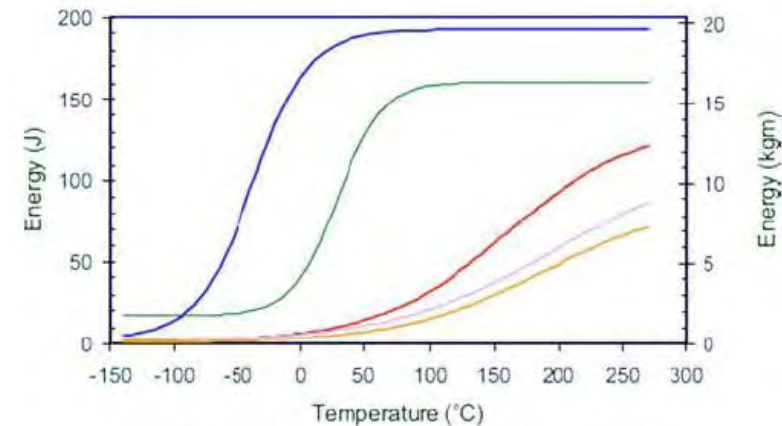
Anaconda Densheath EPR cables returned from service at HFIR at ORNL (~45 yrs of age,  $T_{avg} \sim 27^\circ\text{C}$ , RH ~70%). These cables were subjected to further thermal aging to elucidate their remaining tensile properties.

# Reactor Pressure Vessel Steels

# "Late Blooming Phases" have been the focus of RPV research

- Rapid Cu-rich precipitate hardening drives embrittlement of the reactor pressure vessel
- Modern RPV steels have low-residual Cu-levels
- **Irradiation may drive phase transformations even in low Cu alloys** (Odette et al.)
  - Mn-Ni(-Si-Cu) LBP that can reach large volume fractions and contribute to embrittlement
  - Could be important in low Cu steels thought to have little sensitivity to embrittlement
- RPV materials and surveillance specimens from the Ginna Nuclear Plant and from the Zion Nuclear Plants for material examination, APT, SANS, PAS

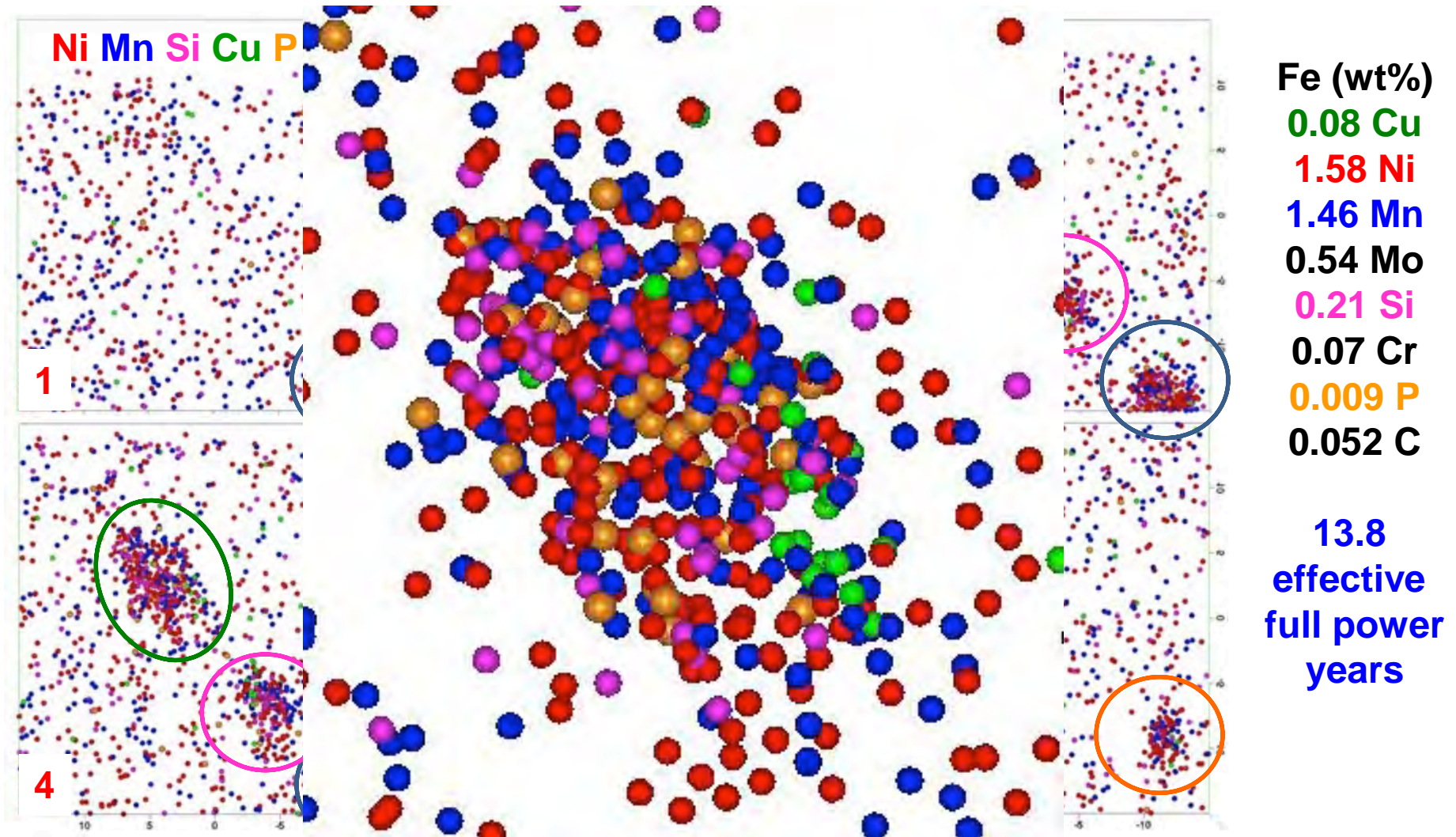
## Embrittlement of low Cu weld Ringhals U4 from surveillance capsules



Low-copper (0.05 wt%) weld shifts 162°C at  $6 \times 10^{19}$ , clusters primarily of Ni-Mn-Si, very little copper.



# U3 Ringhals E6 surveillance weld: Atom maps - 1 nm slices



Atom map slices through 2-nm-diameter precipitates showing the solute distributions of Cu, Ni, Mn, P and Si within the precipitates.

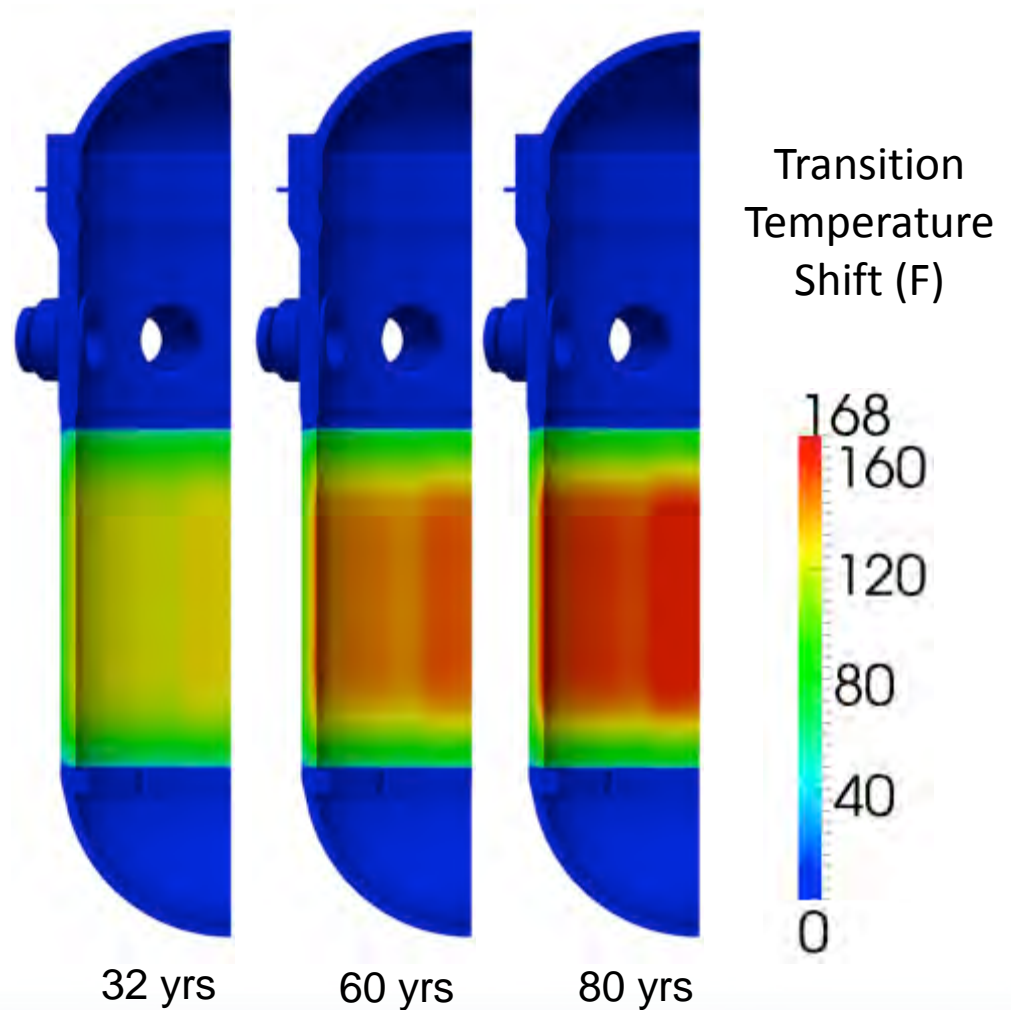
High Ni and Mn, Low 0.08%Cu,  
High fluence:  $6.4 \times 10^{19} \text{ n cm}^{-2}$

M. K. Miller, ORNL

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# A new modeling tool is being developed to predict RPV degradation

- EONY model is used in a 3-D model of an RPV, Grizzly – to calculate change in temperature transition shift, over time and location.
- Application beyond 40 years is an extrapolation of experimental data. It will be updated for extended service with new mechanisms and data.
- It will incorporate weldments, heat affected zones, spatial variations in chemistry, and vessel cladding.
- Additional opportunities for collaboration between research tasks



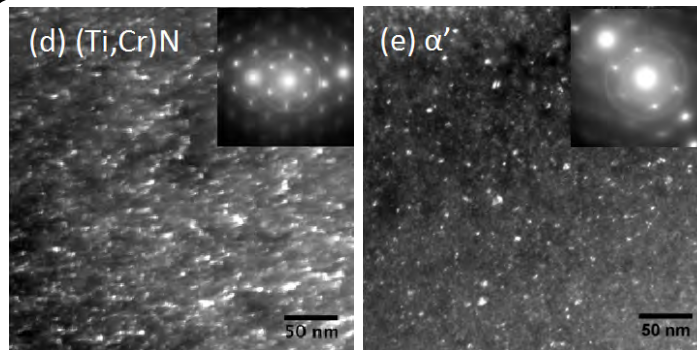
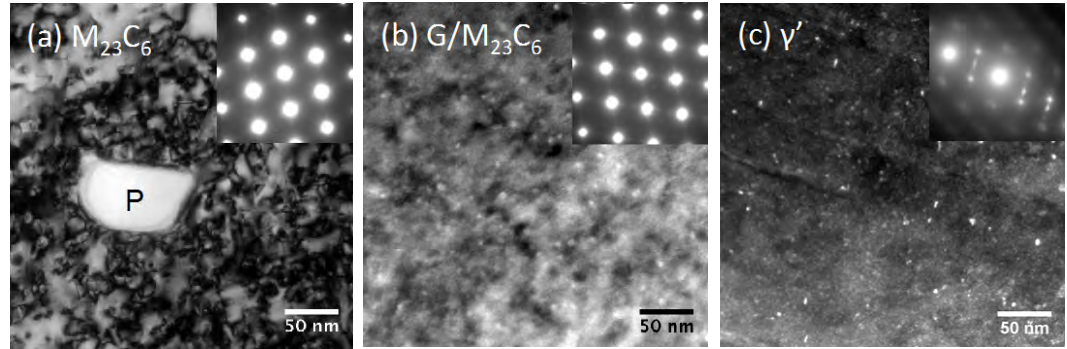
# Radiation Effects



# Radiation Resulted in Various Phase Instabilities

## Formation of cubic-on-cubic coherent precipitates

- (a)  $M_{23}C_6$  in LS13 (9.1 dpa),
- (b) G-phase/ $M_{23}C_6$  in some samples,
- (c)  $\gamma'$  ( $Ni_3Si$ -type) in BS13 (5.5 dpa).

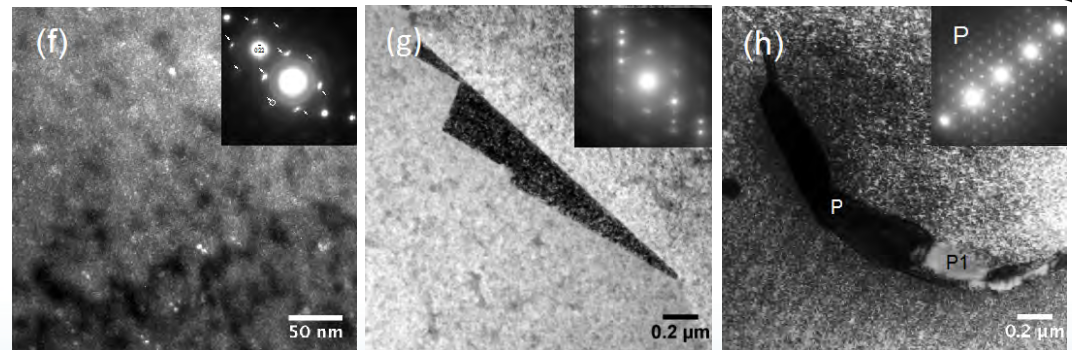


## Formation of incoherent precipitates

- (d)  $(Ti,Cr)(C,N)$  in some samples,
- (e)  $\alpha'$ -phase in FS13 (5.5 dpa).

## Phase transformations of

- (f)  $\alpha$ -ferrite in AS18 (10.2 dpa),
- (g)  $\epsilon$ -martensite in SW37 (4.4 dpa),
- (h) possible  $CrC$  from  $M_{23}C_6$  (P) in LS13 (9.1 dpa).





# Analysis of irradiation-embrittlement in Ni-base alloys as part of the LWRS/Areva/EPRI partnership

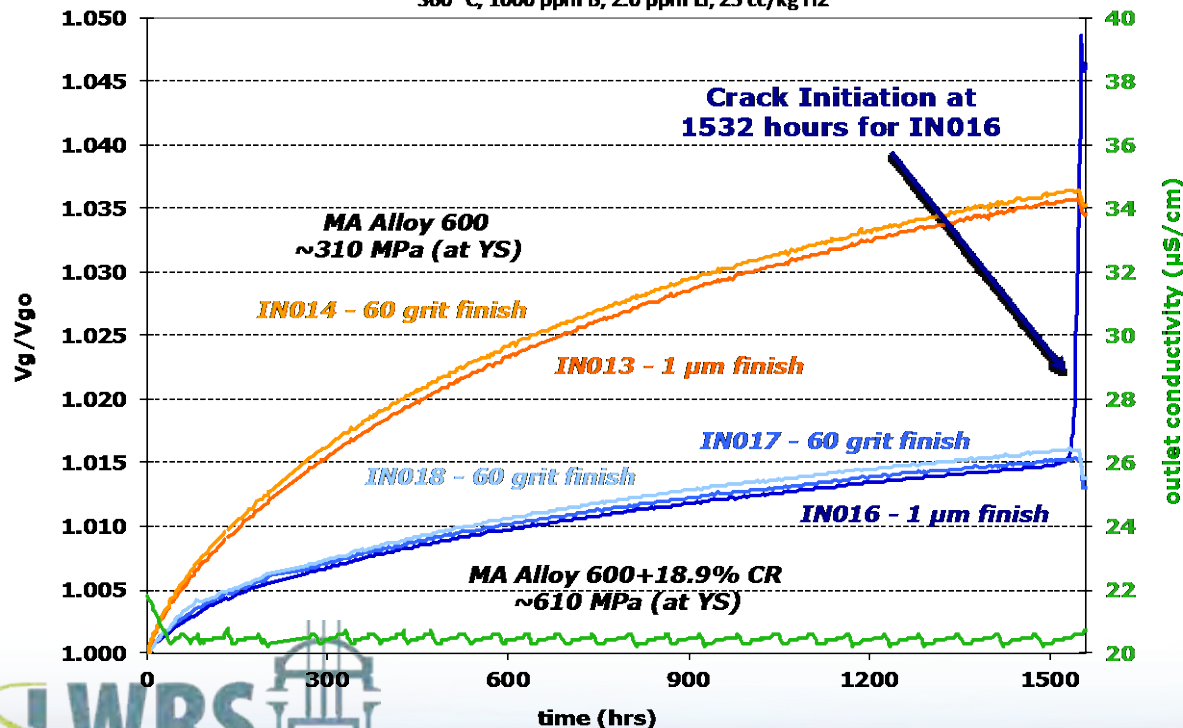


# Corrosion-related research

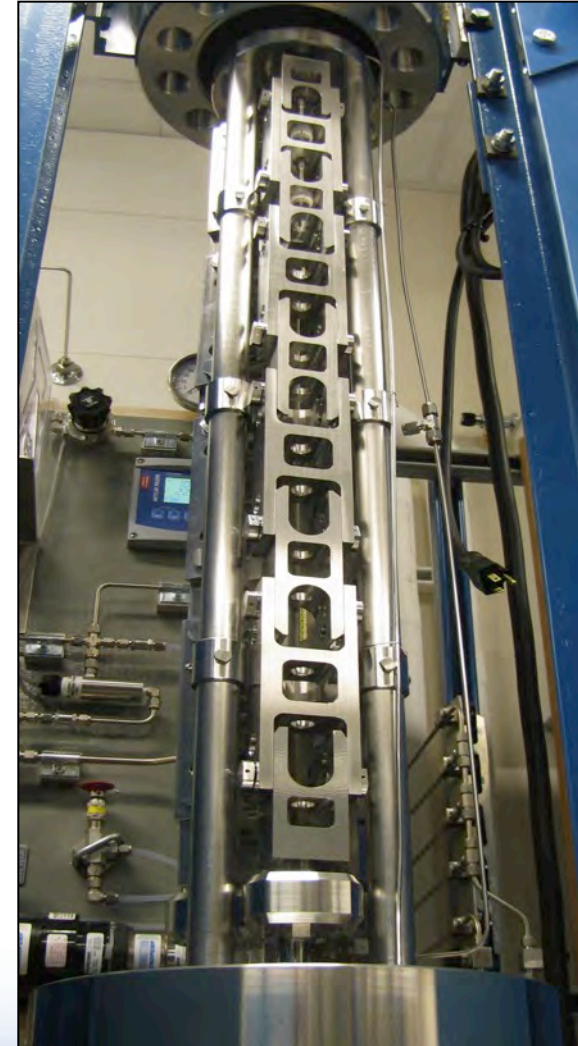
# Multi-Specimen SCC Initiation Testing Demonstrated

The ability to quantitatively measure crack initiation in situ was demonstrated during constant load, SCC test on up to 30 tensile specimens using mill-annealed (MA) alloy 600 with various levels of cold work. Crack nucleation was detected on individual specimens, while test continued for other specimens.

IN013-18 - PNNL alloy 600, MA or MA+18.9%CR  
360°C, 1000 ppm B, 2.0 ppm Li, 25 cc/kg H<sub>2</sub>



30 Specimen SCC Initiation Test System

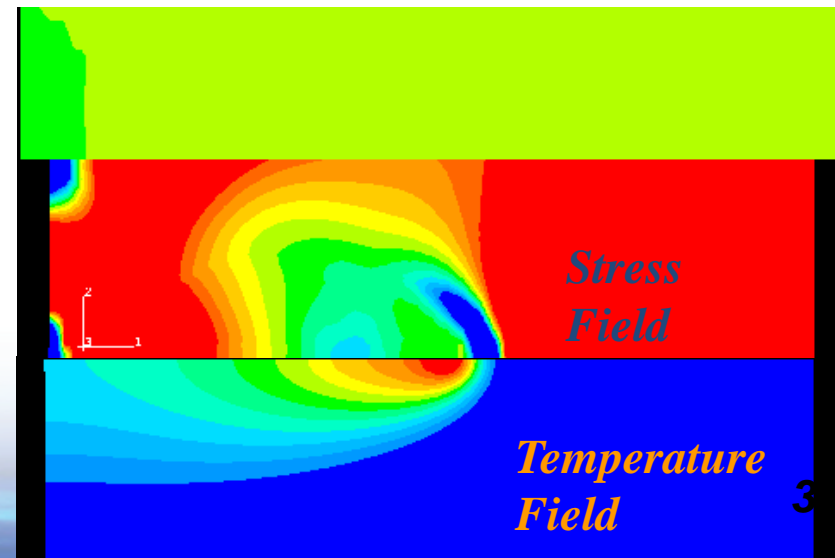
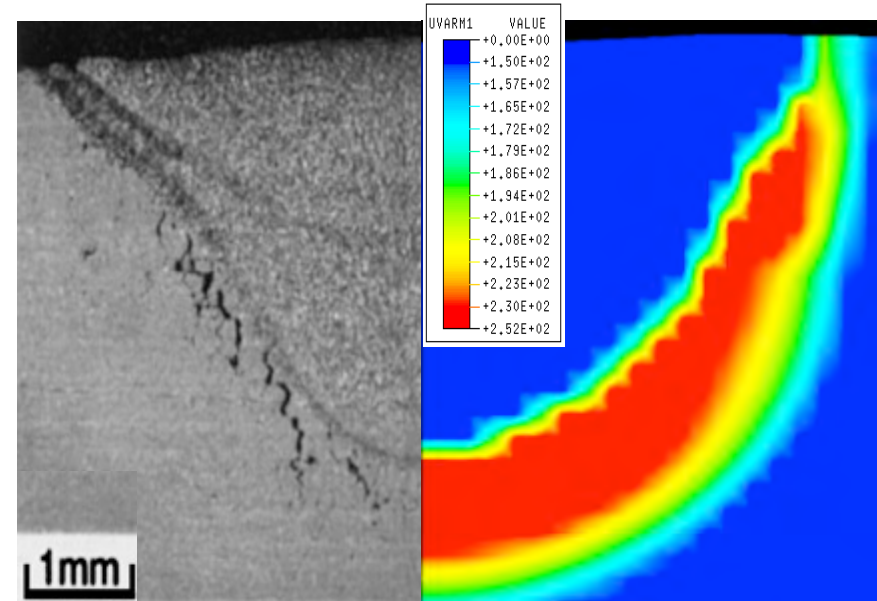


# Mitigation techniques



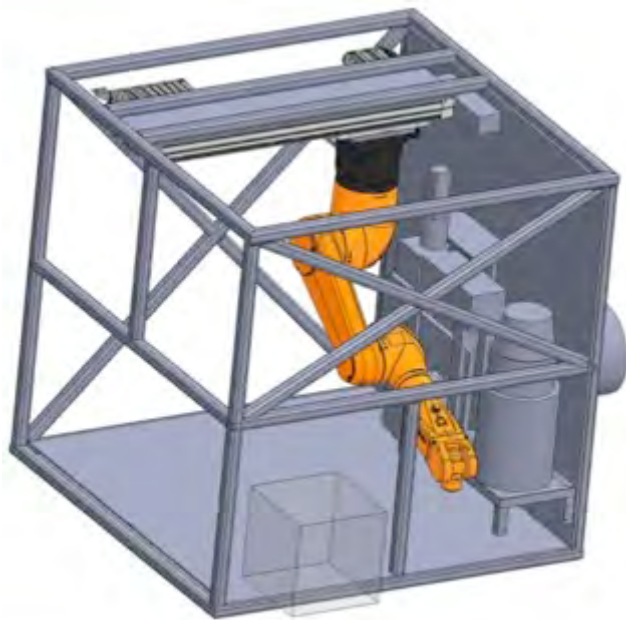
# Advanced welding R&D may provide solutions to long-standing areas of concern

- Residual stress-modeling provides insights into long-term performance and cracking resistance
- Current research in advanced weldments is jointly funded by DOE and EPRI
  - Survey of present art of hybrid welding processes
  - Advanced computational model for hybrid welding processes
  - Hybrid laser weld processing model to optimize the weldability of irradiated materials
  - Experimental methodology for direct measurement of transient high-temperature stress history during welding
- Technology is being developed with the direct expectation of transfer to industry in the near term



# Design and Construction of A Dedicated Welding Hot Cell:

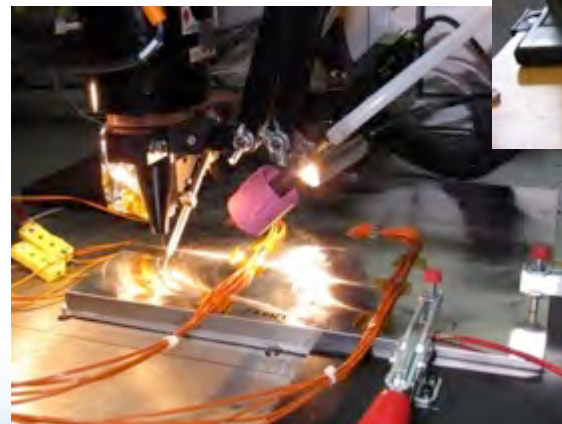
- First of its kind in the US. Part of an “one-stop” facility for R&D on irradiated materials to support DOE NE programs and industry’s needs.
- Cost-shared with EPRI
- Switchable between different welding processes: laser welding, arc welding, and friction stir welding systems. Both LW and FSW can be remotely operated to reduce contamination issues of welding equipment
- In-situ temperature and stress measurement capability through remote optical system and unique measurement techniques
- System design has been completed. Individual hardware are being procured and tested



Exposed view of concept design of welding hot cell with robotic manipulators and friction stir welding system



Remotely operated FSW system to be integrated in the hot cell



Laser welding system under testing and to be integrated in the hot cell

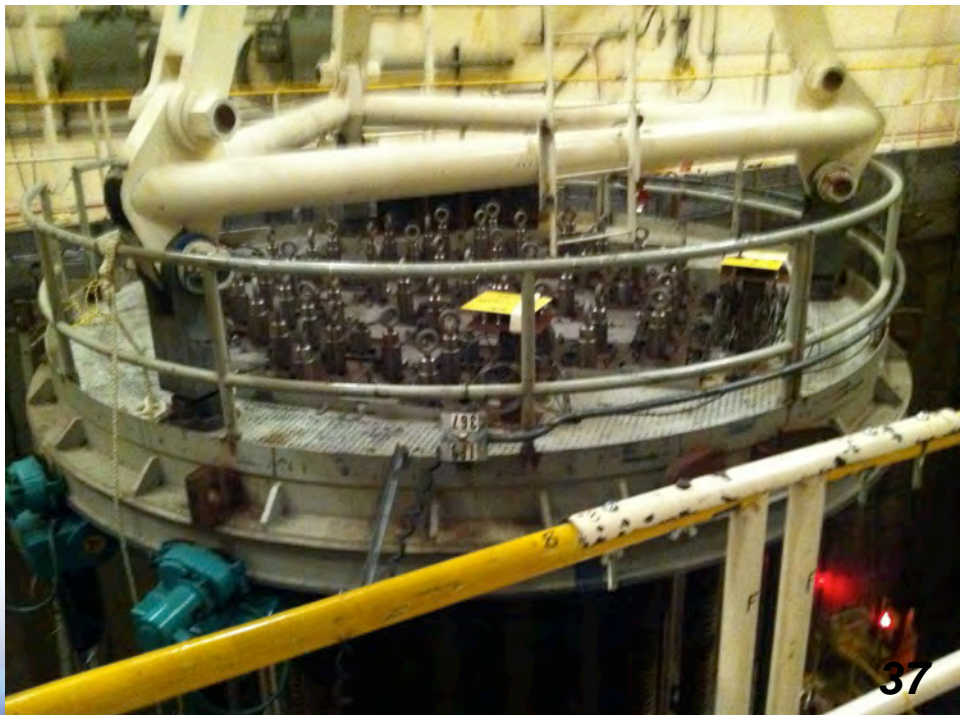
# Integrated Research Activities

# The Decommissioning of the Zion Unit 1&2 NPPs Provides a Timely Opportunity to Examine Service-Aged Materials Degradation

- In support of extended service (and current operations), ORNL is coordinating and contracting activities with Zion Solutions.
- In collaboration with the US NRC, EPRI, and others, a list of materials for “harvesting” has been compiled and feasibility examined.
- Structures and components of interest:
  - Thru-wall RPV sections
  - Cabling
  - Concrete bore samples



T. M. Rosseel, ORNL





# Harvesting Zion Cables (I)

- **Objective is to obtain cables from Zion to help understand and predict cable degradation at extended lifetimes.**
  - **validate predictive models (based on accelerated aging studies) with empirical data obtained from field-aged materials and**
  - **provide greater confidence in the performance of cables during an accident with measurable indicators in lieu of relying on the current methodology of calculating service life based on environmental monitoring.**
- **Six CRDM cable bundles (Power, position indicator & thermal couple), were harvested in 2012. Joint NRC and LWRS effort.**



# Harvesting Zion Cables (II)

- Based on Zion site visit in August, 2013, (NRC and LWRS ) identified cables for harvest. **Request submitted January.**
  - exposed to thermal and radiation environments, i.e. in-containment cables.
  - high thermal environments
  - benign controlled environment (e.g., the cable spreading room) that may provide a baseline for separating the effects of radiation and high thermal environments.
  - cables in submerged environments (e.g. tunnels between buildings)

- Zion Irradiated Concrete Cores: Eight sets of 3 Concrete cores each were identified for harvesting during a site visit (12/9/13).

The diagram shows a vertical layout of buildings. At the top is the 'Cable spreading room'. Below it is the 'Center of Aux Bldg'. Further down is the 'Center of Turbine Bldg'. At the bottom is the 'Service building'. To the left of the 'Cable spreading room' is the 'Diesel generator room end wall'. To the left of the 'Center of Aux Bldg' is 'Unit 2'. To the left of the 'Center of Turbine Bldg' is the 'Fuel-handling building' and 'Unit 1'. To the left of the 'Service building' is the 'Diesel generator room end wall'. Red arrows point from the text labels to the corresponding buildings in the diagram.

**Cable spreading room**

**Center of Aux Bldg**

**Center of Turbine Bldg**

**Loop A (IMB) 2 elevations**

**Loop A (OMB) 2 elevations**

**Diesel generator room end wall**

**Unit 2**

**Fuel-handling building**

**Unit 1**

**Auxiliary building**

**Turbine building**

**Service building**

**Diesel generator room end wall**

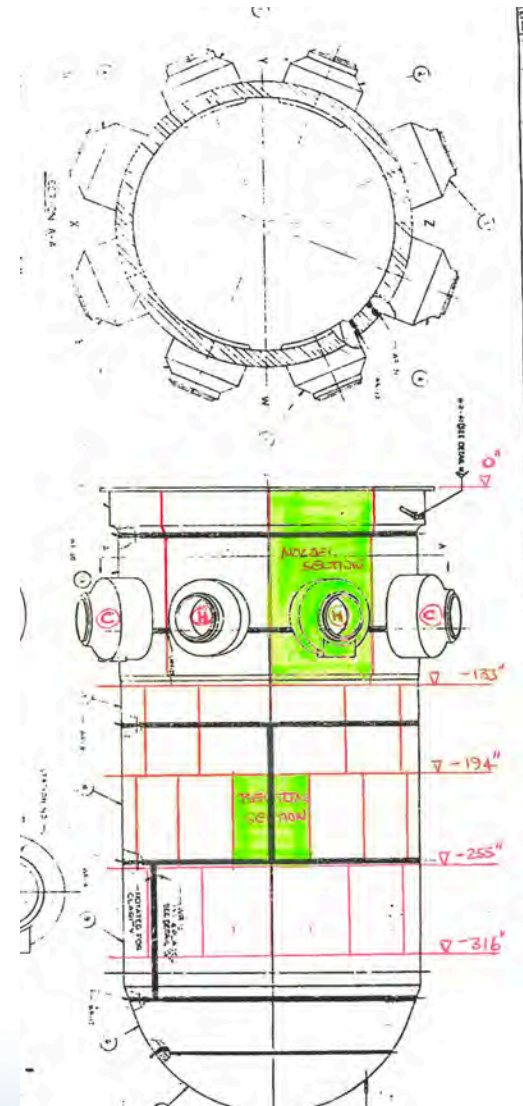


# Harvesting Zion Concrete Cores (II)

- Cores were identified during December 2013 site visit for harvesting concrete cores for 8 locations from containment (Bio shield, IMB, OMB), Aux and Turbine buildings, and outside containment, below grade.
- The cores will be characterized at ORNL and possibly other locations to develop a better understanding of and ability to predict concrete degradation at extended lifetimes.
- **Research will be focused on (1) validating predictive models (based on accelerated aging studies) with empirical data obtained from field-aged concrete in radiation and thermal environments and (2) evaluating concrete radiation gradients (i.e. the biological shield) to investigate the changes in properties as a function of the level of radiation.**
- With the addition of concrete from ambient or controlled environments (e.g., the cable spreading room), it may be possible to separate the effects of radiation and thermal environments.

# Harvesting Zion RPV Sections (I)

- Revised Zion Segmentation Plan:
  - 5' x 5' segments thermal cut instead of 3' x 4' diamond saw cut sections
  - Zion Unit 2: ~ 10/13 – 9/14 (tentative)
  - Zion Unit 1: ~ 10/14 – 8/15 (tentative)
- Ship by rail: intermodal container
  - Clam shell three sections to reduce shine
- LWRS Plan: Acquire 3 U2 sections:
  - 2 Beltline (SA-1769) and vertical weld (WF-70) sections
  - Cold Nozzle section to assess the so-called cavity albedo effect in collaboration with EPRI and CRIEPI (~ 5' x 10' section)





# Harvesting Zion RPV Sections (II)

## Research Plan

- ◆ Access to service-irradiated RPV welds and plate sections will allow through-wall attenuation studies to be performed, which will be used to assess current radiation damage models. **Thermal cut must not cross HAZ of beltline weld**
- ◆ In collaboration with EPRI and CRIEPI, evaluate albedo flux effects in nozzles. Because a recent study suggests the attenuation profile in the nozzle is significantly different than that in the beltline region, a careful analysis of the effect of high fluence at extended lifetimes will provide critical data for the evaluation of RPV long-term operation.
- ◆ Option to perform NDE of sections (Offsite) and machine mechanical testing samples offsite (Energy Solutions Memphis facility)
- ◆ Sections of the segmented RPVs will be machined into test specimens from the Linde 80 (weld wire 72105) weld (RPV peak fluence  $< 1\text{E}^{19}$ )
  - **CVN (Charpy V-Notch), Tensile, and Fracture toughness**

# Zion Harvesting Summary

- ◆ Harvesting of materials from the Zion 1 & 2 NPP by the DOE, LWRS Program, in collaboration with EPRI, the NRC, and the US nuclear industry is providing invaluable access to materials for which there is little operational data or experience to inform relicensing decisions
- ◆ Research in coordination with other LWRS materials tasks, will provide an assessment of current degradation models to further develop the scientific basis for understanding and predicting long-term environmental degradation behavior.
- ◆ An opportunity that shouldn't be missed.



# Materials Aging and Degradation Pathway Summary

- **The DOE LWRS R&D program has initiated a national materials research effort to help provide fundamental and mechanistic knowledge to support extended reactor decisions.**
  - IASCC
  - RPV issues
  - Concrete
  - Cabling
  - Ni-base alloys
  - NDE
  - Mitigation strategies
  - Integrated research
- **Research is collaborative and well coordinated with partners around the world.**
- **High quality data (measurements) to mechanistic understanding to models to monitoring and mitigation**





# Discussion / Questions



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