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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 (ACRS)

6 + + + + +

7 PLANT LICENSE RENEWAL SUBCOMMITTEE

8 + + + + +

9 TUESDAY

10 JULY 10, 2012

11 + + + + +

12 ROCKVILLE, MARYLAND

13 + + + + +

14 The Subcommittee met at the Nuclear  
15 Regulatory Commission, Two White Flint North, Room  
16 T2B1, 11545 Rockville Pike, at 1:30 p.m., Gordon R.  
17 Skillman, Chairman, presiding.

18 SUBCOMMITTEE MEMBERS:

19 GORDON R. SKILLMAN, Chairman

20 J. SAM ARMIJO, Member

21 DANA A. POWERS, Member

22 MICHAEL T. RYAN, Member

23 WILLIAM J. SHACK, Member

24 JOHN D. SIEBER, Member

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ACRS CONSULTANTS PRESENT:

JOHN J. BARTON

MARIO BONACA

NRC STAFF PRESENT:

KENT L. HOWARD, Designated Federal Official

GARRY ARMSTRONG, JR., NRR

RAJENDER AULUCK, NRR

SHANNON BERGER, NRR

ANGELA BUFORD, NRR

RICH CONTE, NRR

ARTHUR CUNANAN, NRR

JOHN DAILY, NRR

CLIFF K. DOUTT, NRR

ALICE ERICKSON, NRR

BART FU, NRR

MELANIE GALLOWAY, NRR

BRIAN HARRIS, NRR

ALLEN HISER, NRR

BRIAN HOLIAN, NRR

WILLIAM HOLSTON, NRR

MATT HOMIACK, NRR

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1 NAEEM IQBAL, NRR  
2 ATA ISTAR, NRR  
3 BRYCE LEHMAN, NRR  
4 JAMES MEDOFF, NRR  
5 KENNETH MILLER, RES  
6 SEUNG KEE MIN, NRR  
7 MIKE MODES, Region I Inspection Team Lead\*  
8 DENNIS MOREY, NRR  
9 CHING NG, NRR  
10 DUC NGUYEN, NRR  
11 ALOYSIUS OBODOAKO, NRR  
12 JACOB PHILIP, NRR  
13 PAT PURTSCHER, NRR  
14 BILL RAYMOND, Region I, Senior Resident  
15 Inspector at Seabrook\*  
16 BILL ROGERS, NRR  
17 ABDUL SHEIKH, NRR  
18 ROBERT SUN, NRR  
19 JOHN TSAO, NRR  
20 MARIELIZ VERA, NRR  
21 JOHN WISE, NRR  
22 MARK YOO, NRR  
23

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## 1 ALSO PRESENT:

2 OGUZHAN BAYRAK, University of Texas

3 BRIAN BROWN, NextEra RONALD CAMPO, NextEra

4 ED CARLEY, NextEra

5 KEN CHEW, NextEra

6 RICK CLICHE, NextEra

7 MICHAEL K. COLLINS, NextEra

8 JIM CONNOLLY, NextEra

9 CLIFF CUSTER, FENOC

10 DAN DORAN, Exelon

11 MICHAEL GALLAGHER, Exelon

12 STEVEN HAMRICK, NextEra

13 LEE HANSEN, NextEra

14 GENE KELLY, Exelon

15 RUSSELL H. LIEDER, NextEra

16 HENRY W. MENTEL, NextEra

17 JAMES MORAN, MPR Associates

18 RICK NOBLE, NextEra

19 MICHAEL O'KEEFE, NextEra

20 MICHAEL OSSING, NextEra

21 A. THOMAS ROBERTS, MPR Associates Inc.

22 DAVID ROBINSON, NextEra

23 DAVID SHAFER, Ameren (Zempleo)

24 JOHN SIMONS, MPR Associates Inc.

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1 KEN SNYDER, NIST

2 THEODORE P. VASSALLO, JR.

3 ROBERT VAYDA, MPR Associates Inc.

4 THOMAS WAECHTER, NextEra

5 KEVIN WALSH, NextEra

6 GARY WARREN, STARS

7 KEVIN WHITNEY, NextEra

8  
9 \*Present via telephone  
10  
11  
12  
13  
14  
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24

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

1:32 p.m.

CHAIR SKILLMAN: Good afternoon. This meeting will now come to order. Ladies and gentlemen, this is a meeting of the Seabrook Plant License Renewal Subcommittee.

I'm Gordon Skillman, chairman of the License Renewal Subcommittee of the ACRS. ACRS members in attendance are Mr. Jack Sieber, Dr. Dana Powers, Dr. Sam Armijo, chairman of the ACRS, and Dr. William Shack. Our consultants are Mr. John Barton and Dr. Mario Bonaca. Kent Howard to my right of the ACRS is the Designated Federal Official for this meeting.

This subcommittee will review the license renewal application for the Seabrook Station and the associated Safety Evaluation Report with open items. Of particular interest to the subcommittee will be the alkali-silica reaction, ASR, issue at the Seabrook Station.

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1                   We will hear presentations from NextEra  
2                   Seabrook representatives, NRC staff and other  
3                   interested persons regarding this matter. I would  
4                   like to add that the Region I inspection team lead,  
5                   Mr. Mike Modes, will participate in this meeting via  
6                   bridge line.

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

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

21                  I request that participants in this  
22                  meeting use the microphones located throughout the  
23                  meeting room when addressing the subcommittee. They  
24                  are asked to please identify themselves and speak

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1 with sufficient clarity and volume so that they can  
2 be readily heard.

3 May I ask for confirmation, please, that  
4 the bridge line is open? We're going to take about  
5 a 120-second pause here and while this pause is in  
6 effect I would like to make a brief comment, please.

7 Probably all of us sitting at this  
8 horseshoe have read all or most of the 770-page SER.

9 We've read multiple RAIs, the status report, many  
10 of the references, consultants' reports. And I  
11 would like to communicate that this meeting while it  
12 will have much attention on alkali-silica reaction,  
13 that there is much more to this application than  
14 simply ASR as alkali-silica reaction is known. So I  
15 want this meeting to be balanced and I want all of  
16 the topics to be available for discussion so that we  
17 don't get swept away by an inappropriate focus on  
18 one single item. And I thank you.

19 As soon as we get the nod I will  
20 introduce Brian Holian from the NRC staff. We're  
21 good to go. I will now present Mr. Brian Holian of  
22 the NRC staff for opening comments. Brian?

23 MR. HOLIAN: Thank you, Mr. Chairman,  
24 and thank you, members of the subcommittee. My name

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1 is Brian Holian. I'm the division director for the  
2 Division of License Renewal in NRR. And I'll just  
3 cover the agenda in some brief opening comments.  
4 Then we'll turn it over to licensee for their  
5 presentation which will be followed by the staff's  
6 presentation.

7 Just a couple of introductions to start  
8 with. I'll introduce the rest of the NRC presenters  
9 when we swap positions. But to my left is Melanie  
10 Galloway, the deputy director, Division of License  
11 Renewal.

12 And I wanted to recognize one other  
13 person at this time, Mr. Rich Conte sitting in the  
14 front row. He's in from Region I. He's a branch  
15 chief in the Division of Reactor Safety so he'll  
16 also be here for questions from a regional  
17 perspective as we look at the presentation.

18 We do have, as you mentioned, Chairman,  
19 Mike Modes, the lead inspector who led the  
20 inspection who will actually be giving the  
21 presentation via the phone when we get to the  
22 regional perspective.

23 Just a couple of opening comments as  
24 you've read the application. And Chairman, I

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1 appreciate your comments on the balanced look. We  
2 think that's appropriate from the staff view also.  
3 There's a lot of issues that the staff has covered  
4 and of course ASR has been the one in the press.  
5 And there will be an appropriate focus on it today,  
6 but we agree with you from the staff's perspective  
7 there's a lot of issues on any license renewal  
8 application.

9 We have Melanie Galloway to talk about  
10 ASR just for a minute as an introduction here.  
11 That's appropriate. Melanie was fulfilling the  
12 division director role here for about the last 6 or  
13 7 months as I was over on a Research rotation. So I  
14 appreciate Melanie keeping the ball going on this  
15 application and this review.

16 One other item I'd like to mention right  
17 off as the subcommittee members have seen it, we  
18 just -- the Division of License Renewal updated from  
19 GALL Rev 1 to GALL Rev 2 last year around this time.

20 And I believe Seabrook will be the last plant.

21 I know we have Limerick coming in next.  
22 Limerick was able to adjust its application to come  
23 in with a full GALL Rev 2 reference which means,  
24 usually it means less requests for additional

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1 information. So I think -- I just wanted to  
2 highlight for the subcommittee, you saw many  
3 requests for additional information. Some of those  
4 were of necessity because the application had been  
5 done in GALL Rev 1 and the NRC staff was bringing  
6 them up to GALL Rev 2 with many RAIs. So I wanted  
7 to highlight that right up front.

8 On the ASR issue, when I came back from  
9 Research one of my first questions was should we be  
10 going ahead with this subcommittee at this time,  
11 this ACRS subcommittee. We did not have agreement  
12 between the staff and the licensee on open items.

13 Open items -- a reminder -- usually are  
14 that. They could either be we don't have agreement  
15 or they could be we have agreement but it's not  
16 written out yet by the staff. The staff is still  
17 reviewing that. You'll see some of that on some of  
18 the open items today, that there is a clear path  
19 forward.

20 On the ASR issue the staff still has  
21 many questions for the applicant. The applicant  
22 does have a conclusion in their slide that they have  
23 an effective aging management program that has been  
24 submitted. You don't see that conclusion in the

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1 staff slides. We are not to that conclusion yet.

2 So as we head here we foresee that we  
3 would recommend a second subcommittee. That will be  
4 up to the subcommittee themselves later, but we  
5 would recommend that still pending the conclusion of  
6 our Safety Evaluation Report. With that let me turn  
7 it over to Melanie.

8 MS. GALLOWAY: Thank you, Brian. A few  
9 notes to provide a little bit more context on the  
10 ASR issue in particular.

11 First of all, the presentation by the  
12 staff on ASR is going to be limited to the effects  
13 and the structures that are described in the license  
14 renewal. The information that's already been  
15 provided by the applicant is what we're going to be  
16 focusing on.

17 In addition to the license renewal  
18 proceeding there is also a lot of work being done  
19 out of our regional offices looking at the current  
20 issues associated with ASR and operability. That's  
21 not going to be the subject of our presentation  
22 today. So I just want to make that content  
23 appropriately clear.

24 Also, it's important to note that our

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1 SER was issued on June 8th of this year and that was  
2 based on submittals provided by the applicant  
3 through March 30th of this year. Since March 30th  
4 the applicant has provided a substantial submittal  
5 date of May 16th which affects the license renewal  
6 information. However, that is continuing under  
7 staff review, and so when we talk about the  
8 information that we've concluded and what our  
9 questions are at this point it is only through the  
10 March 30th date. To the extent that we provide  
11 additional context and more current information we  
12 will appropriately caveat that and let you know that  
13 those are early impressions and that our review is  
14 continuing.

15 The applicant in its May 16th submittal  
16 did provide a new plant-specific ASR-related AMP.  
17 And while we have not completed the review of that  
18 as I just noted we are going to be able to provide  
19 some early-on observations. And we are doing this  
20 because the applicant has included a lot of  
21 information about that program in their presentation  
22 today. So in order to round out that discussion we  
23 will talk about it, but again briefly and only based  
24 on preliminary observations.

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1           It's also important to note that this is  
2 very much for the NRC staff and informational  
3 meeting. Oftentimes when we're coming before ACRS  
4 we are able to provide conclusions. When it comes  
5 to ASR, given the state of our review we are really  
6 only providing status or information at this time as  
7 we know it.

8           Clearly we know the May 16th submittal  
9 as well as additional information. We're  
10 anticipating a response to our open items defined in  
11 the SE as well as additional responses to questions  
12 we will be asking and have already asked on ASR is  
13 going to change the context of the staff's review,  
14 rightly so. But right now we cannot provide that  
15 definition near the tail end of our review as we  
16 might in other situations. So this is informational  
17 and status-seeking today.

18           The other point I wanted to make which  
19 is important is that the GALL report does address  
20 ASR. It defines ASR in a fairly narrow kind of way,  
21 for plants that might have a very small indication  
22 of ASR or something that was in a realm of what we  
23 might consider normal as far as ASR.

24           The Seabrook situation is well beyond

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1 that and so the GALL when talking about any given  
2 effect does indicate that when plant-specific  
3 operating experience is beyond what is expected as  
4 normalcy and defined as normalcy in the GALL that  
5 applicants are expected to go above and beyond and  
6 provide more specific information that gets to the  
7 actual extent of their plant operating experience.  
8 And that's what this applicant is attempting to do  
9 and that's what we are doing in our review going  
10 forward.

11 We do understand that the ACRS  
12 subcommittee has expressed interest in going to the  
13 site in the fall, in particular to see firsthand  
14 some of the effects of ASR on the structures at  
15 Seabrook. We are aware of that and we are looking  
16 forward to coordinating that visit with the ACRS to  
17 make that a reality. On that point I'll turn the  
18 presentation back over to Brian.

19 MR. HOLIAN: Thank you. The only thing  
20 I'll add before turning it over to the licensee is  
21 we did prompt Rich Conte from the region to be ready  
22 for any operability calls or any operability-type  
23 questions. We realize that an issue like this does  
24 cross over, Part 54 license renewal to Part 50.

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1 There is a lot that's probably not even on our  
2 slides.

3 I don't know, I can't remember if we put  
4 on there the fact that there is a Region I kind of  
5 steering group with both Division of License Renewal  
6 presentation and Division of Engineering out of  
7 Nuclear Reactor Regulation that looks at the Part 50  
8 type issues of continued operation, you know, up to  
9 and before the extended period starts. So that --  
10 Region I has put some focus on that and Rich Conte  
11 will be able to speak to that.

12 With that I thank you and I'll introduce  
13 additional NRC personnel later.

14 CHAIR SKILLMAN: Excuse me, Brian. I'd  
15 like to take my nickel back just for a second.

16 MR. HOLIAN: Oh, sure.

17 CHAIR SKILLMAN: I want to thank Rich  
18 for coming down from Region I. And I want to  
19 recognize Dr. Ryan has joined us as part of our team  
20 here on the subcommittee.

21 MEMBER RYAN: Thank you very much.

22 CHAIR SKILLMAN: Back to you. Thank  
23 you.

24 MR. HOLIAN: With that I'll turn it over

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1 to the licensee and a relatively site vice  
2 president, I understand, Kevin Walsh at Seabrook.  
3 So, Kevin.

4 MR. WALSH: Thanks, Brian. Good  
5 afternoon. My name's Kevin Walsh. I'm the site  
6 vice president at Seabrook and today we're here and  
7 I'm happy to be able to discuss the status of our  
8 license renewal application. And I'm going to turn  
9 it over to members of my staff here shortly but I'd  
10 ask that they each introduce themselves.

11 MR. CONNOLLY: Jim Connolly. I'm the  
12 site engineering director.

13 MR. COLLINS: Good afternoon. Mike  
14 Collins, design engineering manager.

15 MR. OSSING: Good afternoon. Mike  
16 Ossing, engineering programs manager.

17 MR. O'KEEFE: Mike O'Keefe, licensing  
18 manager.

19 MR. NOBLE: My name's Rick Noble. I'm  
20 the manager of special projects.

21 MR. CLICHE: And I'm Rick Cliche, the  
22 license renewal project manager.

23 MR. WALSH: Thank you, gentlemen. At  
24 NextEra Energy we have a nuclear excellence model,

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1 and the nuclear excellence model essentially  
2 outlines the framework of our culture. And one of  
3 the primary attributes in that nuclear excellence  
4 model is a deep respect for nuclear safety. And we  
5 take that very seriously and we apply that to all  
6 that we do.

7 And I would like to say that our staffs  
8 work very diligently to put together a comprehensive  
9 analysis to support license renewal at Seabrook and  
10 look forward today to being able to answer the  
11 specific questions on all the topics. So we're here  
12 prepared to discuss all the open items and I'll turn  
13 it over to Rick Cliche.

14 MR. CLICHE: Thanks, Kevin. Good  
15 afternoon. Again, I'm Rick Cliche, license renewal  
16 project manager for NextEra Seabrook. And we've got  
17 the Seabrook Station team here today to discuss a  
18 little bit about the station, give you some  
19 background on the station and to -- some background  
20 on how we prepared the license renewal application,  
21 and thirdly to discuss the open items. And to get  
22 us started Jim Connolly will be talking on the  
23 station background.

24 MR. CONNOLLY: Thank you, Rick. Just

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1 for your information Seabrook is located in the town  
2 of Seabrook, New Hampshire. We're approximately 2  
3 miles west of the Atlantic Ocean and approximately 2  
4 miles north of the Massachusetts state line and 15  
5 miles south of the Maine state line.

6 Seabrook is a single-unit Westinghouse  
7 four-loop pressurized water reactor with a General  
8 Electric turbine generator. The reactor is housed  
9 in a steel-lined reinforced concrete containment  
10 structure which is enclosed by a reinforced concrete  
11 containment enclosure structure. The unit is  
12 licensed for 3,648 megawatts thermal which yields  
13 about 1,245 megawatts electric.

14 The Atlantic Ocean is the normal heat  
15 sink for the plant and there are approximately 1,100  
16 folks onsite including contractors. There are  
17 approximately 700 NextEra employees with 400  
18 contractors including security folks. Next slide.

19 This is a layout of the plant site. I'm  
20 going to take you through. I'll start off at the  
21 turbine building which is in the center of the  
22 picture here. The turbine building obviously houses  
23 our turbine generator and houses our auxiliary  
24 components to support operation on the secondary

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1 side of the plant. In the middle is the containment  
2 structure which houses obviously the reactor itself  
3 and certain auxiliaries. And just below that is the  
4 fuel storage building which houses our spent nuclear  
5 fuel and is our primary building for receipt of  
6 nuclear fuel.

7 Just below that is the primary auxiliary  
8 building which speaks for itself. It holds our  
9 auxiliaries, our pumps, heat exchangers and  
10 everything that supports operation of the reactor.  
11 And just a little bit left of that is the waste  
12 processing building which is used as it says to  
13 process the plant waste from generation of power.

14 Just above that is our control building  
15 along with our diesel building. It is one combined  
16 building for both. The control room is at the very  
17 top of the building, the diesels are at the bottom  
18 of the building. And to the top left is our  
19 switchyard which is our main interconnection between  
20 the electrical side of the unit and the New England  
21 Power grid.

22 And also, at the bottom left is Unit 2  
23 containment structure. Unit 2 was reviewed as part  
24 of the scope of this license renewal. There are a

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1 couple of common structures. There is one as you  
2 can see on the bottom of that is a cooling tower  
3 that is common for both Unit 1 and 2, and also there  
4 is a common servicewater intake structure for both  
5 units.

6 MR. BARTON: Where on this slide is this  
7 electrical tunnel with the ASR?

8 MR. CONNOLLY: On this slide, the  
9 electrical tunnel?

10 MR. BARTON: Where would it be?

11 MR. CONNOLLY: Where would it be. It  
12 is, if you go where the control --

13 MEMBER SHACK: Get the mouse.

14 MR. CONNOLLY: I'm sorry?

15 MEMBER SHACK: Can you use the mouse?  
16 No mouse.

17 MR. BARTON: We've got it now.

18 MR. CONNOLLY: Okay. It's in that area  
19 where the arrow is just --

20 MR. BARTON: The containment building?

21 MR. CONNOLLY: Right between the  
22 emergency feedwater building and the control  
23 building.

24 MR. BARTON: Okay.

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1 MR. CONNOLLY: Which is right next to  
2 the containment building.

3 MR. BARTON: Gotcha. Okay.

4 MR. CONNOLLY: I'm going to briefly go  
5 over the licensing history of the plant. A  
6 construction permit was issued in 1976. Seabrook  
7 went through a three-step licensing process and  
8 achieved a full power license on March 15th of 1990  
9 and went to commercial operation shortly thereafter.

10 In 2002 the operating license was  
11 transferred to FPL Energy which later became NextEra  
12 Energy. During the period of 2005-2006 the unit  
13 went through a couple of power uprates, a stretch  
14 power uprate and a measurement uncertainty uprate.  
15 And the license renewal application was submitted to  
16 the NRC on May 25th, 2010. And the current  
17 operating license expires in March of 2030.

18 I'm going to briefly go over the plant  
19 status. The unit is in cycle 15. We completed  
20 refueling outage 14 in May of 2011 and the current  
21 status of the plant is that the plant has been  
22 operating continuously for approximately 260 days.  
23 The next fueling outage is scheduled for September  
24 2012 and during that outage we'll be doing some

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1 servicewater piping inspections, we'll be doing some  
2 inspections of the reactor vessel head underneath  
3 the reactor vessel head. We'll be looking at the  
4 bottom-mounted instrumentation tubes and that area  
5 at the bottom of the vessel, and we'll also be  
6 performing a rewind of our main generator.

7 MR. BARTON: Is there some reason in  
8 that outage you can't do an inspection of this  
9 containment concrete that's in the annulus that's  
10 exhibiting ASR? I noticed that you're putting that  
11 off until 2015, that inspection.

12 MR. CONNOLLY: Can you repeat that  
13 question? I'm sorry, I didn't hear it all.

14 MR. BARTON: Okay. The -- why can't you  
15 in this next outage do the inspection that you have  
16 planned to do on the containment concrete that has  
17 the ASR that's in the annulus area? And I read in  
18 your paperwork someplace that you don't have that  
19 scheduled until 2015.

20 MR. CONNOLLY: Rick? This is Rick  
21 Noble. He's our special projects manager. Rick can  
22 probably answer that better than I could.

23 MR. NOBLE: So what I think you're  
24 referring to is I think what we said we were doing

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1 in 2015 was the ultrasonic testing. That was a  
2 confirmatory for the steel liner plate. So that's  
3 what that date is. As far as looking at --

4 MR. BARTON: Why can't you do that in  
5 2012? That's my question.

6 MR. NOBLE: The UT for the steel liner  
7 plate?

8 MR. BARTON: Yes.

9 MR. NOBLE: It's scheduled for our  
10 refueling outage in OR '16. That's what that date  
11 is.

12 MR. BARTON: I understand that. Why  
13 can't you do it sooner? I mean we're interested to  
14 know if there's any damage -- there is damage on the  
15 concrete, containment concrete. We're interested is  
16 there any damage on the liner, on the exterior of  
17 the liner and that's an answer we're looking for.  
18 And I'm asking why can't we -- why do we have to  
19 wait till 2015 to get that answer. That's my  
20 question.

21 MR. NOBLE: Ted Vassallo of my staff can  
22 probably shed more light on that.

23 MR. VASSALLO: I'm Ted Vassallo from  
24 design engineering. I can respond to your question.

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1       During our last refueling outage in April of 2011  
2       we did similar UT thickness measurements at 120  
3       locations on the containment liner and we found no  
4       indication of metal loss. So we are fully confident  
5       that there is no corrosion activity on the backside  
6       of our liner.

7                   MR. BARTON: Thank you.

8                   MR. CONNOLLY: Okay. And at this time  
9       I'm going to turn the presentation back over to Rick  
10      Cliche who will discuss some specifics regarding the  
11      license renewal project.

12                  MR. CLICHE: The license renewal  
13      application was prepared onsite at Seabrook Station.  
14      The project team included a number of longtime site  
15      employees like myself, individuals from design  
16      engineering, system engineering, licensing  
17      engineering and licensed plant operators were on the  
18      project team.

19                  The project team was augmented by some  
20      experienced contractors experienced in the license  
21      renewal arena, several plants under their belt. We  
22      all learned license renewal through involvement, the  
23      NEI license renewal committees and the contractors  
24      who were brought in to support the team.

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1           The application was prepared following  
2           the GALL, Standard Review Plan, and NEI 95-10  
3           industry guidance. NextEra corporate fleet  
4           supported the project, provided us oversight and  
5           experienced people for audits, sent members of the  
6           team on benchmarking activities to gain knowledge  
7           both in preparing the license renewal application  
8           and more recently on how to implement license  
9           renewal commitments.

10           We had two quality assurance audits  
11           conducted during the development of the application  
12           to make sure we were following our processes that  
13           had been written down and prescribed. Our technical  
14           leads all participated in the -- and had hosted  
15           onsite at Seabrook the NEI industry working groups.

16           Our industry peers, some of them here  
17           today, reviewed both our technical reports and the  
18           assembled application before we submitted it to make  
19           sure we were aligned with the industry standards.

20           CHAIR SKILLMAN: Rick, is the point that  
21           you're making relative to completing this  
22           application onsite that it was designed, built and  
23           is owned by the site personnel versus the home  
24           office personnel 1,200 or 1,500 miles away?

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1 MR. CLICHE: That's correct, Mr.  
2 Skillman.

3 CHAIR SKILLMAN: Thank you.

4 MR. CLICHE: Scoping activities. We had  
5 a very good existing equipment database that was a  
6 key source of information for scoping. We pulled  
7 the applicable information from it, put it into our  
8 relational database, gave us a good starting point  
9 for scoping of safety-related and the regulated  
10 events.

11 We followed the requirements of 10  
12 C.F.R. 54 and guidance in NEI 95-10. The non-safety  
13 affecting safety was not something that was readily  
14 pulled from that database. Using a conservative  
15 spaces approach we included in scope the water-  
16 filled non-safety systems that are in areas that  
17 contain safety-related components.

18 Having former licensed operators on the  
19 team was a big help as you know, here they were able  
20 to take the lead and confirm through walkdowns that  
21 the plant equipment was in fact in the locations we  
22 had determined them to be.

23 We used commodity groups when the  
24 evaluations were best performed by component type

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1       rather than by individual component.

2               CHAIR SKILLMAN:   Before going to that  
3       next slide let me ask a question.   I'm on your  
4       safety evaluation page 2-94 and the question has to  
5       do with the ASFC, the auxiliary spent fuel pool  
6       cooling heat exchanger.   And it was found to be  
7       installed but not connected.   And the verbiage goes  
8       on to communicate that it is now fully and  
9       completely disconnected and you've done a license  
10      change to remove it from your license.   Are you  
11      having second thoughts after the Fukushima event?

12              MR. CONNOLLY:   Well, that's an excellent  
13      question.   The Fukushima event certainly highlighted  
14      the need to have additional protection in your spent  
15      fuel storage pools.   And to be perfectly honest with  
16      you it's something that we haven't given direct  
17      thought to, but certainly with the heightened  
18      awareness and the heightened sensitivity with  
19      everyone's spent fuel pool that is certainly a  
20      factor we will probably take a look at.

21              CHAIR SKILLMAN:   Thank you.

22              MR. CLICHE:   Time-limited aging analysis  
23      for scoping.   In Seabrook we're fortunate to have a  
24      very comprehensive searchable record of our

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1     licensing base available to us. We perform keyword  
2     searches on the database, make sure we identified  
3     any potential TLAAs. We also reviewed the design  
4     calculations and interviewed site engineers. We  
5     benchmarked potential TLAAs against 19 other  
6     applications. We looked at 69 potential TLAAs in  
7     the application review, ones of similar design and  
8     engineering firms.

9             For neutron fluents, fluents for the  
10    vessel shells and wells was determined for operation  
11    to 60 years. We identified and evaluated materials  
12    in the extended belt line. The upper shelf energy  
13    exceeded the minimum acceptance limit of 50-foot  
14    bounce and for pressurized thermal shock the limits  
15    are below the allowable screening criteria.

16            For metal fatigue a cumulative usage  
17    factor of 40 years as we evaluated for 60 years  
18    based on a cyclic analysis. Environmentally  
19    assisted fatigue was evaluated. We looked at  
20    locations identified in NUREG/CR-6260 for newer  
21    vintage Westinghouse plants. Since then we have  
22    committed to determine if these locations are in  
23    fact limiting and will age-manage the applicable  
24    limiting locations.

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1 CHAIR SKILLMAN: Before changing that  
2 slide I would like to ask this question, please. On  
3 your safety evaluation page 3-149, approximately the  
4 fourth paragraph, the NRC staff writes, "However, it  
5 was not clear to the staff that the metal fatigue of  
6 reactor coolant pressure boundary program will  
7 perform cycle counting, cycle-based fatigue  
8 monitoring and stress-based fatigue monitoring for  
9 RCPB components, including the environmentally  
10 assisted EAF. Furthermore, the metal fatigue of  
11 reactor coolant pressure boundary does not provide  
12 details regarding the action limits that are set on  
13 design basis transient cycle counting or on CUF  
14 monitoring activities."

15 I'd like to hear you speak a little bit  
16 about the comprehensiveness of your cycle counting  
17 and how we can be comfortable that what you indicate  
18 as your current number of cycles is accurate.

19 MR. CARLEY: Probably I should take  
20 that. Ed Carley, license renewal engineer. I was  
21 the TLAA lead.

22 Our current cycle counting and basic  
23 cycle counting that we used for evaluation of TLAA's  
24 is based on our UFSAR cycles. In addition, we are

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1 looking at about an additional 200 points to assist  
2 us in those to determine that those cycles are  
3 accurate in the overall design.

4 But we currently cycle-count all our  
5 UFSAR points. We evaluate it by extrapolation out  
6 to 60 years, those points, and determine that our  
7 current design will be met at 60 years for all the  
8 locations for CUF.

9 In the area of environmentally assisted  
10 fatigue we have two locations that we will exceed  
11 1.0 when we look at the environmental effects of  
12 those locations. We have made a commitment to re-  
13 analyze those two locations. And one of the  
14 projected methods is to look at the actual cycles  
15 that those two locations have received and possibly  
16 may have to submit a change to the number of cycles  
17 allowed at those two locations if we have enough  
18 margin.

19 CHAIR SKILLMAN: Might you have an  
20 opinion of how close to 1.0 your final count might  
21 bring you?

22 MR. CARLEY: Preliminary evaluations  
23 that have been done is -- looks like we can maintain  
24 the current cycles and based on the severity of the

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1 current cycles we have received and the number of  
2 cycles we fully expect to be at at 40 years and 60  
3 years. But as of right now when you project out to  
4 the maximum we would exceed. So looking at what we  
5 expect to be at at 60 years we should be able to be  
6 at or below 1 with re-analysis.

7 CHAIR SKILLMAN: But you used the  
8 "exceed" word at least one time so explain a little  
9 more about that, please.

10 MR. CARLEY: I used the word "exceed" as  
11 right now is if we were to take the cycles we are  
12 designed for, we do exceed. However, if we were to  
13 look at the cycles that we would expect to be at at  
14 60 years we should be at 1.0 or below.

15 CHAIR SKILLMAN: Thank you.

16 MR. MENTEL: Yes, my name is Henry  
17 Mentel. I just wanted to supplement the response  
18 given by Mr. Carley.

19 First of all, as far as cycle counting  
20 goes we have counted cycles since the beginning of  
21 operations and those records were reviewed in detail  
22 by one of our contractors to establish that  
23 definitive cycle count of where we are today for  
24 most of the major cycles. That's one thing.

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1           The second thing is as far as the two  
2           locations mentioned what we propose to do is in the  
3           finite elements analysis that was done to establish  
4           on the -- for the license renewal those numbers that  
5           Mr. Carley mentioned exceeded and obviously the  
6           environmental contribution exceeded also, they were  
7           able to isolate which particular transients were  
8           most contributing to those numbers.

9           And the intent of the future work to be  
10          done before the end of our present license is to  
11          redo that analysis and go back and re-benchmark what  
12          we've used for those particular cycles, the number  
13          of count we used in the analysis and compare it to  
14          where we actually are to basically remove some of  
15          that conservatism and bring those numbers down to  
16          within a cumulative usage factor of 1.

17                 CHAIR SKILLMAN: Thank you.

18                 MR. MENTEL: You're welcome.

19                 CHAIR SKILLMAN: Please proceed. Thank  
20          you.

21                 MR. CLICHE: Okay. As Brian Holian had  
22          mentioned at the beginning we are one of the last,  
23          if not the last plant to be, you know, a GALL 1  
24          applicant. That said, you know, GALL Rev 2 and

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1 several interim staff guidance documents have been  
2 issued since our submittal of the application. And  
3 in this operation -- operating experience has been  
4 reviewed and numerous changes proactively made to  
5 the application.

6 So supplements to the application were  
7 issued to align with GALL Rev 2 AMPs even before  
8 GALL Rev 2 was issued. In some cases for small-bore  
9 Class 1 piping, selective leaching, PWR vessel  
10 internals, buried pipe and tanks, the E3  
11 inaccessible cables and steam generator tube  
12 integrity, and we, you know, continue.

13 We'll be discussing some open items  
14 where there's even more operating experience that we  
15 are pulling into our application in response to  
16 industry OE.

17 So this table here represents  
18 consistency with GALL Rev 1. There were 43 aging  
19 management programs. This includes the recently  
20 submitted alkali-silica reaction monitoring program.

21 Twenty-nine of them are existing programs, fourteen  
22 are new. And you can see the breakdown of  
23 consistency with GALL Rev 1.

24 MEMBER SHACK: Just on your nickel alloy

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1 program, I'm interested in that. Your head is a  
2 low-temperature head. I assume that you have no  
3 plans to replace it at this point. Do you still  
4 count effective degradation years? You know, that  
5 thing that was set up once upon a time, is that  
6 something you actually track for the head?

7 MR. CONNOLLY: This is Jim Connolly,  
8 site licensing manager.

9 MR. MENTEL: Again, Henry Mentel from  
10 NextEra Energy. We do on a cycle-by-cycle basis go  
11 back and review according to the original criteria  
12 the number of degradation years and also the risk  
13 factor for the head.

14 MEMBER SHACK: What number of  
15 degradation years are you at now? Do you know?

16 MR. MENTEL: I'd be guessing. I want to  
17 say on the order of six.

18 MEMBER SHACK: That would seem about  
19 right.

20 MR. MENTEL: Yes. I'm not positive of  
21 the exact number at this point.

22 MEMBER SHACK: And again, in your nickel  
23 alloy program you mention a lot of potential means  
24 for mitigation. How many of your high-temperature

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1 sort of Alloy 182 welds have actually been mitigated  
2 in one fashion or another?

3 MR. MENTEL: Okay. Previously I believe  
4 in the last couple of years I don't know exactly  
5 which outage. We basically did a predisposition on  
6 all our pressurizer nozzles by weld overlay.

7 MEMBER SHACK: Okay.

8 MR. MENTEL: Russ can speak to the steam  
9 generator.

10 MR. LIEDER: I'm Russ Lieder, NextEra  
11 Energy. I'm the Alloy 600 program owner.

12 We have mitigated the pressurizer  
13 nozzles, all six of those. We've inspected the  
14 reactor vessel hot and cold leg nozzles. We found  
15 one with an indication that was mitigated in that  
16 outage and then we have the upcoming inspections to  
17 further inspect.

18 MEMBER SHACK: But you haven't done any  
19 other mitigation on the hot leg nozzles?

20 MR. LIEDER: Just the one that we found  
21 --

22 MEMBER SHACK: An indication, okay.  
23 Now, there was some notion I saw somewhere about  
24 weld overlays and you had flaws in those. Those are

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1 on the pressurizer?

2 MR. LIEDER: Those are on the  
3 pressurizer when we did those.

4 MEMBER SHACK: And those flaws were  
5 basically hot cracking flaws from the weld?

6 MR. LIEDER: I'm not particular to the  
7 welding area, but they were resolved. They were  
8 ground out during the repair process of the weld  
9 overlay.

10 MEMBER SHACK: Okay. You're Alloy 600.  
11 How about steam generators?

12 (Laughter.)

13 MR. LIEDER: I am also the steam  
14 generator program.

15 (Laughter.)

16 MEMBER SHACK: Now you have the 600 TT  
17 tubes.

18 MR. LIEDER: That is correct.

19 MEMBER SHACK: You had some problems  
20 with cracking in those tubes back in the early 2000,  
21 right?

22 MR. LIEDER: 2002. Spring of 2002, yes.

23 MEMBER SHACK: Okay. And what was the  
24 final resolution of that?

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1           MR. LIEDER: The final resolution, the  
2 root cause, basically there was an issue during  
3 manufacturing when they thermally treat the tubes.

4           MEMBER SHACK: Does that affect all your  
5 tubes, or was that a very selective --

6           MR. LIEDER: This is a very small  
7 section -- portion of the tubes. So when they  
8 thermally treat the tubes they put a mark on them  
9 that they're thermally treated and they send them  
10 over for bending. The low-row tubes, then they --  
11 up to row 10 for a mile up because they're 11/16ths  
12 tubes, they re-insert into the oven to heat-treat  
13 the U-bends. So there was a unique signature with  
14 the ones that had the cracking issue compared to a  
15 normal thermally treated low-row tube.

16           Subsequent to that another utility found  
17 something in the higher rows. And we did studies to  
18 see if there was any susceptibility to our higher  
19 rows. We found one tube that may be susceptible and  
20 we removed it from service. We didn't find any  
21 cracking in a high-row tube, only in the low-row  
22 tubes and they have all been removed from service  
23 with that particular signature. We have not had an  
24 issue with that since.

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1                   MEMBER SHACK: Okay. And the last bit  
2 of information I could find was that you had 62  
3 tubes plugged for AVB wear. Is that -- I assume  
4 that's gone up.

5                   MR. LIEDER: Yes. I have the -- we have  
6 a total of 173 tubes plugged in all four steam  
7 generators. Of that 96 tubes are plugged for AVB  
8 wear since day one.

9                   MEMBER SHACK: Okay and is that a  
10 trendable sort of thing? Have your wear rates --  
11 your plugging and wear rates decreased on the AVBs?

12                  MR. LIEDER: Actually over a period of  
13 time based on these model generators the number of  
14 AVB pluggables go down. And after power uprate we  
15 noticed a slight increase which was calculated but  
16 we really haven't plugged a lot of AVB wears in the  
17 recent outage.

18                  MEMBER SHACK: In recent? Okay. So you  
19 did notice an increase in wear though as you did the  
20 EPU.

21                  MR. LIEDER: Wear rate.

22                  MEMBER SHACK: Wear rate.

23                  MR. LIEDER: But not the number of  
24 pluggables.

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1 MEMBER SHACK: Do you happen to know  
2 qualitatively what that factor of increase was?

3 MR. LIEDER: No, I don't off the top of  
4 my head. I'm sorry.

5 MEMBER SHACK: Okay. Thank you.

6 CHAIR SKILLMAN: Please proceed.

7 MR. CLICHE: Okay. Sixty-eight  
8 regulatory commitments have been submitted with the  
9 license renewal application. Again, this includes  
10 the recently submitted commitment to implement the  
11 alkali-silica reaction monitoring program and also  
12 two commitments made for incorporation of industry  
13 operating experience on open-cycle cooling and  
14 closed-cycle cooling. So these three recently  
15 submitted commitments.

16 These commitments are entered into a  
17 site commitment tracking system. I did also want to  
18 point out that implementation plans have been  
19 developed and implementation activities are starting  
20 to get underway at Seabrook Station including some  
21 benchmarking and participation in the industry  
22 activities for implementation. So our intention is  
23 to have this complete, you know, well in advance of  
24 the PEO.

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1 And at this point I'd like to turn the  
2 discussion over to Jim Connolly who will discuss SER  
3 open items.

4 MR. CONNOLLY: Thanks. Again, I'm Jim  
5 Connolly, site engineering director. As you're well  
6 aware after the review performed by the staff in the  
7 draft SER that was issued there were seven open  
8 items that were identified. I'm going to talk to  
9 five of those open items. My counterpart Rick Noble  
10 will be talking to item 6 and 7.

11 Of these open items 1 through 5 we have  
12 recently submitted responses to items 1, 3, 4 and 5,  
13 and we're currently in the license amendment review  
14 process with item number 2.

15 Item number 1 deals with a steam  
16 generator tube integrity, the tube integrity  
17 program, and there are really two issues that were  
18 addressed on this item.

19 The first one deals with primary water  
20 stress corrosion cracking on the primary coolant  
21 side of the steam generator tube-to-tube sheet  
22 welds. And the request was to clarify our  
23 commitment in that area.

24 The second issue deals with industry

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1 operating experience, foreign operating experience  
2 that was found regarding potential degradation of  
3 our steam generator divider plates. Again this was  
4 another PWSEC issue that was identified.

5 And we did have a commitment to inspect  
6 these divider plates before PEO. However, that  
7 wasn't included in the UFSAR supplement that was  
8 provided. So as resolution to both of these issues  
9 the application was updated to enhance -- it has  
10 been enhanced to clarify the tube-to-tube sheet weld  
11 inspection commitment. And additionally, the  
12 application commitment to inspect the steam  
13 generator divider plates has been added to the UFSAR  
14 supplement.

15 CHAIR SKILLMAN: Before you change this  
16 slide a perhaps note of humor or note of  
17 seriousness. Safety Evaluation Report page 3-56,  
18 next to the last paragraph, communicates that there  
19 was an indication in the steam generator C hot leg  
20 tube. And the tube was plugged on both the hot and  
21 cold leg sides. Is it your practice to plug one or  
22 the other but not both?

23 MR. CONNOLLY: I'm going to let, again,  
24 let Russ Lieder, our steam generator engineer,

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1 address that question.

2 MR. LIEDER: Russ Lieder, steam  
3 generator engineer. Yes, we plug both sides of the  
4 tube.

5 (Laughter.)

6 CHAIR SKILLMAN: Thank you.

7 MR. LIEDER: You're welcome.

8 CHAIR SKILLMAN: Okay. Please proceed.

9 MR. CONNOLLY: Thank you. The next open  
10 item deals with the pressure temperature limits.  
11 The consistency of the methods used to develop the  
12 P-T limits, the open issue addresses the methods  
13 used to develop the P-T limits in accordance with  
14 Appendix G of 10 C.F.R. 50.

15 This, as I mentioned, we have a license  
16 amendment in with the staff that is under review by  
17 the staff right now. That amendment requests  
18 approval to extend the current curves from 20 to  
19 23.7 effective full power years. And as I  
20 mentioned, we're in the process of addressing with  
21 the staff and awaiting RAIs from the staff. We  
22 expect to be able to address this commitment.

23 Next open item deals with treated  
24 borated water. The NRC has recently issued some

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1 staff guidance regarding issues with -- for managing  
2 the aging effects of stainless steel structures and  
3 components that are exposed to borated water. We  
4 recently again updated the application to include  
5 components on a one-time inspection program for the  
6 entire population of components.

7 MEMBER SHACK: You've had some cracking  
8 in this kind of situation, right? Canopy seal  
9 welds?

10 MR. CONNOLLY: Yes. I'll let Kevin  
11 Whitney who is our ISI program engineer address the  
12 canopy seal weld question.

13 MR. WHITNEY: Yes, Kevin Whitney,  
14 NextEra Energy/Seabrook in-service inspection. I  
15 was actually personally involved in that inspection  
16 when that leak occurred. If you could restate your  
17 question.

18 MEMBER SHACK: Just did you ever resolve  
19 whether it really was an oxygen problem or a  
20 chloride problem? Were samples taken to find out if  
21 it was transgranular or intergranular?

22 MR. WHITNEY: My belief is we did not do  
23 that. We just clamped it, sealed the leak.

24 MEMBER SHACK: Okay. Do you have

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1 problems with chloride cracking? I mean you're  
2 fairly near the ocean.

3 MR. WHITNEY: I would have to defer to  
4 my chemistry person.

5 MR. CONNOLLY: David Robinson is our  
6 chemistry manager at Seabrook Station.

7 MR. ROBINSON: Yes, good afternoon.  
8 Dave Robinson, chemistry manager at Seabrook. The  
9 only attack that we had from chlorides was on a  
10 residual heat removal safety valve pipe where we did  
11 have transgranular stress corrosion cracking. And  
12 that was due to foreign material that was underneath  
13 insulation and it was a wetted surface. And that  
14 was mitigated.

15 MEMBER SIEBER: What's been the history  
16 of your condenser tube integrity program? Have you  
17 had condenser tube leaks?

18 MR. CONNOLLY: Yes, I think we certainly  
19 have had. I myself am not aware of that history,  
20 but Ron Campo of my staff here who can address that  
21 issue.

22 MR. CAMPO: Ron Campo, plant engineering  
23 supervisor. Can you please repeat the question?

24 MEMBER SIEBER: Could you describe the

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1 condenser tube integrity history for the plant?

2 MR. CAMPO: Seabrook Station has  
3 experienced two leaks in its lifetime on condenser  
4 tubes. We have titanium tubes in the condenser.  
5 Both have been a wear, rubbing against a support  
6 plate on there.

7 MEMBER SIEBER: All right. That's --  
8 that occurred.

9 CHAIR SKILLMAN: Please proceed.

10 MR. CONNOLLY: Thank you. The next open  
11 item addresses the bolting integrity program. The  
12 open item addresses once the seal cap closure is  
13 installed and the bolting and the component external  
14 surfaces themselves within the enclosure are no  
15 longer visible for direct inspection.

16 Seabrook Station presently has one  
17 valve, a check valve, 6-inch check valve on our  
18 safety injection system that has a seal cap on it.  
19 Our plans as we committed to the -- in our response  
20 to the open item was to remove that valve, remove  
21 that condition prior to the end of 2014.

22 CHAIR SKILLMAN: Is that a scheduled  
23 event on your work schedule?

24 MR. CONNOLLY: Yes.

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1 CHAIR SKILLMAN: Thank you.

2 MEMBER SIEBER: You're going to remove  
3 the cap or replace the valve?

4 MR. CONNOLLY: We're going to replace  
5 the whole valve. There was some thought about just  
6 replacing and pulling the cap off but we were  
7 worried about potentially damaging the integrity of  
8 the valve.

9 MEMBER SIEBER: And it looks like the  
10 cap is welded to the valve body as opposed to the  
11 head of the valve.

12 MR. CONNOLLY: That's correct.

13 MEMBER SIEBER: And so that would be  
14 difficult.

15 MR. CONNOLLY: That's correct.

16 MR. BARTON: You also had some history  
17 on bolting integrity on your primary component  
18 cooling water system where you've had bolts corrode  
19 and the valve bodies themselves. And you replaced  
20 bolts with coated -- with coated bolts. And in one  
21 case you painted the -- you had corrosion on the  
22 bolting and your fix was to paint the bolting  
23 because previous painting of the valve bodies  
24 prevented further degradation. My question is you

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1 did that twice. At one time you had some corrosion  
2 on the valve body so you painted the valve body.  
3 Later you had corrosion on the bolts so you went and  
4 painted the bolts.

5 Now, why didn't you paint the whole  
6 thing at one time? It just -- what I'm questioning  
7 here is your corrective action program and your  
8 maintenance practices, all right? And you might not  
9 have an answer for that but I'm just questioning  
10 your maintenance practices.

11 And you also have experience with  
12 containment building spray heat exchanger bolted  
13 connection. You had boric acid leakage. You  
14 replaced a gasket. The leakage returned and you had  
15 to take it apart and re-torque it. So, and I look  
16 at those examples and they're just some examples  
17 that were in your literature.

18 So you know, what I'm asking is what's  
19 the, you know, the effectiveness of your corrective  
20 action program. Is it a problem there or your  
21 maintenance practices aren't right? I'm just  
22 worried that one or the other is a weak link here.

23 MR. CONNOLLY: I'll address that  
24 question in part. Our corrective action program is

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1 a very robust high-volume low-threshold type of  
2 corrective action program. So we, you know, we  
3 firmly believe that our corrective action program is  
4 in very good shape.

5 However, the component cooling aspect of  
6 your question, I'll have Ali Kadal who was the ECCW  
7 system engineer at the time and is presently one of  
8 our engineers in the license renewal project.

9 MR. KADAL: This is Ali Kadal. I'm the  
10 mechanical lead for the license renewal project at  
11 Seabrook Station. I was also the system engineer at  
12 the time for the primary component cooling water  
13 system. And I was actually the individual that  
14 initiated the two condition reports that identified  
15 the two conditions during system walkdown. This was  
16 back in I want to say 2001 time frame.

17 With regards to the corrosion of the 24-  
18 inch flange bolting that was actually due to the  
19 moisture entrapment between the flange bolting and  
20 the insulation. And that was causing corrosion as a  
21 result of condensation that was being entrapped  
22 between the bolting and the corrosion.

23 And the condition was corrected by, one,  
24 replacing the corroded bolts with coated bolts. And

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1 secondly by permanently eliminating the insulation  
2 from the location.

3 MR. BARTON: Okay.

4 MR. KADAL: So that corrective action  
5 was actually effective and eliminated further  
6 degradation at that location.

7 Now, your question with respect to the  
8 containment air-handling coolers. Again, that was -  
9 - I was the one that flagged it. And since then we  
10 have actually painted all the -- again, the cause of  
11 it was condensation. No insulation was involved.  
12 However, we did paint the valve bodies and body-to-  
13 bonnet bolting. And in addition to that some of the  
14 flange bolting that was corroding. And that has  
15 been effective to the best of my knowledge and every  
16 now and then we will do touch-up painting in those  
17 susceptible locations, or in those affected  
18 locations I should say.

19 MR. BARTON: Thank you.

20 CHAIR SKILLMAN: Please proceed.

21 MR. CONNOLLY: Thank you. The next open  
22 item addresses operating experience. The open item  
23 requested us to describe the programmatic details  
24 used to continually identify, evaluate and use

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1 operating experience. And the license renewal  
2 application has been updated to document the  
3 programmatic aspects of evaluating aging-related OE  
4 and is being -- and that is currently being  
5 evaluated by the staff also at this time.

6 CHAIR SKILLMAN: Okay.

7 MR. CONNOLLY: At this point in the  
8 presentation I'm going to turn it over to my  
9 counterpart Rick Noble who's going to discuss the  
10 remaining two open items.

11 MR. NOBLE: Thanks, Jim. As Jim said  
12 I'll talk to the last two open items. And the very  
13 last open item is the one that deals with the ASR  
14 issue so we'll get into the ASR discussions on that.

15 The first one has to do with an ASME  
16 Section 11 inspection of the containment liner  
17 plate. And specifically we have -- our containment  
18 is composed of a heavily reinforced concrete steel  
19 structure and it's got the steel liner plate on the  
20 inside and it has another heavily reinforced  
21 containment enclosure dome that surrounds it. So  
22 there's a gap between those structures or an annulus  
23 between the two structures.

24 And historically we have had an

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1 accumulation of up to as much as 6 feet of  
2 groundwater and a very limited arc, about 40 degrees  
3 around that annulus. And because of that there's  
4 the potential that the water could have migrated  
5 through the concrete to the backside of the steel  
6 liner plate and caused rust. And that's what the  
7 open item is addressing.

8 We do maintain this area dewatered  
9 currently. In fact, I looked at a screen print this  
10 morning of a video camera we have set up in the  
11 annulus to watch this area and it is totally  
12 dewatered. And as far as our resolution of this  
13 it's really two parts. One is that -- and we  
14 already discussed this with an earlier question to  
15 some degree, but we did commit to doing confirmatory  
16 ultrasonic testing on the liner plate to ensure that  
17 there isn't any degradation here. And one of the  
18 reasons, probably an answer for your question too is  
19 that we have removed the water and we're maintaining  
20 it dewatered so there really isn't any potential for  
21 continued water.

22 MR. BARTON: How long that water was in  
23 there?

24 MR. NOBLE: Water historically -- has

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1       been in there since the beginning of operation.

2               MR. BARTON:   It's not an area that  
3       anybody ever looks at.

4               MR. NOBLE:   It's accessible but not  
5       routinely accessed, right.   That's why we have a  
6       camera now looking at that.   It's groundwater.   It's  
7       slightly below grade and it's groundwater that's  
8       migrated in.

9               MR. BARTON:   So you're dewatering that  
10      area how?

11              MR. NOBLE:   We're doing it with a  
12      temporary pump but we have a preventive maintenance  
13      item that maintains that area dewatered.

14              CHAIR SKILLMAN:   Rick, what other  
15      structures have a void or a cavity or a ullage that  
16      can fill and not be inspected?

17              MR. NOBLE:   I'm not aware that we've  
18      identified any other area that would be similar to  
19      this nor am I familiar with any.

20              CHAIR SKILLMAN:   Can you state that this  
21      is the only one?

22              MR. NOBLE:   I don't know that I could  
23      state that unequivocally but I don't know of any  
24      other structure that's similar in design to this.

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1 CHAIR SKILLMAN: I'd like to get that  
2 question on the record and get a response back to  
3 the ACRS subcommittee. The question is here is a  
4 physical area that was permitted to be well-watered.

5 MR. NOBLE: For a void area between two  
6 structures.

7 CHAIR SKILLMAN: For a long time period.  
8 What other similar type below-grade areas may be  
9 filled with water or filling with water and are not  
10 monitored.

11 MR. NOBLE: I understand. We'll get  
12 back to you on the potential for another similar  
13 type configuration that is not monitored that could  
14 have water in it.

15 CHAIR SKILLMAN: Thank you.

16 MEMBER SHACK: Just coming back to the  
17 liner plate, I assume that previous ultrasonic  
18 inspection was done after you dewatered the -- and  
19 it's been dewatered since. Is that correct?

20 MR. NOBLE: We would have dewatered it  
21 from the initial time. We would have already  
22 dewatered it once, that's correct.

23 MEMBER SHACK: Okay. What's the  
24 sequence of dewatering and inspection? I guess

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1       that's what I'm --

2               MR. NOBLE:   Ever since we've identified  
3       this as an area where the water was standing in we  
4       have maintained it in a dewatered state.   Previous  
5       to that we were not -- we were basically not doing  
6       that.

7               MR. BARTON:   But the inspections were  
8       done when?

9               MR. NOBLE:   Ted, do you know the answer  
10      to that?

11              MR. BARTON:   With respect to watering  
12      and dewatering.

13              MR. NOBLE:   I don't have the answer to  
14      that, the inspection and dewatering.   I don't.   A  
15      year, year and a half, but I don't know the exact  
16      date.   We did our IWL examinations in September and  
17      October of 2010 and they were dewatered at that  
18      point to facilitate those ASME examinations.

19              MEMBER SHACK:   And then you did the  
20      ultrasonic measurements on the plate.

21              MR. NOBLE:   Yes.   In April of 2011.

22              MEMBER SHACK:   So you only had this on  
23      an arc basically, is that?

24              MR. NOBLE:   To about 40 degrees, that's

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1 correct.

2 MEMBER SHACK: Okay. And that's where  
3 the inspection was focused, on that arc? Or you did  
4 a --

5 MR. NOBLE: No, these were random  
6 locations throughout the containment liner in  
7 support of our IWE examination that occurred during  
8 April of 2011.

9 MEMBER SHACK: Is this one of these EPRI  
10 inspections where you randomly select?

11 MR. NOBLE: No, no. It's an ASME  
12 Section 11 examination.

13 MEMBER SHACK: Okay.

14 MR. NOBLE: But the confirmatory UT  
15 testing that we're talking about doing forward we  
16 would not only UT in that vicinity of where the  
17 potential is for that water, we're also going to do  
18 a 10-degree sample all the way around, every 10  
19 degrees around the containment.

20 MR. BARTON: Is the ASR in that concrete  
21 all the way around, or is it in certain areas?

22 MR. NOBLE: No, in fact there's some  
23 indication of micro cracking in that area where it's  
24 been wetted but really the other markers -- we'll

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1 talk about this a little later -- but there's  
2 potential for ASR there but the other markers for  
3 ASR are actually not present.

4 MR. BARTON: But where there was ASR  
5 present I think, is that where you did your UT,  
6 behind?

7 MR. NOBLE: Correct. That's correct.

8 MR. BARTON: Okay. All right.

9 CHAIR SKILLMAN: Please proceed.

10 MR. NOBLE: All right. So again we're  
11 maintaining this in a dewatered state. We've  
12 committed that we'll do this confirmatory UT  
13 testing. And then also as we started to discuss  
14 because of the potential, because it has been wetted  
15 in the past and the potential for ASR we are  
16 monitoring this area for ASR as well. In fact, it's  
17 included as a tier 2 monitoring point in our ASR  
18 monitoring program which I'll discuss a little bit  
19 later. In fact, right now.

20 The last open item, this is the open  
21 item that deals with the aging management of  
22 concrete structures affected by alkali-silica or  
23 ASR. And at the time of our SER, I think it's  
24 already been stated. Melanie stated this earlier

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1 that we had not submitted an aging management  
2 program for ASR at the time of that SER.

3 We have since submitted that aging  
4 management program. It was submitted on May 16th  
5 and it provides the method to manage the ASR effects  
6 going forward.

7 We've also completed an interim  
8 structural assessment and that documents the current  
9 structural adequacy for where we are right now with  
10 this condition. And this interim structural report  
11 was submitted under docket to the NRC on May 24th of  
12 this year as well. And this analysis used -- I'm  
13 not going to get into it in too much detail right  
14 now unless there are questions, but it used a  
15 conservative bounding approach to demonstrate  
16 structural adequacy.

17 There are data in the industry for  
18 small-scale tests that have been done that we  
19 applied to Seabrook as well as unrestrained data  
20 that we had from some of our core sampling.

21 We've also initiated full-scale testing  
22 programs which we'll talk about in more detail in  
23 this discussion. In this presentation for the most  
24 part we're going to focus on the monitoring of ASR

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1 and the effects of aging since that's what the open  
2 item actually is.

3 Just a very brief background on ASR.  
4 Although Seabrook Station is the first domestic  
5 nuclear power plant to report signs of ASR it's  
6 certainly known in the transportation industry and  
7 hydro dams since the nineteen thirties.

8 And what it is, it's a slow chemical  
9 reaction between alkali hydroxides and the cement  
10 paste, the Portland cement at relatively high pHs,  
11 pHs of 12 and a half or greater. And what happens  
12 is these alkalis react with reactive forms of silica  
13 in the aggregate and it could be the fine aggregate,  
14 the sand, or the coarse aggregate, the stones.

15 In the case of Seabrook we've determined  
16 that it's the metamorphic rock in our coarse  
17 aggregate that's the source and in fact it's  
18 strained quartz within that metamorphic rock that's  
19 the source of the reactive silica.

20 Now although we used a low-alkali cement  
21 which was technology at the time there's obviously  
22 enough alkali there in order to sustain the  
23 reaction.

24 The reaction forms an expansive gel and

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1 it's this gel that then puts the tensile stress  
2 inside the material and it can cause micro cracking  
3 of the aggregate and then that micro cracking can  
4 then combine and it can form larger cracks that can  
5 extend out into the cement paste. And the gel  
6 itself, the ASR gel is hygroscopic. It will absorb  
7 water and it will expand as it absorbs water. So  
8 that can add to the expansion that you see for ASR.

9 And that is the main concern with ASR is  
10 not so much the reaction itself, the chemical  
11 reaction, but it's the expansive nature of it. And  
12 that's why it's observed by the cracking and then  
13 they actually physically measure expansions in  
14 concrete in the transportation industry.

15 The way we diagnosed ASR, we took core  
16 samples in the spring of 2010. These were taken  
17 from the Bravo electrical tunnel. And the reason  
18 for taking them there is the Bravo electrical tunnel  
19 is one of our areas where we do have the highest  
20 amount of -- historically of groundwater in-leakage  
21 through those -- to those walls. So we picked that  
22 area to do our first core bores. These are 4-inch  
23 diameter cores that we removed.

24 We did testing on these removed cores

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1 and they did show a reduction in Young's modulus and  
2 petrographic examinations did confirm the presence  
3 of markers of ASR in some of the samples. Reduction  
4 in Young's modulus is the first thing you would  
5 expect to see with mild levels of ASR. It's the  
6 first impacted material property on the strain  
7 cores.

8 As a result of this we did an extent of  
9 condition. In the extent of condition we did  
10 walkdowns of other potentially susceptible areas and  
11 we picked the five most susceptible areas. We did  
12 additional core bores in those areas. We did,  
13 again, it's very localized but we did confirm the  
14 presence of ASR in four of those five areas. That  
15 was done through petrographic analysis of the  
16 samples.

17 We also did material testing on those  
18 removed cores. We found that the compressive  
19 strength as would be expected with low levels of ASR  
20 were not compromised. But we did see reductions,  
21 varying reductions in Young's modulus as you would  
22 expect.

23 MR. BARTON: I have a question. You  
24 have a confirmatory action letter. And in your

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1 response to it you talked about testing of the cores  
2 and you gave compressive strength and whether it's  
3 actually increased. And that's also in the  
4 literature on ASR. But the NRC has stated that the  
5 plant has lost almost 22 percent of its strength  
6 because it's been saturated with groundwater for  
7 more than a decade. So I'm confused.

8 MR. NOBLE: I think I can help you on  
9 that, Mr. Barton. So, the 22 percent is -- actually  
10 it's a number that we reported early on. So when we  
11 took the first 12 concrete core samples from the  
12 Bravo tunnel we sent those off. The initial  
13 compressive tests of those came back. We compared  
14 those to cylinder tests that we had done in 1979.  
15 And that's what we saw the 22 percent reduction to  
16 those cylinder tests.

17 MR. BARTON: Okay.

18 MR. NOBLE: Since then we've done extent  
19 of condition. We've taken 20 more cores I believe,  
20 20 more cores and from those -- same area in the  
21 electrical tunnel but they didn't show any signs of  
22 ASR.

23 And we've done compressive testing at  
24 another lab, an independent lab that I believe the

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1 NRC actually witnessed some of that work. And what  
2 it showed is that there was no difference in the  
3 compressive strength between the cores that showed  
4 ASR and the ones that were ASR-free. So the ASR is  
5 not affecting compressive strength.

6 So what we attribute that 22 percent  
7 reduction to, it's not really a reduction, there's  
8 two things going on. One is that you're looking at  
9 cylinder tests versus core tests which there is  
10 known to be a 10-12 or more percent difference there  
11 potential anyway. And we look at the way the  
12 loading was done for the two tests and that would  
13 account for the delta.

14 MR. BARTON: That's what you were  
15 comparing.

16 MR. NOBLE: Right. And so that number  
17 got put out there that there's a 22 percent  
18 reduction and it's really not correct.

19 MR. BARTON: Okay.

20 MR. MODES: Just a question I have. Why  
21 is Seabrook alone with -- I'm sure you've asked that  
22 question yourself.

23 MR. NOBLE: I don't know that it is. I  
24 mean, I know why we have it. We have it because the

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1 aggregates that we chose, we used the tests at the  
2 time. The tests at the time were not very good at  
3 detecting slow-reactive aggregates and we have a  
4 slow-reactive aggregate. The other technology at  
5 the time was to use low-alkali cements which we did.

6 We used very low alkali cements. That is also  
7 known to not necessarily preclude ASR going forward.

8 So I would say those same conditions potentially  
9 exist for other plants as well. It would depend on  
10 your local aggregates whether or not they actually  
11 were reactive or not.

12 MR. BARTON: Well, would it also depend  
13 upon the ability to dewater their site to keep these  
14 things dry?

15 MR. NOBLE: It may or may not. As  
16 you'll see some of our ASR sites don't have anything  
17 to do with groundwater. They're above grade. We  
18 have signs of ASR on the external surface of the  
19 condensate storage tank. One of the pictures that  
20 Ted has, we'll actually show you a picture, another  
21 area where there's above-grade structures that show  
22 signs of ASR distress. So you need 90 percent  
23 humidity or greater. You don't necessarily --

24 MR. BARTON: You've got that where your

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1 plant is located, don't you?

2 MR. NOBLE: Yes, we do.

3 MEMBER RYAN: Just to understand it a  
4 little bit better, it's not necessarily a wetted 100  
5 percent water condition. It's a 90 percent relative  
6 humidity condition?

7 MR. NOBLE: That's correct. In fact,  
8 and I may refer to Dr. Bayrak from the University of  
9 Texas here in a minute, but I'll start off a little  
10 discussion. I've seen pictures from Houston where  
11 there were bridge beams. They're very heavily ASR-  
12 impacted and they're on the underneath side of the  
13 decking of the bridge. So they're protected from  
14 rainwater, they're not in contact with any water,  
15 but there's a high enough humidity level in Houston  
16 that they're still ASR.

17 Do you want add anything to that, Dr.  
18 Bayrak?

19 DR. BAYRAK: Well, one thing that's to  
20 me the most interesting observation that I had over  
21 the years is that we have done some field testing on  
22 drilled shaft foundations in Houston, Texas and  
23 these are fairly large shafts going into the ground  
24 some 40-45 feet, in that range. And by the time we

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1 excavated around the drilled shaft foundations to  
2 take a look at the cracking condition the portion of  
3 the foundation that was exposed to wetting and  
4 drying cycles did show visible cracks. The portion  
5 that was below grade where it was exposed to all  
6 kinds of moisture from the clay environment that  
7 surrounded the drilled shaft did not have any  
8 visible cracks. So wetting and drying cycles  
9 actually do figure into how big those cracks are and  
10 how they develop.

11 MEMBER RYAN: So your expectation then  
12 at Seabrook would be if there's footers or other  
13 steel structural components that are saturated, in a  
14 saturated zone all the time that there would be no  
15 effect. Is that what you're saying?

16 DR. BAYRAK: What I'm saying is that the  
17 cracking that we see on the inside of the Bravo  
18 electrical tunnel is likely worse than what you  
19 would see on the outside of it if you had a chance  
20 of excavating the dirt out of there. It's actually  
21 not dirt, it's lean concrete is what it is on the  
22 backside of it.

23 MEMBER RYAN: Thank you.

24 MR. NOBLE: That's actually a good segue

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1 way. I was going to talk about one of the insights  
2 is that -- and it's very key to the monitoring  
3 program. So, I have -- I'd like to pass this  
4 around, but this is a section from one of the cores  
5 that was taken from the Bravo tunnel. And I've  
6 passed this around at a few different public  
7 meetings, but the reason I use this one is this  
8 shows the most visible ASR signs of any sample that  
9 we've taken. So it's a good -- if you look at this  
10 one, this has got the most visible signs. And  
11 you'll see that the cracks are truly micro cracks in  
12 the aggregate.

13 But one important insight from this that  
14 Dr. Bayrak was just alluding to was this is the  
15 exposed surface on the inside of the wall. So the  
16 first couple of inches into this would be the cover  
17 concrete that's not inside the steel. And I think  
18 it's pretty obvious. I'll let you make your own  
19 conclusions, but if you look at it you'll see that  
20 the cracking is visible, quite visible as you go a  
21 couple inches into the material. The deeper you go  
22 into the material the less you see the expansion  
23 cracks. And that's carried out, and these are 14-  
24 inch long cores, as you're going towards the center

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1 of the wall.

2 MR. BARTON: Where's your rebar?

3 MR. NOBLE: The rebar is 2 inches in.

4 So once you're inside that rebar field you don't see  
5 the cracking. This would also be the wetted and  
6 dried surface. So you get that alkali flow at that  
7 surface. That would also tend to make the reaction  
8 greater, but there's two things going on. One, it's  
9 free expansion which allows more cracking and then  
10 you have that wetting/drying effect. So, the  
11 exposed surface is what you can see, but the good  
12 news to that is it's also where the worst conditions  
13 are going to be. Pass that around.

14 MR. BARTON: But there's no guarantee  
15 that you wouldn't have cracking deeper in because  
16 you've got moisture in that concrete that's captured  
17 in there, right?

18 MR. NOBLE: There's no guarantee you  
19 would not have it and we've seen it in the cores.  
20 But like I said, the extent is less than what you  
21 see on the visible surface.

22 MR. BARTON: But long-term can that  
23 chemical reaction go on further in and start  
24 affecting and corroding the rebar?

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1 MR. NOBLE: The chemical reaction is  
2 going on throughout it.

3 MR. BARTON: Right.

4 MR. NOBLE: It's the expansion that's  
5 differential between the interior and the outside.  
6 So the level of chemical reactions really for the  
7 most part occurring are the same except for the  
8 little thing I said about the alkali flow at the  
9 surface.

10 As far as the rebar, we have done  
11 excavations of rebar. We have seen very good  
12 condition of our rebar. It's well passivated. And  
13 one of the reasons for that is if you have alkali-  
14 silica reaction going on you're looking at pHs in  
15 the 12, 12 and a half range. That's very good news  
16 for steel corrosion that they're relatively high pHs  
17 where the alkali flow is going on.

18 MR. BARTON: I've seen some ASR-damaged  
19 concrete that's actually -- and it's not -- well,  
20 you're probably aware of this also. On bridge  
21 structures and columns and stuff where it's actually  
22 gotten deep into the rebar and has actually started  
23 affecting the rebar and that starts expanding. So  
24 why wouldn't they see that here eventually?

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1 DR. BAYRAK: One thing that we have to  
2 appreciate here is that if you were to take a core  
3 out of this wall and slice it much like the sample  
4 that's being passed around the nature of cracking is  
5 different in the cover concrete. I would refer to  
6 those cracks as macro cracks that are visible to  
7 naked eye. And what you would find in the  
8 structural core, so that would be past the rebar  
9 curtain, is micro cracking. You would almost need a  
10 microscope to see those cracks.

11 The reason for that is the restraining  
12 or confinement effects that's coming from the  
13 reinforcing bar cage that's present. So though the  
14 chemical reaction is taking place in the entire  
15 volume of concrete, when confined concrete is not  
16 able to form wide cracks. And when it isn't, just  
17 like it is the case for the cover concrete larger  
18 cracks do form.

19 So the question that you're posing in  
20 relation to corrosion is a different one and it's  
21 somewhat isolated, or it's a different separate  
22 discussion than ASR. ASR is one chemical mechanism  
23 that we can discuss and corrosion of the reinforcing  
24 steel is another one. And you need conducive

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1 conditions for the corrosion to take place. Things  
2 like chlorides and so on and so forth.

3 MEMBER POWERS: I guess I don't  
4 understand. The cracking is giving you a net flux  
5 of sodium to silicate out of the material. That's  
6 why you see the white deposits outside.

7 DR. BAYRAK: Okay.

8 MEMBER POWERS: And so you're depleting  
9 your base in the macro cracking outside.

10 DR. BAYRAK: Right.

11 MEMBER POWERS: So if you have an  
12 intrusion into the macro cracking of chloride-  
13 contaminated water then that is the driving force  
14 for the corrosion of any rebar it encounters. So  
15 the two are not separated from each other.

16 DR. BAYRAK: Well, the discussion on  
17 what ASR does to structural integrity is one  
18 discussion. Whether the cracking that is a net  
19 consequence of alkali-silica reaction, whether that  
20 forms or enhances the chance of corrosion that may  
21 take place in the reinforcing bars is a separate  
22 discussion is what I was trying to say.

23 And in that regard, one thing that I did  
24 see is these pictures. As a matter of fact, I'm

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1 going to turn this question over to Ted because he  
2 can speak to it directly. I was personally very  
3 interested in seeing the pictures of the reinforcing  
4 bars of the walls at Seabrook just to see if there  
5 was any corrosion or not. And they have in fact  
6 excavated some concrete out of there. And Ted can  
7 speak to that.

8 MR. VASSALLO: Yes, we actually have  
9 three data points. One of the areas in the Bravo  
10 electrical tunnel, we've removed all the cover and  
11 we've found absolutely no signs of corrosion on the  
12 bar. In other areas where we see the micro cracking  
13 we find no evidence of any corrosion going on sub-  
14 surface. Typically if the bar starts to corrode you  
15 will find rust staining on the outside surface of  
16 the wall.

17 And our third data point is in removing  
18 some of the cores from some of the walls we did cut  
19 some of the reinforcing steel. And examination of  
20 that reinforcing steel showed no evidence of  
21 corrosion.

22 CHAIR SKILLMAN: Please proceed.

23 MR. NOBLE: The next series of slides --

24 MEMBER POWERS: I mean, there's -- we're

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1 talking about 40 years from now are you going to be  
2 able to say the same thing is the question.

3 MR. NOBLE: I believe so and we'll be  
4 able to monitor it. So I mean, it's not something  
5 you'd ever say you'll never have any condition like  
6 that. It's something that needs to be continued to  
7 be monitored. You need to be aware that there is  
8 the potential for it. And our structures monitoring  
9 program does take into account as it's required to  
10 corrosion of reinforcing steel as one of the key  
11 elements that we look for.

12 MR. BARTON: But ASR continues, it never  
13 stops. I mean, as long as the surface is wet it  
14 continues to go on. Does it get to a point where it  
15 accelerates?

16 MR. NOBLE: No. I've never seen that in  
17 any of the studies. But I think you're correct. As  
18 an engineer I don't like to use the words "never" or  
19 "always" but I won't say it never stops, but I think  
20 you're correct in that the long-term studies, long-  
21 term exposures studies have shown the expansion  
22 rates just continue and continue and continue.

23 There is some possibility that if we use  
24 low-alkali cement that we could become alkali

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1 limited at some point. But I think you're right and  
2 I do talk to it in a later slide here, some of the  
3 accelerated tests we've done to look at the amount  
4 of reactive silica we have left. We still have  
5 reactive silica. So I think your statement is  
6 correct that we would expect to see this continue  
7 for the length of --

8 MR. BARTON: And that's my concern, that  
9 this continues and at some point it.

10 MR. NOBLE: And it has been seen. You  
11 know, there are dams that are, you know, 100 years  
12 old that have had ASR progress the entire time.

13 The next series of slides -- so the next  
14 thing we're going to talk about is confinement which  
15 we've talked about here a little bit. The  
16 confinement of the concrete is important to  
17 structural performance with ASR. And we now  
18 understand that testing of unrestrained cores, once  
19 you remove the cores from that structural context  
20 the material testing that you're getting does not  
21 correlate to the actual performance of the  
22 structure.

23 This has been very well documented for  
24 triaxially reinforced structures, concrete beams for

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1 instance. And that the materials test that you get  
2 from core removals will give you materials numbers  
3 that just do not correlate to the strength numbers  
4 when you actually test the structural elements.

5 Next slide.

6 MEMBER POWERS: The best are figures of  
7 merit.

8 MR. NOBLE: Yes. The next series of  
9 slides, these are some -- these are actually beams.

10 These are triaxially reinforced beams at the  
11 University of Texas at Austin. These were not done  
12 for Seabrook. These are existing beams that the  
13 University of Texas had for doing testing, strength  
14 testing on ASR, the full-scale beam testing.

15 And these are very advanced ASR-reactive  
16 beams. They've undergone accelerated ASR reaction  
17 either through the use of sodium hydroxide added,  
18 very reactive aggregates and high temperature and  
19 moisture to accelerate the ASR.

20 But the purpose of showing this is  
21 really to -- for a discussion on restrained versus  
22 unrestrained expansion. So for all practical  
23 purposes chemically you're seeing, chemically and  
24 environmentally this beam is seeing the same

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1 conditions throughout the whole beam. So the same  
2 level of ASR reaction is going on in this beam  
3 throughout. But you'll see a very drastic  
4 difference in the expansion in the cracks from the  
5 restrained versus unrestrained sections of the beam.

6 So the first picture is just a picture  
7 of the surface of the beam. It does show signs of  
8 ASR distress as pattern cracking there as well as  
9 effervescence from ASR gel on the surface and  
10 discoloring. The next slide is the same beam but as  
11 you can probably see the ends of these beams, the  
12 reinforcing doesn't go nearly to the end of these  
13 beams. So the end of that beam that you see that's  
14 on the support is -- there's no rebar cage inside  
15 there. So it's unreinforced.

16 So this is the same concrete without  
17 reinforcing steel with the same level of ASR and you  
18 can see the very visible macro cracks in that  
19 surface. So again, the purpose of these slides is  
20 just to illustrate there is a huge difference  
21 between restrained versus unrestrained expansion at  
22 the same levels of ASR.

23 A logical question once you've detected  
24 ASR is what's the prognosis for the future. What is

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1 it going to do? Is it going to continue to expand?

2 Is it going to stop?

3 And although there are some accelerated  
4 ASR tests that can be used and we've done some of  
5 those, they can provide some insight on the amount  
6 of reactive silica you still have. But the rates  
7 that are obtained from these tests do not correlate  
8 to actual rates that are seen in in situ structures.

9 The reason for that is in order to get  
10 the accelerated ASR you're really putting these  
11 under very severe exposure conditions and you're  
12 varying all the variables at once, temperature,  
13 sodium hydroxide. You also have unrealistic  
14 specimen preparation for the mortar bar test. You  
15 grind the coarse aggregate into sand and then that's  
16 what's actually reacted in the mortar bar test.

17 Again, these tests were conducted with a  
18 lack of confinement so you're seeing unconfined  
19 expansion. So the rates are not usable. However,  
20 we did do it -- we did the accelerated mortar bar  
21 test on removed aggregate from our Bravo electrical  
22 tunnel wall. And we took it from areas where there  
23 is clear signs of ASR, some of our worst ASR. We  
24 removed that aggregate. And then control samples

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1 where there's no signs of ASR. And we did the  
2 mortar bar tests on both of those samples to see if  
3 there was any difference in the rate of reaction.

4 And I'd say the only real conclusive  
5 thing I can say from that, those results is that we  
6 do continue to have reactive silica so we would  
7 expect the expansions to continue in the future.  
8 The rates are essentially the same. There's very  
9 little difference. So there's not much that can be  
10 really gained from that.

11 The gold standard for how you determine  
12 whether or not your accelerated test rates could  
13 possibly be used to predict rates is you go out and  
14 you monitor the actual crack progression in situ or  
15 the expansion rates in situ. So that is the way  
16 that the tests are run. So we have the ability to  
17 go out and actually crack-map and measure the  
18 expansion that's occurring in our structures. And  
19 that turns out to be the most effective way to  
20 determine how fast it's progressing. So as I said,  
21 the accelerated tests just don't give you anything  
22 that's really usable.

23 MEMBER SIEBER: If the rate is  
24 reasonably constant and you probably have calculated

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1 or estimated the rate of progression through the  
2 period of time so far which is about 20 years,  
3 right? Fifteen years? What condition will it be in  
4 at the end of 60 years?

5 MR. NOBLE: I'm not really prepared to  
6 say that because I don't know, we really don't know  
7 at what point. Right now we'll be able to make that  
8 determination but we've really only done detailed  
9 monitoring, crack-indexing, measuring the expansion,  
10 we've really only done that, two iterations of that.

11 So I really only have two data points to really  
12 make that determination. I can tell you that  
13 there's not much difference between those two data  
14 points. Six months apart, they're essentially  
15 identical. So it's very slow.

16 MEMBER SIEBER: Well, 6 months is pretty  
17 short compared to 60 years.

18 MR. NOBLE: They usually say about 2 to  
19 3 years of that monitoring in order to get that rate  
20 that you're looking for to project.

21 MR. BARTON: Can you measure the rate of  
22 reactivity as it decreases in your silica and your  
23 alkali? You've got alkali in the concrete,  
24 reactivity in the silica were the two bad guys that

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1 with water are reacting. Now, is there a point  
2 where the reactivity in the silica just keeps  
3 getting less and less, or is it?

4 MR. NOBLE: Doesn't appear to. And  
5 again, I would say that the studies out there don't  
6 really show that. If you look at long-term tests  
7 they don't really show that.

8 There's another accelerated test called  
9 the concrete prism test which is a little longer  
10 term test, it's a year test. Mortar bar tests are  
11 14 days. If you look at the curves for that you  
12 will see it's a flattened S curve for expansion  
13 rates over time. So it takes a little while to get  
14 going and then you have a pretty steady rate and  
15 then it flattens off. But the experimenters really  
16 attribute that flattened rate at a year to be alkali  
17 leaching. So it's an artifact of the test method.  
18 In real life they don't see that flattening of the  
19 expansion curve.

20 MR. BARTON: You're saying what we're  
21 seeing now in the rate is going to continue at the  
22 same rate.

23 MR. NOBLE: It's likely to continue at  
24 the same rate.

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1 MR. BARTON: And we can't stop it. It's  
2 just going to keep going for the next 40 years.

3 MR. NOBLE: Right.

4 MEMBER RYAN: Is there any condition or  
5 evidence that you've found that would say the rate  
6 would accelerate?

7 MR. NOBLE: No. No, but again, you  
8 know, to be a little careful with that because the  
9 rate's not going to be -- the expansion rate is not  
10 going to be constant anywhere in the plant. It's  
11 very dependent on in situ conditions, right? So  
12 it's dependent on temperature, it's dependent upon  
13 moisture. As I said, wetting and drying can affect  
14 it. So --

15 MEMBER RYAN: But given that --

16 MR. NOBLE: -- in a given area you  
17 wouldn't expect it, if the conditions stayed the  
18 same you wouldn't expect.

19 MR. BARTON: If this continues at the  
20 same rate does it get to a point where this cover of  
21 concrete on the rebar just starts falling off?

22 MR. NOBLE: I don't believe we would  
23 ever see expansions that high but you'll see with  
24 our long-term testing. And you know it's a very

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1 slow reaction so you're talking decades from now.

2 MR. BARTON: It took about 10 or 20  
3 years to get to where you are now.

4 MR. NOBLE: Correct.

5 MR. BARTON: Probably.

6 MR. NOBLE: So we do have remediation  
7 strategies in our long-term testing that we'll talk  
8 about a little bit that would address if we were to  
9 get to a point where something needed to be done.  
10 But obviously it's not a near-term thing. It would  
11 be something that we have some time to plan out how  
12 we would address it.

13 MR. BARTON: The areas that are being  
14 affected by groundwater, unless you turn that  
15 around, how will that affect the rate of this?

16 MR. NOBLE: You would expect to see it  
17 continue at about the same rate they are now if the  
18 groundwater isn't changing. I'm going to talk about  
19 mitigation a little bit in a minute. I think I'll  
20 answer your question. If I don't, let me know. In  
21 fact this next slide is mitigation.

22 The mitigation strategies, there are  
23 mitigation strategies for fresh mixes of concrete  
24 that have shown quite a bit of efficacy. Things

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1 like fly ash that are added up to 40 percent or more  
2 concentrations now in new concrete mixes. You can  
3 also do things like lithium is another one. Lithium  
4 is very interesting because it's another alkali  
5 metal but --

6 MR. BARTON: That's not really been  
7 proven to be effective in the long term, has it?

8 MR. NOBLE: That's correct. Well,  
9 lithium is effective if it's added as a mix because  
10 the gel that's formed from lithium is non-expansive.  
11 So you still get ASR but you don't get an expansive  
12 gel. But the problem with lithium, the reason it  
13 hasn't been effective is you can't get it to  
14 penetrate the existing structures more than a few  
15 millimeters.

16 MR. BARTON: Right.

17 MR. NOBLE: In fact, the Federal Highway  
18 Administration spent almost a decade I believe  
19 studying that, the use of lithium as topical  
20 applicants. And they've really come to the  
21 conclusion that there really is no efficacy to using  
22 that as a topical applicant.

23 MR. BARTON: Okay.

24 MEMBER POWERS: But it's a lovely

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1 antidepressant so everybody was very happy.

2 (Laughter.)

3 CHAIR SKILLMAN: Rick, let me ask you a  
4 question here. You've got about 10 more slides.  
5 We're scheduled for a break at 1500. We have people  
6 in this room that would probably desire to have that  
7 break. Is this a good time to take a few minutes  
8 and then we reconvene in 15 minutes? Will that work  
9 for you?

10 MR. NOBLE: This would be a fine  
11 breaking point.

12 CHAIR SKILLMAN: We're going to take a  
13 break for 15 minutes. Please come back at 20 after  
14 on that clock. Thank you.

15 (Whereupon, the above-entitled matter  
16 went off the record at 3:03 p.m. and resumed at 3:18  
17 p.m.)

18 CHAIR SKILLMAN: Ladies and gentlemen.  
19 And Rick Noble, you were on slide 27 or 28 and we'll  
20 ask you to please continue. Rick?

21 MR. NOBLE: Thank you. I'm going to  
22 talk a little bit about mitigation strategies. As  
23 we said there are mitigation strategies for fresh  
24 mixes of concrete but there really hasn't been any

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1 mitigation strategy for existing concrete that's  
2 been shown to have any efficacy.

3           However, stopping groundwater intrusion  
4 in the areas where that's what's driving ASR would  
5 be a good thing to do but it would not necessarily  
6 prevent the progression of ASR. There's several  
7 reasons for that.

8           One of them is, as I said, we see ASR at  
9 our site in some areas that are not associated with  
10 groundwater. We see them in some of the above-grade  
11 areas.

12           The second issue is that it's not just  
13 stopping of groundwater. You actually have to  
14 reduce the humidity below 90 percent. So if you  
15 stopped groundwater and the areas below grade  
16 remained at 90 percent humidity you would not have  
17 stopped the ASR reaction.

18           There's also some indication that we  
19 have groundwater flow and that if you stopped the  
20 groundwater without drying out the walls you could  
21 actually increase the alkali concentration and you  
22 may see a short-term increase in ASR. So, although  
23 groundwater is a good thing to do to reduce it, it's  
24 not necessarily the solution to stopping ASR.

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1 MR. BARTON: The question I've got is  
2 one way to try and mitigate this I always thought  
3 was if you dry it out you stop the reaction or slow  
4 it down.

5 MR. NOBLE: That's a fact. If you could  
6 actually completely dry it out and stay below 90  
7 percent that would work. But that involves like I  
8 said not only stopping the groundwater intrusion but  
9 making sure that the humidity is not above 90  
10 percent.

11 MR. BARTON: Take your tunnel, all  
12 right? You could dry it out. You could dry out the  
13 tunnel, all right? You could also circulate air in  
14 there and maintain a humidity that's below 90  
15 percent. Now, I don't know if you want to go  
16 through all that effort but you could do that and  
17 that should help the tunnel ASR I would think.

18 MR. NOBLE: We are looking -- we  
19 actually looked at that. We actually had a company  
20 that came in that does that experimentally, dries  
21 out the concrete. I will tell you that it's not as  
22 simple -- and these walls are very thick. They are  
23 many feet thick. They stay saturated for years.

24 (Laughter.)

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1 MR. NOBLE: It's difficult to get it  
2 completely dry. They do have some techniques.  
3 They're very intrusive. They involve drilling a  
4 whole lot of holes in the wall.

5 MEMBER POWERS: I don't think you want  
6 to do that.

7 MR. NOBLE: I'm saying, I mean these are  
8 not things we would not consider, but I just wanted  
9 to make it clear that not necessarily -- stopping  
10 the groundwater isn't a panacea. Stopping moisture  
11 entirely is, but stopping groundwater isn't  
12 necessarily a panacea because like I said, we do see  
13 ASR in areas that have nothing to do with  
14 groundwater.

15 MEMBER RYAN: How confident are you in  
16 your site-wide geohydrologic model? Because you  
17 know, you can't really consider this kind of problem  
18 we're discussing today without really understanding  
19 the --

20 MR. NOBLE: That's an excellent  
21 question.

22 MEMBER RYAN: -- wider environment that  
23 it's in. Because you might pump stuff and it might,  
24 you know, recharge in a week.

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1 MR. NOBLE: Right. So I'd say we've  
2 been -- groundwater has been an issue, aside from  
3 the ASR issue groundwater has been something that  
4 we've been working on since 1986. We've tried quite  
5 a few different things. We've tried drilling holes  
6 through the walls and injecting material on the  
7 backside.

8 In fact, some of the material you see --  
9 you have to be careful because some of the staining  
10 material you see on our walls is waterproofing  
11 material that we injected years ago. That had some  
12 -- that helped in some localized areas. It tended  
13 to move the groundwater from one location to  
14 another.

15 In some areas where it was a concern we  
16 were able to put some dewatering systems in. We put  
17 five dewatering systems in. They reduced the  
18 hydrostatic head in that area. That does slow the  
19 intrusion of groundwater, helps from a cleanliness  
20 material condition aspect, but again it doesn't stop  
21 it completely or dry it out. It just reduced the  
22 inflow of groundwater.

23 MR. BARTON: Pump too much too fast  
24 because you have the Atlantic Ocean in here pretty

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1 soon.

2 MR. NOBLE: So that was his question  
3 about the hydrology. We have done a study recently,  
4 we've commissioned a study. It's called fade and  
5 transport study that details the movement of all the  
6 groundwater on the site. And without going into it  
7 in too much detail our site's basically carved out  
8 of bedrock, it sits on a bowl of bedrock. So most  
9 of this groundwater flow is not traditional  
10 groundwater flow through permeable ground. This is  
11 through fissures in the basalt.

12 And so it's very dependent on where  
13 those fissures are, where the water comes through.  
14 And so this fade and transport study essentially  
15 maps out where those underground rivers are. So we  
16 have some of that intelligence, but still it's not a  
17 straightforward or simple problem to solve.

18 MEMBER RYAN: Just one more hole, that's  
19 all we need.

20 (Laughter.)

21 MEMBER RYAN: You heard that I'm sure.

22 MR. NOBLE: That's correct. That  
23 concludes what I was going to say about mitigation  
24 strategies. I would like to introduce Ted Vassallo.

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1       He's a materials engineer. He's already spoken to  
2       a couple of questions but he's in our civil design  
3       engineering group. And Ted is going to talk about  
4       the structures monitoring program, in particular the  
5       aging management program for ASR.

6               MR. VASSALLO: All right, thanks Rick.  
7       I'm Ted Vassallo from NextEra Design Engineering  
8       Civil Group. To monitor the aging effects of  
9       alkali-silica reaction on concrete our structures  
10      monitoring program has been augmented by a plant-  
11      specific alkali-silica reaction monitoring program.

12             This program consists of 10 elements as  
13      described in NUREG/CR-1800. The monitoring program  
14      is structured according to the guidelines prescribed  
15      in ACI-349.3R, structural condition assessment of  
16      buildings.

17             The program includes three action levels  
18      which were developed based on ASR guidance. Three  
19      documents provided the guidance to us for these  
20      action levels.

21             The first document we used was a report  
22      that was published by the Federal Highway  
23      Administration. It's titled "The report of the  
24      Diagnosis, Prognosis, and Mitigation of Alkali-

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1 Silica Reaction in Transportation Structures."

2 The second document that we used was a  
3 British publication that was issued by the British  
4 Institutes of Structural Engineers. It's titled  
5 "Structural Effects of Alkali-Silica Reaction:  
6 Technical Guidance on Appraisal of Existing  
7 Structures."

8 And the third document that we use was a  
9 document prepared by Oak Ridge National Laboratories  
10 for the NRC staff in 1995. It's titled "In-service  
11 Inspection Guidelines for Concrete Structures in  
12 Nuclear Power Plants." Next slide?

13 ASR is typically detected by inspection  
14 of concrete structures by visual observations of  
15 pattern cracking and other features of ASR such as  
16 secondary deposits or effervescence in the cracks,  
17 dark staining adjacent to the cracks which is caused  
18 by the ASR gel. And in some locations you can also  
19 have the actual ASR gel deposits in the cracks.

20 There are two parameters that we use to  
21 monitor the extent of ASR and the rate of ASR  
22 associated with the pattern cracking. One is a  
23 combined crack index and the other is the individual  
24 crack width. We collect this data and we have

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1 formed the baseline with this data and we will use  
2 this data for future examinations and measurements  
3 that we'll do in the areas that we have assessed.

4 The evaluation of the structure's  
5 condition is completed according to guidelines that  
6 we have included in our structures monitoring  
7 program in the next slide, please. This table  
8 represents that criteria in our structures  
9 monitoring program. It's a three-tier criteria with  
10 increasing levels of monitoring up to a full  
11 structural evaluation. As you can see from the two  
12 columns to your right the combined crack index  
13 values are identified and the individual crack  
14 widths are also identified. So the field  
15 measurements are taken and they are then compared to  
16 this table and appropriate corrective actions or  
17 further evaluations are taken based on this data.  
18 Next slide, please?

19 MEMBER ARMIJO: I have a quick question.

20 MR. VASSALLO: Sure.

21 MEMBER ARMIJO: You monitor crack  
22 widths.

23 MR. VASSALLO: Yes.

24 MEMBER ARMIJO: But not necessarily the

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1 crack lengths.

2 MR. VASSALLO: Correct.

3 MEMBER ARMIJO: Why is that?

4 MR. VASSALLO: Well, the standard that  
5 is published in the British standard, in the Federal  
6 Highway Administration, the protocol is basically  
7 crack width and combined crack index. Based on  
8 those parameters or those values different effects  
9 then are evaluated against the concrete. So it's  
10 not necessarily a length. That's not the protocol  
11 that was used in the two standards.

12 MEMBER ARMIJO: If you look at a  
13 structure and you've got this whole number of cracks  
14 all have, you know, add up to a certain number of  
15 widths. Some of these cracks -- in one structure  
16 the cracks are short, in others they're long.  
17 Everything has the same crack width index or  
18 whatever you call it. It just seems to me that one  
19 is a more severe damage than the other.

20 MR. VASSALLO: Well, I could also say  
21 that some of the testing done on ASR-distressed  
22 concrete components was based on crack width and  
23 crack index. So all the data that's out there for  
24 us to do assessments is based on those two

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1 parameters and not the length of the crack.

2 MR. NOBLE: Because we do it on a 20 by  
3 30 grid though it would take into account to some  
4 extent the length of the cracks as well.

5 DR. BAYRAK: The density of cracking is  
6 what it would take into account. The reason why  
7 typically, if I may, in structural evaluations the  
8 focus internationally as you see in the  
9 aforementioned documents is placed on crack widths  
10 rather than crack lengths is because it's all about  
11 what the cracking does to the rebar that would be  
12 crossing that crack. And the strain that would be  
13 imposed on the rebar would be directly proportional  
14 to the width of that crack as opposed to the length  
15 of it. And I'm not sure if that makes --

16 MEMBER ARMIJO: But more rebar would be  
17 strained if you had a longer crack of a given width.  
18 It would affect more rebar, the longer one.

19 DR. BAYRAK: And the conclusion wouldn't  
20 change. The fact that the maximum crack width you  
21 are measuring say is 20 mils or something like this  
22 would remain to be a fact. And if along the length  
23 of that crack the width of the crack diminishes down  
24 to a lesser value and the crack eventually closes

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1 say either a foot or, you know, 10 feet away from  
2 that maximum crack width location what you're doing  
3 is that you're assuming that conservative maximum  
4 crack width value to apply to all rebar that's  
5 present in that structure. So that's really how the  
6 logic goes.

7 CHAIR SKILLMAN: To what extent is your  
8 evaluation dependent upon your knowing the size and  
9 spacing of the rebar in the sections where the  
10 cracking is occurring?

11 MR. VASSALLO: Well, the size and the  
12 spacing of the rebar is considered when a full  
13 structural evaluation is done to look at the  
14 capacity versus demand of the concrete element under  
15 examination. So that's where it's figured in.

16 CHAIR SKILLMAN: Are you dependent upon  
17 drawings or are you dependent upon construction  
18 photographs for that information?

19 MR. VASSALLO: The original design basis  
20 calculations from the AE that designed the plant.  
21 And also the original AE rebar detail drawings for  
22 the structures. We have all that information onsite  
23 and that's what's used for the evaluations.

24 CHAIR SKILLMAN: Thank you.

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1 MR. VASSALLO: Okay. Next slide,  
2 please? This slide illustrates a typical crack  
3 indexing grid for monitoring any progression of ASR.  
4 This photo shows the west wall of the discharge  
5 structure that was taken in June of 2012 during our  
6 second crack measurement and crack-indexing  
7 campaign.

8 As you take a closer look at the picture  
9 you could see in the corners and at the intersection  
10 of the grid lines there are stainless steel pins  
11 that have been permanently installed in the  
12 concrete. And these are used for the future  
13 measurement campaigns.

14 These lines also are the lines that we  
15 use to establish the length where we measure the  
16 crack width and sum up the crack width to come up  
17 with the cracking index which is the parameter --  
18 one of the two parameters that we use. I would say  
19 the review of the data, the preliminary data that  
20 I've looked at from the June re-inspection, re-  
21 measurement campaign compared to the initial  
22 walkdown work that was done approximately 6 months  
23 ago, we see no evidence or no suggestion of any  
24 change in concrete expansion at the plant.

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1 MEMBER RYAN: Was the slot over on the  
2 right cut on purpose to look deeper in?

3 MR. VASSALLO: Yes. Yes, that is a  
4 rustification joint. And a rustification joint is  
5 an architectural feature that is added into large  
6 walls for architectural eye-pleasing aesthetics  
7 reasons. And it just was coincident that the area  
8 we selected to do the monitoring, the rustification  
9 joint fell in that area.

10 MEMBER RYAN: It wasn't a monitoring  
11 purpose that you installed it.

12 MR. VASSALLO: No, it just was  
13 coincident with the area that we chose on that  
14 structure.

15 MEMBER SIEBER: These cracks, are they  
16 in the enclosure building, or the containment  
17 building, or both?

18 MR. VASSALLO: This location is our  
19 discharge structure. But we have assessed 131  
20 locations and it did include our containment  
21 enclosure building.

22 MEMBER SIEBER: But what about the  
23 containment building itself?

24 MR. VASSALLO: And we have done crack

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1 indexing and crack measurement on three locations on  
2 the containment structure.

3 MEMBER SIEBER: And there are cracks  
4 there also?

5 MR. VASSALLO: I beg your pardon?

6 MEMBER SIEBER: There are cracks in the  
7 containment building itself?

8 MR. VASSALLO: And they were screened  
9 out based on crack width. They were very small  
10 cracks.

11 MEMBER SIEBER: Now, your biggest  
12 concern amongst all these things is going to be the  
13 ability of the containment to hold axial pressure,  
14 right?

15 MR. VASSALLO: No.

16 MEMBER SIEBER: No?

17 MR. VASSALLO: The containment is  
18 probably, and this will probably surprise you a  
19 little bit, but of the priority of the buildings the  
20 containment building is probably the least  
21 potentially impacted by ASR.

22 And there's two reasons for that.  
23 Number one, there's not a good source of moisture  
24 there other than the one area that we talked about

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1 earlier, the one-sixth area. But the main reason is  
2 that that's a heavily triaxially reinforced  
3 structure and in heavily triaxially reinforced  
4 structures ASR has the effect of making the  
5 structure stiffer. So that structure actually --  
6 structural performance will be greater with ASR than  
7 it was without ASR.

8 MEMBER SIEBER: Okay. Well that's  
9 exactly the point I'm trying to make is that the  
10 real safety feature of the plant as far as  
11 containment of the accident debris, you know,  
12 pressure, temperature, radioactive products, that's  
13 the least affected by this phenomenon.

14 MR. VASSALLO: That's correct.

15 MEMBER SIEBER: Okay. And the enclosure  
16 building is not subject to high radiation  
17 temperatures other than environmental conditions or  
18 internal pressures.

19 MR. VASSALLO: You're correct. And the  
20 main --

21 MEMBER SIEBER: So really what you're  
22 looking for is just degradation for the basic  
23 integrity of the enclosure building compared to the  
24 pressure-retaining function of the containment

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1 building.

2 MR. VASSALLO: Correct. I would agree  
3 with that. In fact, it's our non-triaxially  
4 reinforced structures that we would have the most  
5 concern about.

6 MEMBER SIEBER: Right. Okay. I'm just  
7 trying to put it into perspective for myself.

8 MR. VASSALLO: Thank you.

9 CHAIR SKILLMAN: Please continue.

10 MR. VASSALLO: Okay. That actually  
11 concludes my portion of the presentation so I'll  
12 turn it back over to Rick.

13 MR. NOBLE: Thanks, Ted. As Ted  
14 explained the aging management program that we  
15 developed for ASR uses the best available industry  
16 guidance on establishing those action levels. And  
17 then the structural evaluations that we do based on  
18 that, they're based on very conservative application  
19 of existing data that comes from small-scale testing  
20 as well as unrestrained samples. So because of the  
21 importance of confinement in the actual performance  
22 of ASR-affected structures Seabrook has initiated  
23 two large-scale testing programs to replicate the  
24 critical Seabrook design details, specifically the

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1 reinforcing details.

2           The first of these, both of these are  
3 going to be conducted at the Ferguson Structural  
4 Engineering Laboratory at the University of Texas in  
5 Austin. And the first of these is being  
6 administrated by Dr. Richard Klingner and that  
7 testing has to do with anchors, with installed  
8 anchors. It's being done on large-scale beams and  
9 these beams are being aged for ASR but they're using  
10 reinforcement details from Seabrook plant basically  
11 to design them.

12           The second large-scale testing, an even  
13 bigger effort is some large-scale destructive  
14 testing to establish shear and lap splice strength.

15       And this testing also done at the Ferguson  
16 Structural Lab is going to be administrated by Dr.  
17 Bayrak.

18           And Dr. Bayrak's spoken a couple of  
19 times this morning but I'll introduce him again.  
20 And Dr. Bayrak's going to go into a little more  
21 detail on that testing that's going to be done at  
22 the University of Texas. Dr. Bayrak?

23           DR. BAYRAK: Thank you, Rick. My name  
24 is Ozzie Bayrak and I spoke in the morning a few

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1 times. You may be wondering looking at my name how  
2 do you get Ozzie out of that. That was my sister in  
3 middle school, but maybe I shouldn't go that far  
4 back in terms of introducing myself.

5 As Rick indicated we're currently under  
6 contract to be carrying out some really ambitious  
7 full-scale testing programs to shed light to the  
8 structural implications of ASR at Seabrook. The  
9 primary focus of our testing is on shear performance  
10 of really reinforced concrete elements that do not  
11 have through-the-thickness reinforcement. And the  
12 second portion of the testing program focuses on the  
13 lap splice performance. And there what we would be  
14 looking at is the anchorage properties of  
15 reinforcing bars and what ASR does to the rebar  
16 anchorage.

17 A total of nine beams is what we will  
18 test as part of the shear testing program. In a  
19 similar manner we will test nine beams for the rebar  
20 anchorage purposes.

21 There are three major objectives in each  
22 one of these test programs. To begin with we will  
23 test the control specimen to evaluate the design  
24 margin and that will tell us what kind of an actual

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1 margin over the code calculated capacities we would  
2 have for those behavioral modes. And effects of ASR  
3 would then be evaluated as part of series 1 test  
4 specimens. And within the series 1 I try to use a  
5 color-coding here ranging from yellow to darker  
6 colors.

7           The first specimen is intended to  
8 replicate so to speak most of your ASR condition  
9 that is present at Seabrook today. I have been to  
10 the plant, to Seabrook, a few times actually to date  
11 and I have personally seen these affected areas. I  
12 have done my own walkdowns.

13           And as I was mentioning earlier in the  
14 morning, well earlier in the afternoon session I  
15 have been involved with quite a few other ASR-  
16 related structural test programs. And in my  
17 estimation the cracking that I see for the most part  
18 at Seabrook I view that as not necessarily at a  
19 significant stage. It's a fairly minor cracking is  
20 what it is for the most part.

21           So the first test specimen in series 1  
22 that would replicate that condition and that we  
23 would then have increasing levels of ASR damage.  
24 What that is going to tell us is that what happens

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1 to the original design margin as the ASR damage  
2 progresses for the two behavioral modes that I was  
3 talking about, the shear strength and the rebar  
4 anchorage.

5 CHAIR SKILLMAN: Let me ask a question  
6 here, please.

7 DR. BAYRAK: Absolutely.

8 CHAIR SKILLMAN: An hour ago or 45  
9 minutes ago some statements were made regarding the  
10 bore samples and the fact that once those samples  
11 are removed and tested, even though they show a  
12 change in properties because they are samples and  
13 are no longer in the host section from which they  
14 came the results of that testing are really not  
15 representative of the characteristics of that same  
16 material when it's in the host location, the  
17 location from which it was withdrawn.

18 DR. BAYRAK: Correct.

19 CHAIR SKILLMAN: That leads me to think  
20 okay, you pull a sample, you cut it up, you do some  
21 testing, the data is nice but it's not necessarily  
22 representative of the in situ location from which  
23 that material came.

24 DR. BAYRAK: Correct.

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1 CHAIR SKILLMAN: Why should we be  
2 comfortable that when you mix a batch and cure it  
3 and subject it to load in Texas that it has anything  
4 at all to do with what's going on at Seabrook?

5 DR. BAYRAK: Let me answer that  
6 question. The primary reason why you should feel  
7 comfortable is that when you take a core out of a  
8 structural element what you're doing is that you're  
9 picking up a concrete piece and removing it from its  
10 structural context. So what you're losing there is  
11 the effects of confinement.

12 CHAIR SKILLMAN: Yes.

13 DR. BAYRAK: So the materials testing  
14 clearly disconnects itself from reality, let's call  
15 it, which is the structure.

16 CHAIR SKILLMAN: That's why I'm asking  
17 the question.

18 DR. BAYRAK: Right. And the specimens  
19 that we will make are pretty much full-scale  
20 replicas of entire wall sections of Seabrook plant.

21 These are specimens that will weigh tons. And what  
22 is going to happen is that as ASR develops in these  
23 test specimens the rebar cage that is in there is  
24 going to restrain the concrete that's present in the

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1 specimens in a manner very similar if not exactly  
2 the same as Seabrook. So that is the primary reason  
3 why you should feel comfortable.

4 The second reason why you may feel  
5 comfortable is that for each one of these behavioral  
6 aspects we're currently in the process of developing  
7 some procedures. We're trying to replicate the  
8 plant conditions as close as possible. That does  
9 include involving local materials from Maine, the  
10 coarse aggregate and so on, in terms of the  
11 aggregate interlock that feeds into the shear  
12 behavior.

13 We picked up the most important  
14 properties of reinforced concrete walls and those  
15 properties that are germane to the behavior are  
16 being replicated in our testing program. So that is  
17 the second reason why you should feel comfortable.  
18 Did I answer your question?

19 CHAIR SKILLMAN: Partly. Let me  
20 introduce the idea of why I asked the question.  
21 From your report, it's on your page number 17, it's  
22 on your major paragraph 5. The development of a  
23 credible management program for an ASR-affected  
24 structure is a complex process that must take into

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1 account a multitude of factors including but not  
2 limited to the degree of concrete reactivity, site  
3 environment, quality of the reinforcing details,  
4 current state of deterioration, reserves of  
5 structural strength, consequences of failure,  
6 potential for future deterioration, et cetera.

7 So it seems to me in order for your  
8 testing program to be convincing in the matter at  
9 hand which is adding 20 years to this license this  
10 board needs to know that the test results fully  
11 represent the Seabrook conditions.

12 DR. BAYRAK: Sure they do. Once again,  
13 backtracking, I think you're referring to one of my  
14 two white papers that I issued to date.

15 CHAIR SKILLMAN: It is. It is the  
16 document that is entitled "The Structural  
17 Implications of ASR State of the Art," February 2,  
18 2012.

19 DR. BAYRAK: Sure, sure. Within the  
20 couple of papers that I issued sharing my  
21 perspectives on the issue one must note that there  
22 is more than the shear and rebar anchorage behavior  
23 that's involved in structural performance.

24 The reason why we're focused on the

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1 shear performance and the rebar anchorage is because  
2 those are the most vulnerable behavioral aspects as  
3 far as the structural details at Seabrook is  
4 concerned. And within there the elements that we're  
5 going after replicating are elements in which  
6 through-the-thickness reinforcement does not exist.

7 So once again lack of reinforcement in the third  
8 direction which cannot restrain the ASR expansion  
9 will render the elements that we're testing, you  
10 know, very conservative or bounding elements in  
11 terms of what we have at Seabrook.

12 There was earlier a discussion on the  
13 containment structure that does have heavy  
14 reinforcement and two curtains in addition to the  
15 through-the-thickness reinforcement and lack of  
16 water and so on. All those conditions render as far  
17 as ASR is concerned the containment structure to be  
18 the least vulnerable of all the structures that I  
19 have personally seen at Seabrook.

20 So it is for that reason that the  
21 specimens that we have in our hands are not directed  
22 towards that particular structure but what we're  
23 looking at is the walls of Bravo electrical tunnel  
24 and places like it. I'm not sure if that helps.

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1 CHAIR SKILLMAN: It helps. Thank you.

2 MR. NOBLE: Perhaps the next slide that  
3 shows the scale of the test specimens will help.

4 DR. BAYRAK: Right.

5 MEMBER SIEBER: One question before you  
6 change.

7 DR. BAYRAK: Sure. Yes, sir.

8 MEMBER SIEBER: You say the most  
9 affected parameter is shear strength. And in the  
10 enclosure building if you were to have a seismic  
11 event the largest force would correspond to the  
12 weakest parameter in the building.

13 DR. BAYRAK: True. That's a true  
14 statement.

15 MEMBER SIEBER: That's right. And so I  
16 think that's, to me that's where the vulnerability  
17 would be and you have to be able to predict a  
18 decline of shear strength and compare that to the  
19 seismic capability that you have to have to meet  
20 your seismic design requirement in order to say this  
21 structure continues to be safe.

22 DR. BAYRAK: Right. And to that end I'm  
23 going to refer back to an interim structural  
24 assessment report that was prepared by MPR

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1 Associates that benefitted from the couple of white  
2 papers that I issued on the issue. And once again  
3 we will see a picture in about 2 minutes or so,  
4 depending on how long this discussion goes, not that  
5 I'm trying to put a time limit on it.

6 But what we have done is we started out  
7 with a whole range of structures and structural  
8 details and so on, and we narrowed it down to issues  
9 that we can answer with existing information in the  
10 literature. And therein the listed references are  
11 far fewer than that, but I have a stack of 150-plus  
12 papers in my office that I can benefit from in  
13 answering these questions.

14 We narrowed it down to a couple of items  
15 that we could not answer with existing data in the  
16 literature credibly, okay? And those are the items  
17 that you see here that we're trying to do to provide  
18 direct answers for the Seabrook situation.

19 MR. NOBLE: Just to correct one thing  
20 you said, Oz.

21 DR. BAYRAK: Okay.

22 MR. NOBLE: Right. So what we did in  
23 the interim is we applied some very conservative  
24 values. So we didn't have credible values --

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1 DR. BAYRAK: Correct.

2 MR. NOBLE: -- in some cases for the  
3 shear so we use very conservative numbers, like a 40  
4 percent reduction for lap splice and 25 based on  
5 small-scale testing which we don't believe is very  
6 representative of what we have, but it's very  
7 bounding.

8 MEMBER SIEBER: Probably not.

9 MR. NOBLE: Right. So we ran the  
10 structural analysis in the interim using those very  
11 conservative numbers and that's what our current  
12 basis for operability is. Obviously that's not  
13 where we want to stay. We don't want to stay with  
14 those very conservative numbers, hence the testing  
15 that's going to give us that detail.

16 I just want to make sure that it's not  
17 that we haven't evaluated it. We've used very --

18 MEMBER SIEBER: Those numbers are based  
19 on seismic events?

20 MR. NOBLE: That's correct.

21 MEMBER SIEBER: Okay, thanks.

22 MEMBER ARMIJO: I had a question.

23 You're going to fabricate those large beams using  
24 the same construction practices and materials to the

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1 best of your ability representative of the Seabrook  
2 structures.

3 DR. BAYRAK: With one caveat and that is  
4 we will be in the business of accelerating ASR which  
5 is going to imply --

6 MEMBER ARMIJO: That's the second part  
7 of my question.

8 DR. BAYRAK: Okay.

9 MEMBER ARMIJO: How do you accelerate  
10 ASR on those test samples and how confident are you  
11 that it's representative of the ASR that's affecting  
12 the Seabrook structures?

13 DR. BAYRAK: The way we have done it in  
14 the past is the way we will intend to do in the  
15 future and that is we actually use sodium hydroxide  
16 and fresh concrete mix to be able to accelerate the  
17 ASR expansions. What that's going to do certainly -  
18 - in the construction of Seabrook sodium hydroxide  
19 was not used in the concrete, but certainly neither  
20 the committee here nor anybody involved in the  
21 process who's got questions on what does ASR mean  
22 for Seabrook, I don't think anybody is willing to  
23 wait 20 years to get an answer for the current  
24 condition at Seabrook. It'll be 20 years too late

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1 if that --

2 MEMBER ARMIJO: So is this a common  
3 practice to use a sodium hydroxide mix in the  
4 concrete?

5 DR. BAYRAK: Very much so.

6 MEMBER ARMIJO: Okay, so that is kind of  
7 like your accelerant.

8 DR. BAYRAK: Very much so. High-alkali  
9 cement, sodium hydroxide and reactive aggregates is  
10 what will go in the mix. And within there we are --  
11 our initial trial batching involves 10 different  
12 mixtures. We're using some of the earlier mixtures  
13 that we had used in my laboratory in addition to new  
14 mixtures that we're trying out that would more  
15 closely replicate the plant conditions with their  
16 aggregates and so on. So we're going to have strike  
17 a balance between being as similar to Seabrook as  
18 possible while developing ASR as quickly as  
19 possible.

20 MEMBER ARMIJO: In the way you fabricate  
21 these samples then you will have ASR through-the-  
22 thickness.

23 DR. BAYRAK: Correct.

24 MEMBER ARMIJO: Whereas in the real life

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1 I thought ASR started from the surface and worked  
2 its way in.

3 MR. BARTON: It's also working  
4 internally, isn't it? Yes.

5 MR. NOBLE: The expansion will be worse  
6 on the surfaces but the reaction itself is occurring  
7 throughout the whole section.

8 MEMBER POWERS: Back to the question is  
9 that you indicated earlier you're going to import  
10 the aggregate from Maine, but that quarry that  
11 supplied the aggregate did so 20 years ago. I  
12 suspect they have progressed beyond that particular  
13 vein where they were mining. How do you know you  
14 will have the strained amorphous silica in the  
15 aggregate?

16 MR. NOBLE: Ted's done the research.

17 MR. VASSALLO: Well, I actually went to  
18 the quarry and we obtained samples from the current  
19 quarry that Pike Industry uses. And we sent them to  
20 our petrographer at SG&H and he compared the  
21 mineralogy of the aggregates from -- the aggregates  
22 from the Bravo tunnel and the other affected ASR  
23 cores in our plant to the mineralogy of the  
24 aggregate samples that I collected. And he said

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1 that it's basically the same.

2 DR. BAYRAK: And from a structural  
3 standpoint as long as coarse aggregate is reactive  
4 in the mix and as long as --

5 MEMBER POWERS: Yes, I don't have any  
6 troubles with that. It's just that areas change as  
7 a function of time and you're going in the direction  
8 -- I presume the mining is going in the direction  
9 they should be getting increasingly crystalline  
10 silicates but I don't know. But apparently you've  
11 checked. Good.

12 MR. NOBLE: I also know that these are  
13 reactive because the owner of the quarry is also a  
14 very large construction company in northern New  
15 England. They produce -- they own their own batch  
16 plants. They produce a lot of concrete, do a lot of  
17 highway work. And they have designed mixes which of  
18 course they have to use fly ash or silica fume to  
19 prevent/mitigate ASR. So we know they're reactive.

20 CHAIR SKILLMAN: I'm going to ask Dr.  
21 Bayrak if you would move along because we need to  
22 give the staff ample opportunity. They've been very  
23 --

24 DR. BAYRAK: Absolutely. Can we go back

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1 one slide?

2 CHAIR SKILLMAN: -- quiet here, but we  
3 need to hear from them.

4 DR. BAYRAK: Sure. Prior to the  
5 extended discussion here I was indicating that  
6 various levels of ASR will be covered in our series  
7 1 testing. And if it at a point in time we realize  
8 that the design margins that need to be there to  
9 maintain the original design basis are not quite  
10 there we will then tap into our series 2 test  
11 program in which we would then be considering  
12 various retrofit strategies that will be proven  
13 experimentally prior to their implementation at  
14 Seabrook if Seabrook chooses to implement them. Now  
15 we can roll the slide.

16 What you see here is a full-scale  
17 reinforced concrete beam test. It's over 27 foot  
18 long, about 4 feet deep, 42 inches to be exact, 21  
19 inches into the page. It's part of a previous  
20 testing program for another sponsor. It's got  
21 nothing to do with Seabrook. And this is an element  
22 in which triaxial reinforcement did exist. And in  
23 this particular testing our test results show that  
24 ASR damage improved the stiffness and the strength

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1 of the reinforced concrete beam.

2 If you were to take cores out of that  
3 beam and test them for compressive strength or  
4 tensile strength or modulus you would prove to  
5 yourself that ASR decreased the material properties  
6 but the structural testing did prove the fact that  
7 the performance in fact improves.

8 And the way the setup work is that the  
9 orange ramps push the beam up. The blue beams on  
10 the top side restrain the beam from moving up. The  
11 ramp to your left is the one that was engaged in the  
12 second test on this beam. You see the shear crack  
13 that formed, and that way we get to evaluate the  
14 shear capacity of the beam. And this picture was  
15 taken in Ferguson's structural engineering  
16 laboratory.

17 MEMBER RYAN: Is the beam 2 feet square  
18 or so, something like that?

19 DR. BAYRAK: No. If you can go back one  
20 slide. In the vertical direction it's 42 inches  
21 deep, into the page or along the length it's 21  
22 inches and 27 foot long.

23 MEMBER RYAN: Okay.

24 DR. BAYRAK: That was a replica of a

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1 bend cap, bridge bend, as opposed to a wall segment  
2 at Seabrook.

3 MEMBER RYAN: It looks fairly similar to  
4 the wall.

5 DR. BAYRAK: Oh yes, yes.

6 MEMBER RYAN: Yes, okay. I mean it's  
7 not -- the dimensions aren't off in one dimension or  
8 another. It's fairly similar.

9 DR. BAYRAK: Right.

10 MEMBER RYAN: Okay.

11 DR. BAYRAK: This is my last slide for  
12 the record here. And just to give you an idea as to  
13 how the University of Texas work fits in the overall  
14 picture here. The box you see at the top is our --  
15 that's the University of Texas. Our emphasis and  
16 focus is on shear strength, rebar anchorage and  
17 flexural stiffness of the elements.

18 As I was indicating earlier we will  
19 focus on the original design margin. We will  
20 correlate the cracking indices with the percent  
21 reduction in capacity as it's depicted in that XY  
22 plot at the top. And should there be a need to  
23 develop a repair strategy we will have specimens at  
24 our disposal to develop those repair strategies.

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1 When we conclude our work we will feed a final  
2 report to the final structural assessment that will  
3 take place which will in turn feed into the aging  
4 management program.

5 If we can animate this slide once. And  
6 the way this is going to work is that as Ted  
7 explained the plant is monitoring now two cycles of  
8 the crack widths and cracking indices. Those will  
9 be tapping into our research report and cracking  
10 indices will then be correlated to percent reduction  
11 in capacity.

12 And one more animation will take us to a  
13 place where if the percent reduction in capacity  
14 depending on what it is is going to trigger  
15 different levels of action that may range from more  
16 rigorous inspections to perhaps having to implement  
17 some retrofit strategies. And if Seabrook chooses  
18 to implement those strategies they will have  
19 experimentally proven strategies available to them  
20 at their disposal.

21 That concludes my portion of the capsule  
22 description of what we did at the University of  
23 Texas. And with that I will turn the floor over to  
24 Rick Noble.

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1 CHAIR SKILLMAN: Thank you.

2 MR. NOBLE: Thanks, Ozzie. Just a quick  
3 conclusion recap. So we continue to operate right  
4 now based on our interim structural assessment which  
5 demonstrates current structural adequacy. That's  
6 docketed in the interim assessment dated May 24th,  
7 2012.

8 We understand the effects of ASR and we  
9 believe we know how to manage them. We've initiated  
10 full-scale testing that will be able to quantify the  
11 structural implications of ASR using Seabrook-  
12 specific details. And that will be rolled into our  
13 final structural assessment.

14 We have completed baseline inspections  
15 and we've completed one reinspection interval. And  
16 we've developed an ASR-specific aging management  
17 program that provides the best means to monitor the  
18 progression of ASR, and that's through monitoring of  
19 crack indexing and surface expansion.

20 And that concludes my portion. I'll  
21 turn it back over to Rick Cliche for any final  
22 comments.

23 MR. CLICHE: Thanks, Rick. In closing,  
24 NextEra Seabrook has incorporated both industry and

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1 site operating experience into the application.  
2 Programs have been revised and new programs created  
3 based on OE.

4 We submit a response to four of the open  
5 items that incorporates recent industry operating  
6 experience and we believe that our responses will  
7 close those items.

8 What you heard here is that we  
9 identified an unexpected aging mechanism at Seabrook  
10 in our concrete structures. We explain the effects  
11 of ASR, and the program owner described the aging  
12 management program that's monitoring its  
13 progression.

14 So we are looking forward to continuing  
15 our support of the staff in its review of the  
16 application and closure of the SER open items.  
17 Thank you very much.

18 CHAIR SKILLMAN: Colleagues, any  
19 questions before we release?

20 MR. BARTON: Not on this issue but I've  
21 got some other ones.

22 MEMBER ARMIJO: I've got a question. In  
23 reading I believe it's an MPR report. And I read  
24 this paragraph that's -- still confused about it.

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1 It says the concrete at Seabrook was not expected to  
2 be susceptible to ASR due to the following. The  
3 coarse aggregate is igneous rock that passed the ASR  
4 reactivity testing used during construction. Two,  
5 the low-alkali cement was used, and three, the  
6 aggregate passed petrographic examination.

7 Now, igneous rock is going to be  
8 crystalline.

9 MR. NOBLE: Right. It's not all  
10 igneous. It's actually -- the vein that they took  
11 it from had metamorphic with strained quartz in it.

12 MEMBER ARMIJO: So the report wasn't  
13 accurate?

14 MR. NOBLE: It was granite and so it was  
15 believed to be the majority of it was igneous rock  
16 but there's actually metamorphic rock in there.  
17 That's the source of the reactivity.

18 MEMBER ARMIJO: So that was your source  
19 of the -- of the reactivity.

20 MR. NOBLE: But again it did pass all  
21 the tests at the time to look for reactive  
22 aggregates. It did pass the tests of the day.

23 MEMBER ARMIJO: Would it pass the  
24 current tests that are used?

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1 MR. NOBLE: I can say unequivocally no  
2 because we've run the accelerated mortar bar test  
3 using our aggregates and we get accelerations  
4 greater than 1 percent in 14 days which is the  
5 acceptance criteria. So it would not pass.

6 MEMBER ARMIJO: Okay. And then the  
7 other quick question was if you could just briefly  
8 say what are the proven retrofit strategies that you  
9 could use if you had to?

10 DR. BAYRAK: At this point in time I can  
11 comment on that at a conceptual level. We would be  
12 talking about installing some essentially anchors  
13 into the -- to provide the through-the-thickness  
14 reinforcement and various forms of it. And that's  
15 why -- and we will end up developing those through  
16 our testing program. So it's a little premature for  
17 me to provide the details of it.

18 MEMBER ARMIJO: I'm just trying to get a  
19 feel that other structures that have been affected  
20 by ASR have been retrofitted in some way that's  
21 turned out to be successful.

22 DR. BAYRAK: Sure. But it highly --  
23 there has been repair jobs that I got personally  
24 involved with going back to that one drilled shaft

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1 example and there we used carbon-fiber-reinforced  
2 polymers, but the boundary conditions are so  
3 different that you could wrap this material around  
4 it.

5 Over here you have one exposed surface.

6 You would be talking about installing post-  
7 installed anchors through the thickness of the wall  
8 as one strategy. Obviously we will look into other  
9 methods as well, but that's the most logical.

10 CHAIR SKILLMAN: Okay, John, you had a  
11 question?

12 MR. BARTON: Not on this.

13 CHAIR SKILLMAN: Okay. Dr. Ryan?

14 MEMBER RYAN: No, thank you.

15 CHAIR SKILLMAN: Dr. Powers? Dr. Shack?  
16 Dr. Bonaca? Rick and team, thank you very much for  
17 a very patient and thorough presentation. You're  
18 released and I'm going to ask Brian Holian to bring  
19 up his team, please.

20 MEMBER POWERS: You guys aren't going  
21 home yet, right?

22 (Laughter.)

23 MR. HOLIAN: Chairman, if you're ready  
24 while they're sitting -- to save time I'll start

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1 introductions and continue.

2 CHAIR SKILLMAN: Yes, please.

3 MR. HOLIAN: Okay, thank you. Once  
4 again I'm Brian Holian, Division of License Renewal.  
5 We'll progress to the staff's status of their  
6 evaluation. I mentioned earlier -- let me start  
7 again with the individuals. I'll start from the  
8 left to the right across the room.

9 We have Dr. Allen Hiser who's our senior  
10 level advisor for license renewal. Abdul Sheikh  
11 who's our senior structural engineer in the Division  
12 of License Renewal. We have Rich Conte, he's the  
13 branch chief in the Division of Reactor Safety from  
14 Region I. And again we have Michael Modes on the  
15 phone who was the lead inspector who will be doing  
16 that portion of the presentation. And Rich is here  
17 to support.

18 We have Arthur Cunanan who is a project  
19 manager assigned to the Seabrook plant. You've seen  
20 Arthur recently before I believe on the Columbia  
21 application here before the committee. And senior  
22 project manager John Daily assisting today. John's  
23 got a different plant, South Texas, coming up right  
24 now but he's assisting.

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1 I'd also like to highlight just briefly  
2 a couple of members of staff in the audience. As  
3 usual we have many of our branch chiefs and staff  
4 not only from License Renewal but other technical  
5 divisions as needed. But a couple of staff that  
6 have assisted in particular on the ASR issue, I  
7 highlight them because this subcommittee has been  
8 delayed 10 months as we've gotten to this point in  
9 the SER. So a lot of work has gone on. I  
10 appreciate the licensee's presentation but I  
11 appreciate the staff here also who have progressed  
12 the issue with their types of questions and issues.

13 A couple of the folks out here if I  
14 catch the main members if you'd raise your hand.  
15 Bryce Lehman, structural engineer in the Division of  
16 License Renewal. Alice Erickson, structural  
17 engineer, License Renewal. Ms. Angela Buford over  
18 here in this corner. Angela was just onsite 2 weeks  
19 ago working with Region I. I think she goes back,  
20 is it next week? So the region still doing some  
21 onsite time related to this issue, region-led and  
22 Angela is our coordinated engineer from here  
23 accompanying those trips.

24 With that I'd just like to briefly

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1 mention, you know, there was a question from the  
2 subcommittee about other plants affected. Clearly  
3 an issue the NRC staff's been concerned with. We  
4 did put an information notice out about a year ago  
5 so hopefully you've seen that in your background  
6 material. Nobody's raised their hand and  
7 volunteered that they have it.

8 As Melanie mentioned earlier, ASR is an  
9 item in the GALL. We do expect a plant that  
10 identifies it at their plant to address the latest  
11 GALL advice that the staff has on it and make a  
12 plant-specific program should they have it.

13 How will we find that? Well, we'll find  
14 that by the regional inspections. Again, we go out  
15 before PEO, the period of extended operation and  
16 verify that. But the same inspectors who do license  
17 renewal inspectors are routinely the Division of  
18 Reactor Safety inspectors and they're looking for it  
19 under Part 50 processes too. So I wanted to  
20 highlight that.

21 I also wanted to highlight that New  
22 Reactors, we interface with New Reactors. Somebody  
23 mentioned the question about current standards and  
24 so New Reactors is also aware of this issue.

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1 MR. MODES: Is it reported as Part 21?

2 MR. HOLIAN: Under Part 21, it has not  
3 been reported under Part 21. I'll take that for  
4 maybe a lookup on why for a significant condition  
5 but it has not been. With that I'll turn it over to  
6 Arthur Cunanan, project manager.

7 CHAIR SKILLMAN: Art, welcome.

8 MR. CUNANAN: Thank you.

9 CHAIR SKILLMAN: Thank you.

10 MR. CUNANAN: Good afternoon Chairman  
11 and members of the ACRS staff. My name is Arthur  
12 Cunanan. I'm the project manager for the Seabrook  
13 Station license renewal application. I'm here to  
14 discuss the staff's review of the Seabrook license  
15 renewal application as documented in the Safety  
16 Evaluation Report.

17 Brian has made introductions of the NRC  
18 staff at the table and also there are members of the  
19 audience, the technical staff who participated in  
20 the review of the license renewal application or at  
21 the audits conducted at the plant.

22 Mike Modes, the Region 1 lead inspector,  
23 will be available on the phone line throughout this  
24 presentation and will be discussing the results of

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1 the license renewal inspection. Mike, are you still  
2 available?

3 MR. MODES: Affirmative.

4 MR. CUNANAN: Thanks, Mike. I would  
5 like to note that this presentation is different  
6 from other presentations that you've seen recently  
7 related to the license renewal. We will present a  
8 different conclusion because the open item related  
9 to the alkali-silica reaction, ASR, on concrete  
10 structures is a significant issue that may take a  
11 long time to resolve.

12 Seabrook has had four schedule changes.

13 The schedule changes were not all related to ASR.  
14 Some were related to the environmental review. In  
15 general, if issues do come up for plants going  
16 through license renewal the staff will not hesitate  
17 to delay the schedule or change it in order to  
18 address the issue.

19 As Brian mentioned, based on the  
20 original schedule the Seabrook subcommittee has been  
21 delayed 10 months. The last schedule change made  
22 the remaining safety to be determined, TBD. The  
23 Safety Evaluation Report has seven open items. Most  
24 of the open items have responses that the staff are

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1 still reviewing. We will quickly go over these open  
2 items and focus our attention to the structures  
3 monitoring program open item which relates to the  
4 alkali-silica reaction of concrete. This discussion  
5 will occur towards the end of the presentation.

6 For the ASR open item we will focus even  
7 further to the issues related to license renewal.  
8 However, if you do have questions related to Part 50  
9 Rich Conte, our branch chief from Region 1, is  
10 present to answer your questions.

11 Here's an outline of today's  
12 presentation. Next slide. This is an overview of  
13 the Seabrook Station license renewal application.  
14 The applicant has covered most of the points  
15 presented in this slide. However, I wanted to  
16 mention that the Seabrook is a PWR four-loop design  
17 with the original steam generators. Next slide.

18 The staff conducted audits for the  
19 license renewal application during the period shown  
20 on this slide. In addition, Region 1 conducted its  
21 license renewal inspection as shown. Those  
22 inspection results will be presented shortly.

23 In preparing the Safety Evaluation  
24 Report the staff conducted in-depth technical

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1 reviews and issued over 219 requests for additional  
2 information. As mentioned before the Safety  
3 Evaluation Report has seven open items. We'll  
4 quickly go over the open items and focus our  
5 attention on the structures monitoring program open  
6 item which relates to the alkali-silica reaction of  
7 concrete. This discussion will occur towards the  
8 end of the presentation.

9 Section 2 of the SER describes the  
10 structures and components subject to aging  
11 management review. If there are no questions on  
12 this slide I will now turn the presentation over to  
13 Mike Modes, the Region 1 lead inspector who will  
14 discuss the license renewal inspection review.  
15 Mike?

16 MR. MODES: Hello everyone, my name is  
17 Michael Modes. I'm a senior reactor inspector and  
18 team lead for license renewal in Region 1. Next  
19 slide.

20 The Region 1 inspection in this case  
21 consisted of 3 weeks spread out over a month and  
22 consisted of four inspectors with a focus primarily  
23 on 10 C.F.R. 50.4(a)(2) inspection which is the non-  
24 safety affecting safety portion of the rule. And we

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1 selected aging management programs for more thorough  
2 onsite review.

3 The team reviewed approximately 19 of 42  
4 aging management programs. We reviewed 10 of 13 new  
5 and 9 of 29 existing aging management programs. We  
6 generally don't find it useful to review programs  
7 that are in existence and are being constantly  
8 monitored by the ROP process such as ISI.

9 The applicant had developed appropriate  
10 evaluation reports for their aging management  
11 programs that allowed the inspectors to make a full  
12 and broad assessment about the applicant's plans  
13 obviously except for the ASR issue. Next.

14 Some of the interesting AMP inspection  
15 results, the aging management program. For the  
16 buried piping and tanks inspection because NextEra  
17 has a good sound understanding, accurate records and  
18 full drawings for their buried piping program --  
19 they don't have any tanks within scope -- with the  
20 exception of the backfill aggregate size they meet  
21 most of the stipulated requirements of GALL Rev 2 as  
22 proposed.

23 And so for the GALL Rev program, the  
24 program is structured to reward any buried piping

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1 program that most fully implements the cathodic  
2 protection. In the case of Seabrook it was noted by  
3 the team that the cathodic protection system reports  
4 starting in 1993 reflected that the cathodic  
5 protection system was not fully reliable until 2007  
6 when a survey found that only 62 percent of the  
7 areas surveyed were mitigated by cathodic  
8 protection.

9 During the first quarter of 2009 the  
10 cathodic protection program was finally categorized  
11 as green or satisfactory, and they voluntarily  
12 entered that cathodic protection system into the  
13 maintenance rule under 10 C.F.R. 50.65 during that  
14 same quarter.

15 Because the cathodic protection program  
16 at the site hasn't been fully implemented during the  
17 entire period of operation it is reasonable for the  
18 site to propose some digging of buried piping for  
19 excavation in order to corroborate both the  
20 historical basis and to support the conclusion that  
21 they don't have an ongoing program, and that the  
22 cathodic protection program is in fact doing its  
23 job.

24 Another situation of interest was lube

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1 oil analysis where the team identified that the  
2 lubricating oil and hydraulic fluid samples of a  
3 particular charging pump were not being tested for  
4 water content despite the pump being water-cooled,  
5 and also they identified as they have in other  
6 locations not unique to Seabrook that the  
7 application change resulted for flow testing to the  
8 2020 version of the NFPA 25 standard for the fire  
9 water system. Next slide.

10 MR. BARTON: Wait a minute. Even though  
11 the diesel fuel storage tanks are not buried or  
12 located below grade, the diesel generator building,  
13 you guys follow up to see if those tanks were ever  
14 inspected? Or maybe you didn't. Maybe the  
15 applicant can answer that. Have you ever inspected  
16 those tanks?

17 MR. MODES: I looked at all of the tanks  
18 that were within scope, the aboveground. I did not  
19 look at -- maybe the applicant can in fact  
20 illustrate that.

21 MR. BARTON: Diesel generator fueling  
22 tanks.

23 MR. CHEW: My name is Ken Chew from  
24 license renewal group. Yes, we do inspect and clean

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1 and UT those tanks.

2 MR. BARTON: And they have been done.  
3 Have you found any indications of any corrosion or  
4 bottom-thinning?

5 MR. CHEW: No. No, we have not.

6 MR. BARTON: How about the in-scope  
7 above-grade tanks, aboveground tanks? Did you guys  
8 look at those, Mike?

9 MR. MODES: Yes, I did. I looked at all  
10 the aboveground tanks.

11 MR. BARTON: Well, I guess it was in  
12 your report. Yes, in your inspection report on the  
13 fire protection water storage tank had blistered  
14 paint and rust, and rust stains, and caulking at  
15 tank bottom edge had evidence of cracking and  
16 peeling in open areas, at the tank edge area. Did  
17 you follow up to see if they've ever inspected that  
18 tank bottom for any thinning of the tank bottoms?

19 MR. MODES: Yes, and they hadn't. They  
20 had a plan to do so. I did follow up on the noted  
21 conditions, the caulking that was missing, the  
22 blistering, some of the rust spots that I noted.  
23 The AMP GALL audit that had preceded us had reviewed  
24 the same program and it had looked at a number of

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1 the historical records. So I was aware of their  
2 work on that. I also followed up and looked at  
3 about a half a dozen work orders going back to  
4 understand how they were mitigating the consequences  
5 of that aging effect.

6 MR. BARTON: Did you guys check to see  
7 if that -- the conditions of that tank were listed  
8 or in their corrective action program? Did they  
9 have that deficiency in their program?

10 MR. MODES: Yes, those -- the work  
11 orders I looked at were a consequence of those  
12 conditions being noted in the corrective action  
13 program.

14 MR. BARTON: Okay. Thank you.

15 MR. MODES: You're welcome. Any other  
16 questions?

17 CHAIR SKILLMAN: Please proceed, Mike.

18 MR. MODES: Next slide. Obviously the  
19 subsection IWL and structures monitoring program was  
20 of interest to the team because it constitutes a  
21 large issue. There's been a considerable amount of  
22 discussion as the regional inspection because it  
23 occurred early in this process during a period when  
24 Seabrook was essentially in the first phases of

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1 discovery. What the team concluded was that it  
2 would be necessary for further development to occur  
3 and so the team deferred any conclusion about the  
4 acceptability of that program. Next slide.

5 The regional inspection did a large  
6 number of walkdowns. I personally did the residual  
7 heat removal system in order to understand how some  
8 of these aging management program proposals fit into  
9 the monitoring of aging of what is a rather safety-  
10 significant and risk-significant system. In  
11 addition to which one of the team members focused on  
12 the non-safety affects safety. And he does that by  
13 taking the drawing and trying to understand the  
14 three-dimensional relationships that exist in  
15 various locations such as the turbine building, the  
16 primary auxiliary building, east main steam,  
17 feedwater pipe chases, control building,  
18 servicewater pumphouse, et cetera. Quite an  
19 extensive walkdown.

20 MR. BARTON: I've got a question on  
21 that. On those buildings outside the power block  
22 what did your team assess the material condition of  
23 those buildings to be?

24 MR. MODES: Except for those locations

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1 where the ASR, the material -- and those locations  
2 such as the residual heat removal vault which are  
3 below grade. The condition of the plant is rather -  
4 - it's the normal condition of a plant of its  
5 pedigree and age.

6 MR. BARTON: Not good or bad.

7 MR. MODES: You know, we wrestled.  
8 Inspectors who come to talk to you guys wrestle with  
9 this question every time.

10 MR. BARTON: I know. I ask the question  
11 every time.

12 MR. MODES: Yes, I know, and I've been  
13 doing this for 13 years with you fellows. The thing  
14 is the standard I apply is the plants that I look  
15 at. And so for me to answer that question I'm  
16 drawing a comparison against plants that are only  
17 located in the Northeast. So given that caveat,  
18 given that standard this plant is in good condition.

19 MR. BARTON: I'm not looking for a  
20 comparison to all plants. I'm interested in when  
21 you guys look at these plants do they pay attention  
22 to the outer buildings. Do they really care about  
23 the condition of all the buildings, not just the  
24 power block which everybody concentrates on and

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1 thinks well, that's what's important. I think, you  
2 know, the culture at the site also depends on how do  
3 you take care of your outbuildings, all right? And  
4 that's what I'm looking for.

5 MR. MODES: We've had this discussion  
6 before and it's sort of the Spic and Span standard.

7 MR. BARTON: Yes.

8 MR. MODES: Right. So if you -- and I  
9 agree with you, especially somebody who's been doing  
10 these inspections for 40 years. I think what you're  
11 talking about is getting an impression, an  
12 impression about the culture of the site --

13 MR. BARTON: That's right.

14 MR. MODES: -- based on the physical  
15 evidence of how well they take care of the site.

16 MR. BARTON: Right, exactly.

17 MR. MODES: And I can tell you that in  
18 walking around that site. And again, except for  
19 those areas where it's below grade and there's  
20 intrusion of water, et cetera, there appears to be  
21 what I would call pride of ownership.

22 MR. BARTON: Okay, that's what I'm  
23 looking for. Thank you.

24 MR. MODES: You're welcome. Next slide.

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1       So some of the observations are that obviously the  
2       -- we observed the applicant's initial struggle with  
3       the alkali-silica reaction. And we did not, I  
4       personally noted water intrusion in the RHR walkdown  
5       including a considerable amount of deposits and  
6       brown stains from the membrane failure that I  
7       believe they referred to earlier. Next slide.

8               So we concluded that the scoping of the  
9       non-safety systems and structures and components and  
10      the AMPs were acceptable, and that except for the  
11      ASR I believe the inspection results would support a  
12      conclusion of reasonable assurance that the aging  
13      effects will be managed and the intended functions  
14      maintained.

15             And also the rule requires that the  
16      documentation supporting the application be  
17      auditable and retrievable, and that is something  
18      that we always check. And we found that in fact the  
19      documentation in this case is complete and does  
20      support the application. That concludes my remarks.

21             MR. CUNANAN: Thanks, Mike.

22             MR. MODES: Thank you.

23             MR. CUNANAN: Now we're going to move  
24      onto Section 3 of the SER. Section 3 of the SER

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1 covers the staff's reviews of the applicant's aging  
2 management programs and aging management review line  
3 items in each of the systems which was reviewed  
4 against the criteria in the GALL report. I'm now  
5 going to go over the Section 3 open items except for  
6 the open item related to ASR.

7 As shown on the table the staff reviewed  
8 42 aging management programs. The staff also  
9 reviewed over 6,000 aging management review line  
10 items from the submitted license renewal  
11 application. Next slide.

12 CHAIR SKILLMAN: Art, before you change  
13 let me ask this question. In two instances on the  
14 SER page 3-183 referring to the nickel alloy nozzles  
15 and penetrations program, and the SER page 3-188 PWR  
16 vessel internals aging program the staff uses the  
17 word "may" and here's the example. This is  
18 specifically on page 3-188 and this is the PWR  
19 internals.

20 "On the basis of its technical review of  
21 the applicant's PWR vessel internals aging  
22 management program the staff concludes that the  
23 applicant demonstrated that through the use of this  
24 AMP the effects of aging of the RVI components may

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1 be adequately managed." Emphasis on the word "may."

2 That shows up also on page 3-183 on the  
3 nickel alloy nozzles and penetrations where the  
4 staff writes, "The effects of aging may be  
5 adequately managed." In almost every other instance  
6 the staff writes "will be adequately managed."

7 Why are those "mays" hiding down in the  
8 safety evaluation?

9 MR. CUNANAN: Well, I think that  
10 probably would have been a review that was  
11 incorrectly stated. So if we're going to say that  
12 it's adequate we will say "will."

13 CHAIR SKILLMAN: I would suggest you may  
14 want to go back through this document and make sure  
15 that if you use the word "may" you mean "may" and  
16 there is an adequate explanation for why that is  
17 appropriate or you may want to change that "may" to  
18 "will."

19 MR. CUNANAN: Yes.

20 CHAIR SKILLMAN: So there are a number  
21 of examples and I would suggest you please find  
22 those and correct those.

23 MR. CUNANAN: We will do that.

24 CHAIR SKILLMAN: Thank you.

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1 MR. CUNANAN: This slide addresses the  
2 bolting integrity program open item. In recent  
3 reviews of license renewal applications and  
4 operating experiences the NRC staff noted that the  
5 seal cap enclosures can contain water leakage and  
6 therefore use of such enclosures should be accounted  
7 for in the license renewal applications to ensure  
8 proper aging management.

9 The applicant stated that it used a seal  
10 cap enclosure to contain water leakage. Seal cap  
11 enclosures may prevent the direct inspection of  
12 bolting and component external surfaces. It was  
13 unclear how components within seal cap enclosures  
14 will be age-managed since direct inspection is not  
15 possible.

16 The applicant has subsequently submitted  
17 an LRA amendment stating in its UFSAR supplement to  
18 remove the seal cap enclosures no later than  
19 December 31, 2014. The LRA amendment is still being  
20 reviewed by the staff.

21 This slide addresses the ASME Code  
22 Section 11 Subsection IWE program open item. Due to  
23 the applicant's previous failure to maintain the  
24 annulus space between the containment and

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1 containment enclosure buildings in a dewatered state  
2 the staff is concerned that the applicant has not  
3 until now implemented procedures and inspection  
4 requirements to keep the area dewatered in the  
5 future. Accumulation of water in the annulus space  
6 can potentially degrade the containment liner and  
7 accelerate degradation of concrete. The staff is --  
8 the staff determined this is being tracked as an  
9 open item. Next slide.

10 This slide addresses the steam generator  
11 tube integrity program open item. This is an  
12 administrative item to clarify the applicant's  
13 intent and to place the applicant's commitments in  
14 the UFSAR supplement. The applicant has since  
15 submitted a LRA amendment to clarify its intent on  
16 the commitment of the steam generator tube integrity  
17 program and included the commitments in the UFSAR  
18 supplements. However, the LRA amendment is still  
19 under review. Next slide.

20 This slide addresses the operating  
21 experience open item. This is an open item that the  
22 ACRS has seen before with Columbia Generating  
23 Station. The applicant did not fully describe how  
24 it will use future operating experience to ensure

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1 that the aging management program will remain  
2 effective for managing the aging effects during the  
3 period of extended operations.

4 Operating experience is important  
5 because it serves as a feedback mechanism to ensure  
6 the continued effectiveness of the aging management  
7 program. Appropriate aspects associated with the  
8 applicant's activities for the ongoing review of  
9 operating experience related to aging should be  
10 consistent with the guidance in the final license  
11 renewal interim staff guidance LR-ISG-2011-05 titled  
12 "Ongoing Review of Operating Experience." Next  
13 slide.

14 This slide addresses the treated borated  
15 water open item. The LRA contained several AMR line  
16 items that managed stainless steel components  
17 exposed to treated borated water for loss of  
18 material, cracking and reduction of heat transfer  
19 with the water chemistry program.

20 However, the staff noted that new staff  
21 guidance recommends an additional one-time  
22 inspection to verify the effectiveness of water  
23 chemistry controls in borated water environments.  
24 The application has submitted a LRA amendment to

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1 include the additional one-time inspections for  
2 several AMR line items to manage stainless steel  
3 components exposed to treated borated water. The  
4 LRA amendment is still under review by the staff.

5 Section 4 of the SER contains the  
6 staff's review of the time-limited aging analysis,  
7 TLAA. The following slide presents the open item  
8 related to TLAAs.

9 This slide addresses the pressure  
10 temperature limit open item. As part of a separate  
11 licensing action on P-T limits the applicant  
12 requested approval of P-T limits that would, based  
13 on an updated neutron fluents evaluation, extend the  
14 operating time of the current curves from 20  
15 effective full-power years to 23.7 effective full-  
16 power years.

17 The staff has had concerns related to  
18 whether the methodology used to develop the P-T  
19 limit is consistent with the requirements in 10  
20 C.F.R. 50 Appendix G. Because the methodology used  
21 to develop the P-T limits during the initial  
22 operating period is the same as that used during the  
23 period of extended operation this additional  
24 information is also pertinent to the review of the

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1 license renewal application to resolve this issue as  
2 an open item.

3 This slide addresses the structures  
4 monitoring program open item. Based on operating  
5 experience related to concrete degradation due to  
6 alkali-silica reaction, ASR, the staff is concerned  
7 that the applicant's enhancement to the structures  
8 monitoring -- aging management program is not  
9 sufficient to manage the effects of ASR. The staff  
10 is also concerned that the applicant has failed to  
11 address the effects of ASR degradation in its  
12 concrete containment.

13 I would like to note that when the SER  
14 was issued on June 8th, 2012 and reviewed to the  
15 March 30th, 2012 letter, the applicant has submitted  
16 an LRA amendment to include a plant-specific ASR  
17 monitoring program on May 16th, 2012. However, the  
18 staff is still reviewing the information and the  
19 evaluation on the May 16th letter was not included  
20 in the SER. Later in the presentation the staff  
21 will include its initial observation of the ASR  
22 monitoring program.

23 Also, the focus of this presentation is  
24 related to the license renewal issues. The

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1 applicant has told its story. The staff disagrees  
2 with the applicant's presentation because the staff  
3 believes that the applicant should address the  
4 effects of ASR in concrete containment and the aging  
5 management program does not include trending data to  
6 determine extent and rate of degradation of  
7 mechanical properties from tests.

8           However, these are the staff's  
9 differences today. With the evolving review the  
10 staff's position could change with new information  
11 received in the future.

12           The following slides will explain the  
13 staff's position related to the ASR issue.

14           DR. BONACA: I have a question. Why is  
15 this being treated as an aging management issue in  
16 license extension space and not as a Part 21 in the  
17 current situation? I mean, the plant has a problem  
18 with aging in the current environment. If the plant  
19 was not going for license renewal it still would  
20 have to report this issue under normal licensing  
21 steps. I mean, Part 21 comes to mind. Maybe I  
22 should ask the question to the staff.

23           MR. HOLIAN: Yes, Dr. Bonaca, Brian  
24 Holian again. If I heard the question right it is a

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1 question about reporting kind of threshold for the  
2 plant, the safety significance of the issue. Is  
3 that correct?

4 DR. BONACA: Yes. I mean, assume that  
5 Seabrook was not going for license renewal but this  
6 issue was identified. You would have to decide  
7 whether or not it's enough to report it.

8 The reason why I think it's important is  
9 that, again, you know, I asked the question this  
10 afternoon about why only Seabrook and the answer in  
11 my judgment is that it's not only Seabrook. If the  
12 licensees look hard they may find similar situations  
13 or intermediate situations. So the issue may be  
14 larger than purely Seabrook.

15 MR. HOLIAN: Yes, I agree with that  
16 perspective. It has been discussed all across NRR,  
17 to the technical divisions, Division of Engineering.

18 I do not have the answer on whether it met the  
19 threshold for Part 21. I assume it didn't from the  
20 licensee's perspective or they have the burden to  
21 report under Part 21 for an immediate safety issue.

22 I know that Rich Conte can speak to the  
23 CAL. It's open. So the region has opened up a  
24 confirmatory action letter on this issue and is

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1 following operability issues. They are satisfied  
2 with operability from what they've seen so far.

3 The further question about other plants  
4 reporting, if it doesn't meet a Part 21 or one of  
5 our NUREG reporting criteria the burden will be on  
6 us to find it during inspection or to put out a  
7 bigger, better generic correspondence that requires  
8 them to report.

9 At this point I don't know if we've  
10 pushed the safety significance to that issue.  
11 Clearly Seabrook is the most crucial. I think it is  
12 in one way fortuitous that it was found during the  
13 license renewal review. That's one point. The  
14 licensee has known about it for awhile, even prior  
15 to the license renewal. We would have probably  
16 liked to have seen it highlighted more in the  
17 application. That's part of that 10-month delay as  
18 we've ferreted out what may be an acceptable  
19 program. We still have questions on that.

20 But I will take the reporting piece with  
21 us. It is on our mind at NRR for extent of  
22 condition across the fleet.

23 DR. BONACA: Thank you.

24 MR. CONTE: We also looked at the

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1 reportability on the primary containment condition.

2 It didn't meet the threshold of what's in the tech  
3 spec requirements.

4 There's also another factor here. One  
5 of the ongoing inspection issues is the current  
6 applicability of their design basis code, the  
7 3.18.19.71, that assumes ASR-free concrete. And a  
8 lot of the relationships, especially when you look  
9 at shear stress which are based on the compressive  
10 strength numbers, we have been constantly  
11 challenging the licensee in their operability  
12 determinations.

13 And I think right now the breakthrough  
14 has been when the licensee has done an independent  
15 research on the literature and independently came up  
16 with some of these parameters like shear capacity  
17 and put that in their bounding calculation. So, in  
18 fact if you were to do the calculations today you  
19 would conclude they meet the design basis code.  
20 What's the report? So this is somewhat of a unique  
21 problem. I'm pretty -- Bill Raymond, are you on the  
22 line?

23 MR. HOLIAN: He might be on the line.

24 It's on mute.

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1 MR. CONTE: I'm pretty sure we thought  
2 about the Part 21 criteria and we came to the  
3 conclusion it wasn't applicable at this point. We  
4 can still check.

5 DR. BONACA: Thank you.

6 MR. RAYMOND: Rich Conte, can you hear  
7 me?

8 MR. CONTE: Yes. Bill, do you have  
9 anything more to add on the Part 21 issue?

10 MR. RAYMOND: I agree that the Part 21  
11 criteria appear not to have been met. The NUREG  
12 reporting criteria appear not to have been met. The  
13 calculations that have been done so far showing that  
14 you don't have a condition that would warrant --  
15 rise to that level.

16 MR. HOLIAN: And just for the record  
17 that's Bill Raymond, senior resident instructor at  
18 the site.

19 MR. CUNANAN: Are there any further  
20 questions? The following slides will explain the  
21 staff's position related to ASR. So the staff will  
22 provide an overview of the ASR phenomenon including  
23 the effects on structures, discuss the conditions of  
24 concrete structures at Seabrook, discuss the status

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1 of tests conducted and planned by the applicant to  
2 provide input to the aging management program and  
3 discuss the staff's concerns and initial  
4 observations of the aging management program  
5 submitted on May 16th, 2012. Next slide.

6 As the applicant has stated in its  
7 presentation in order for ASR to occur the concrete  
8 structures must have alkali in the cement, reactive  
9 aggregates and exposures to water. Next slide.

10 This slide in general discusses the  
11 effects of ASR in concrete. So I would like to  
12 introduce Abdul Sheikh who will provide further  
13 details in the ASR issue. Abdul?

14 MR. HOLIAN: Subcommittee Chairman,  
15 point of order again just to interrupt. At this  
16 point the staff usually tries to not repeat some of  
17 the issues so we'll -- I'm just reminding the staff  
18 in the sake of the time to maybe just paint the  
19 picture of where we stand with differences. Is that  
20 appropriate?

21 CHAIR SKILLMAN: Yes, sir.

22 MR. HOLIAN: Okay, thank you.

23 CHAIR SKILLMAN: Thank you, Brian.

24 MR. SHEIKH: My name is Abdul Sheikh and

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1 I'm going to address some of the concerns the staff  
2 has. And this slide we have captured what's the  
3 effect of ASR on concrete. And the applicant has  
4 addressed most of these issues. But I would like to  
5 find out about the degradation of mechanical  
6 properties of concrete. There we have some  
7 difference of opinion with the applicant.

8 The applicant has stated there is no  
9 change in the compressive strength of the concrete  
10 due to ASR but we have searched the literature also  
11 and we have found from among hundreds of appears  
12 there is a difference of opinion on this issue. And  
13 the consensus is that there is some reduction in  
14 compressive strength of concrete due to ASR. It  
15 depends on, you know, the type of structure and the  
16 confinement and whatnot. So it's not a blanket  
17 statement that the concrete compressive strength  
18 does not decrease.

19 Secondly, we agree with the applicant  
20 that there is the reduction in tensile and shear  
21 strength and bond strength and elastic modulus of  
22 the concrete because they have -- the degradation is  
23 more pronounced.

24 And also the major item which we have

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1 been fighting for the last so many months is our  
2 opinion is that the original design was based on  
3 non-ASR concrete. In that non-ASR concrete the  
4 design codes provide an implicit relationship  
5 between the concrete compressive strength and the  
6 shear strength and the bond strength. For instance,  
7 if you have a compressive strength of 100 psi it  
8 tells you shear strength will be so much percentage  
9 of the compressive strength. Because of the  
10 cracking in the concrete the tensile strength  
11 obviously is -- because cracks is reduced  
12 appreciably more than the compressive strength.  
13 Similarly, the elastic modulus, similarly the shear  
14 strength which is a function of tensile strength.

15 I would like to note here that based on  
16 our RAIs for the last 18 months the applicant has  
17 finally changed their approach on this issue. And  
18 applicant has finally concluded that the compressive  
19 strength results alone are not sufficient to manage  
20 the aging of the ASR.

21 Now I'll go to the next slide.

22 CHAIR SKILLMAN: Abdul, let me ask a  
23 question and that question is this. Is there any  
24 notion that the cathodic protection system out of

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1 service for all of those years has had anything at  
2 all to do with ASR?

3 MR. SHEIKH: I'm not a cathodic  
4 protection expert but my immediate reaction based on  
5 what the applicant presented in the presentation  
6 that they have checked the rebars and they found no  
7 corrosion because concrete is very alkaline around  
8 the rebar. So there doesn't appear to be any effect  
9 due to cathodic protection.

10 CHAIR SKILLMAN: Thank you. Would the  
11 licensee like to weigh into that? Let's proceed.  
12 Excuse me, I'm sorry.

13 MR. HOLSTON: My name's Bill Holston.  
14 I'm Division of License Renewal. I am the subject  
15 matter expert on buried piping and cathodic  
16 protection, and I could not conceive of an impact to  
17 the cathodic protection out on the ASR aging  
18 mechanism. So I would not say that it being out of  
19 service caused this problem to be worse.

20 CHAIR SKILLMAN: Thank you. Please  
21 proceed.

22 MR. SHEIKH: Okay. So this picture we  
23 took out of a newspaper and our famous Ted Vassallo  
24 is in the picture. You know, the applicant.

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1 MR. BARTON: Is this out of the Boston  
2 Globe or what?

3 MEMBER SIEBER: Boy, those three guys  
4 all look the same.

5 MR. SHEIKH: So as you can see and the  
6 applicant has explained so I don't need to go  
7 further there is pattern cracking under this tunnel.  
8 And as the applicant explained the reason the ASR  
9 occurred because the previous industry standards  
10 were not able to detect slow expansive aggregate or  
11 reactivity.

12 The new standards, the ASDM standards as  
13 the applicant said can detect the slow expansive  
14 aggregate. That's why we have issued an information  
15 notice to the other licensees to look into this  
16 issue last year.

17 As we understand now there are 19  
18 structures which are affected by ASR based on the  
19 extended condition investigation performed by the  
20 applicant. Most of these structures are located  
21 below grade and they are subjected to about 30 to 40  
22 feet of groundwater. Some of these structures are  
23 exposed to about 80 feet of groundwater.

24 MR. BARTON: What was that? How many

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1 feet?

2 MR. SHEIKH: Eighty feet.

3 MR. BARTON: Eight zero?

4 MR. SHEIKH: Right.

5 MR. BARTON: Okay.

6 MR. SHEIKH: But now we understand today  
7 that there are some structures which are above grade  
8 and they also have ASR.

9 As the applicant stated the  
10 waterproofing membrane which was provided during  
11 construction on these walls is not functioning. And  
12 they don't -- Seabrook does not have a groundwater  
13 dewatering system which would prevent the ingress of  
14 water into the buildings.

15 So, after the applicant found this  
16 problem in the electrical tunnel they went into the  
17 containment building. And let's go to the next  
18 slide, please. And as applicant also showed this  
19 picture in a different way, that there was about 6  
20 feet of water in this annular space which is 4 to 6  
21 inches wide.

22 Applicant has dewatered the area and you  
23 know, they have observed and confirmed that the ASR  
24 is present in the right side of the picture where

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1 I'm looking which is the containment enclosure  
2 building. So there is no difference of opinion as  
3 far as the containment enclosure building is  
4 concerned that there is ASR present.

5 However, we have been going at the area  
6 which is the left side of the picture which is the  
7 48-inch thick containment building. Initially the  
8 applicant stated that ASR is not present in the  
9 containment concrete. Recently in response to an  
10 RAI the applicant informed the staff that they have  
11 observed pattern cracking in the concrete in two  
12 areas of the containment that was exposed to  
13 groundwater.

14 Based on the walkdown information the  
15 applicant determined that the containment concrete  
16 may be indicative of ASR. This is the exact  
17 statement from their letter. However, the applicant  
18 has not performed any further reevaluation or  
19 petrographic examination to confirm whether ASR is  
20 present in the containment or not.

21 In addition, I am not aware of any  
22 evaluation the applicant has performed about the  
23 structural integrity of the containment building if  
24 there is ASR present. The reason for my concern is

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1 that if ASR is present the concrete is going to be  
2 degraded and we need to know over the long term what  
3 is the effect of ASR on containment.

4 MEMBER SHACK: You're not comfortable  
5 with the notion of the 3D reinforcement?

6 MR. SHEIKH: I don't know what the  
7 extent of the problem, especially the applicant  
8 position on different issues have evolved over time.

9 As I explained. You know, initially we were told  
10 there's no cracking. Initially we were told there's  
11 no ASR. In the recent letter they said it could be  
12 indicative of ASR and they found two cracks. So I  
13 don't know the extent of the problem.

14 We either need to confirm there is ASR.

15 If there is ASR they have to go through the  
16 exercise to see what's the impact of it on the  
17 containment.

18 MEMBER ARMIJO: Will you require core  
19 samples and petrographic examination from the  
20 containment to be satisfied that there is or is not  
21 ASR?

22 MR. SHEIKH: Yes, either -- yes, that's  
23 one way of looking at it. Because -- or if like the  
24 applicant has already stated now recently that the

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1 containment concrete may be indicative of ASR. If  
2 that is the case they have to demonstrate and do  
3 further work what is the impact of this ASR on  
4 containment concrete.

5 CHAIR SKILLMAN: Let me ask this  
6 question and it goes back to John Barton's question  
7 some hours ago relative to why wait until 2015 to do  
8 these inspections. What is identified on page 330  
9 of the SER is that the applicant is committing to  
10 five -- no more than five RFOs of inspections, 36  
11 locations, 10 degree centers. The building's 100  
12 feet in diameter. It's approximately every 8 to 10  
13 feet around the circumference of the building.

14 Why isn't there some connection between  
15 this set of inspections and the operability  
16 determinations? To go down that wall around the  
17 entire periphery at various heights, to really smoke  
18 out whether or not there is a phenomenon that's  
19 occurring under everybody's nose but they just  
20 haven't seen it because they haven't looked.

21 MR. SHEIKH: The issue you are talking  
22 about if I understand correctly is about the liner  
23 plate which is -- if you can point to that 48-inch  
24 thick wall.

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1 CHAIR SKILLMAN: I know where the liner  
2 plate -- it's on the left side of the 48-inch wall.  
3 I understand that.

4 MR. SHEIKH: Right, I'm sorry. So the  
5 liner plate is there and our concern was the 6 feet  
6 of water which has been there for awhile. We don't  
7 know exactly how many.

8 MEMBER ARMIJO: I think they said since  
9 construction. Maybe.

10 CHAIR SKILLMAN: A long time. A long  
11 time.

12 MEMBER ARMIJO: That's hard to  
13 understand. Since construction is a long, long time  
14 and nobody looked?

15 MR. SHEIKH: I cannot answer that issue.

16 CHAIR SKILLMAN: So my question is why  
17 isn't there some pressure being applied for a  
18 heightened sense of urgency to do some of these  
19 inspections? It's an operating plant. I understand  
20 they've done a prompt operability determination. I  
21 understand the discussion relative to if you do the  
22 calculations the concrete seems to be good to go  
23 even by today's standards. But there was an  
24 existing condition for a relatively long time that

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1 could have compromised what is really a safety  
2 component of the containment.

3 MR. CONTE: There was, Mr. Skillman,  
4 there was an evaluation of the -- at the time they  
5 called it a craze cracking on the primary  
6 containment. We looked at that evaluation. One  
7 point I think that was made is that this water is  
8 under atmospheric pressure. So you don't have the  
9 hydraulic pressure coming in from that outside wall.

10 If you will, the containment enclosure building on  
11 the right there is perhaps the sacrificial lamb to  
12 this effect. So without the atmospheric pressure  
13 you wouldn't expect a lot of driving head into the  
14 concrete.

15 Now there is those areas, I believe,  
16 maybe the licensee can correct me if I'm wrong, but  
17 I believe they did a chemical analysis on the  
18 deposits and at least preliminarily they were saying  
19 that it wasn't ASR. And so that evaluation, there  
20 really is no operability determination on the  
21 primary containment because it doesn't look like  
22 there's that much of an effect as with the  
23 containment enclosure building and some of these  
24 other structures.

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1 Does the licensee want to offer any new  
2 information on that?

3 MR. NOBLE: This is Rick Noble again.  
4 Yes, just to clarify a couple of things I guess. So  
5 we are kind of mixing a couple of things with liner  
6 plate degradation and ASR.

7 The UTs that we're talking about doing  
8 on the inside are to determine if there's any  
9 thickness lost to the liner plate. It really would  
10 have nothing to do with ASR, those 10 degree checks.

11 And as Ted mentioned we have done informational UTs  
12 that haven't shown any liner loss and we have  
13 removed the water so the driving force for that.

14 As far as there being ASR in the  
15 containment structure itself I don't think there's a  
16 lot of controversy on it. I think what we've seen  
17 is there's pattern cracking there which is  
18 potentially ASR. We don't see the other markers for  
19 ASR. It's very small cracks. You don't see any  
20 effervescence. You don't see the other markers  
21 you'd expect to see with ASR. So if there is ASR  
22 it's at very low levels. However, since it was  
23 wetted at one time and it does show pattern cracking  
24 we are monitoring that as a potential ASR location.

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1       So it's not being ignored, it's actively being  
2       monitored for ASR in that location.

3               MEMBER ARMIJO: But if the enclosure  
4       wall has ASR and this whole region was flooded with  
5       water for a significant length of time and  
6       everything was built with the same kind of concrete  
7       and the same kind of aggregate, I don't understand  
8       what's going on.

9               MR. NOBLE: This location is 30 feet  
10      below grade so on the enclosure side you see the  
11      driving head of all that water that's forcing it  
12      through that enclosure building. So that wall is  
13      saturated and then the water is building up in this  
14      annulus area between that building and the  
15      containment. So now there's only 6 feet of driving  
16      head going into the containment. That's the basic  
17      difference is you've got 30 feet of driving head  
18      saturating one wall and only 6 feet of static head  
19      on the other wall.

20              MR. HOLIAN: This is Brian Holian,  
21      Division of License Renewal. Chairman, I knew  
22      operability would come up. We're prepared to  
23      address it at one level but I did want to take it to  
24      a little bit of a higher level. One, it's the

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1 licensee's burden to call operability. It's the  
2 staff's burden to question that which we are doing.  
3 It's ongoing.

4 There is a confirmatory action letter in  
5 place that discusses operability. I mentioned just  
6 2 weeks ago headquarters staff were there with the  
7 region onsite. They're going back next week I  
8 believe it is. So that is a current issue that's  
9 still open with the region. The region has taken an  
10 initial look at it and has not been able to deem it  
11 non-operable. Your question goes further to should  
12 we be enhancing the testing or getting the data  
13 quicker to enable us to do that and that's an open  
14 issue between the region and headquarters and the  
15 licensee.

16 I'll talk more about it. Just to  
17 mention there was just a charter issue, public  
18 charter issue between Region 1 and headquarters,  
19 kind of a technical interface team that is looking  
20 at the Seabrook issue primarily for the current  
21 operability issues.

22 CHAIR SKILLMAN: Thank you. And I do  
23 recognize that we began Melanie said we're not  
24 really here to discuss current operability. We're

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1 here to discuss license extension. So I understand  
2 that and I thank you but I wanted to pulse the staff  
3 to find what the answer would be. Thank you.

4 MR. SHEIKH: Can we have the next slide,  
5 please? So, as I talked about now I will address  
6 the Seabrook operating experience, where they are,  
7 what tests they've performed and what they plan to  
8 perform to my understanding.

9 Initially they reported that the  
10 compressive strength has reduced by 22 percent and  
11 the modulus of elasticity for the tunnel area was  
12 reduced by 47 percent.

13 I want to bring this into perspective.  
14 When the concrete -- and they compared these data to  
15 the original tests which were performed in 1989.  
16 Since 1989 the concrete has hardened and the normal  
17 increase in compressive strength and the modulus of  
18 elasticity at least all the codes agree is in the  
19 range of 20 to 25 percent. For instance, if the  
20 concrete strength was 4,000 psi measured at 1989 it  
21 would have increased. If there was no ASR the  
22 concrete would have increased to 4,800 psi which is  
23 a well-known fact. There's no denying.

24 So they compared the first sets of

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1 cylinders not to 4,800 but to 4,000 psi and they  
2 found 22 percent reduction. If you compare it with  
3 the additional strength the reduction in strength  
4 would have been a lot more.

5 Number one. We agree that if you take a  
6 core and all the ACI standards state if you take a  
7 core the strength measured from the core is less  
8 than the original cylinders. But that is only about  
9 10 to 15 percent. So, the applicant has stated that  
10 they did another type of test and they are  
11 attributing this change to the type of, you know,  
12 the testing done at two different labs.

13 But then we have to also look at what is  
14 in the literature and the literature is not in  
15 agreement. There -- it seems to be, you know,  
16 disagreement between different researchers whether  
17 the compressive strength reduced or not. So I would  
18 like to point that out. But the elastic modulus was  
19 originally reduced to 47 percent and that's what the  
20 applicant reported.

21 Since then the applicant has not  
22 performed any test to determine the rate of  
23 degradation of shear, tensile strength, bond  
24 strength on the concrete in the last 18 months.

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1 They haven't, as I pointed out before, they haven't  
2 extracted any cores from the containment.

3 And it is a well-known fact that the  
4 visual examination cannot rule out the presence of  
5 ASR. You have to do some confirmatory tests. You  
6 can rule in and say yes, if you see pattern cracking  
7 and if you want to consider it ASR that's fine. But  
8 you cannot rule in -- rule out the presence of ASR  
9 without petrographic examination. I checked with  
10 several researchers and that's what they told me  
11 about it.

12 MEMBER ARMIJO: Do you have pictures of  
13 what a petrographic examination of an aggregate with  
14 ASR and without ASR is? You don't have to show it  
15 now but --

16 MR. SHEIKH: The applicant has those  
17 pictures.

18 MEMBER ARMIJO: I've seen sketches but I  
19 haven't seen actual petrographic.

20 MEMBER SIEBER: You've seen collapsed  
21 bridges.

22 MEMBER ARMIJO: No, I'm talking about  
23 down to microscopic levels.

24 MR. BARTON: Stuff like that you mean?

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1 MEMBER ARMIJO: Yes. Yes, yes, yes,  
2 okay.

3 MR. SHEIKH: We have requested the  
4 applicant and I don't know --

5 MEMBER ARMIJO: There is some --

6 MR. VASSALLO: This is Ted Vassallo from  
7 NextEra. All the petrographic examination reports  
8 have been processed through our internal review  
9 approval system and they are all available at the  
10 site. We've also uploaded them into Certrec and  
11 they include all the data from the laboratory. It's  
12 available for your review.

13 CHAIR SKILLMAN: Thank you.

14 MEMBER ARMIJO: We can get hold of  
15 those?

16 MR. SHEIKH: Yes, we'll make sure.

17 MEMBER ARMIJO: Okay, thank you.

18 CHAIR SKILLMAN: Let's move along,  
19 please.

20 MR. SHEIKH: Yes. So, and the applicant  
21 initially planned to do small-scale tests commonly  
22 used when there's an ASR to detect the mechanical  
23 properties changes and also to determine where they  
24 are in the degradation phase, how much the ASR has

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1 progressed and how much is left. However, they have  
2 engaged the experts now from University of Texas and  
3 they are going to -- in a different approach which  
4 is they're going to do large-scale tests as the  
5 applicant have explained.

6 We do agree with them that this could be  
7 a useful way to do it but we haven't looked at it in  
8 more detail. We need to look more in this issue,  
9 how it will -- whether the results and the  
10 procedures are appropriate or not. The staff is  
11 still reviewing it as part of -- right.

12 The other thing is to find out where the  
13 -- how far the ASR has progressed. And the normal  
14 way to check that as the applicant stated is to do  
15 the accelerated test which they have performed and  
16 they found so far if I understand correctly that  
17 there is still reactivity, but they said that this  
18 is not a very conclusive test and we do agree with  
19 it. But they are doing another -- they committed to  
20 do another test which is a long-range test which is  
21 going to take about a year.

22 Also, in the literature which is the  
23 Federal Highway report which the applicant cited and  
24 it's produced by University of Texas. It states

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1 that you can also check the progress and the status  
2 of ASR degradation by another test which is the  
3 stiffness damage index test on the core samples. I  
4 do have the report here from the University of Texas  
5 and the applicant has stated that they did not --  
6 they do not want to perform that test.

7 So, in conclusion for this slide I will  
8 say that based on the initial knowledge and RAIs  
9 from the staff the applicant approach for managing  
10 the ASR-affected structures has continued to evolve.

11 CHAIR SKILLMAN: Thank you. Let's move  
12 along. Next slide, please?

13 MR. SHEIKH: Now I will talk about the  
14 containment issue and the size of the cracks and  
15 what our concerns are about it. The applicant has  
16 observed now that there is cracks in the containment  
17 in the area where there was water. And the crack  
18 width is 8 mils. And the cracking pattern is  
19 indicative of ASR.

20 So, the applicant contention here is the  
21 cracks are smaller than the industry standards of 15  
22 mils width so they are insignificant and they don't  
23 need to be addressed. Our contention, the staff  
24 contention is that the standard has been written for

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1 cracks, shrinkage cracks which are not active.

2 They're two types of cracks, the cracks  
3 which grow over time and cracks which was there  
4 after the initial core and they don't change in the  
5 crack width. It's a widely known fact that the ASR  
6 phenomena over time. So the cracks due to ASR we --  
7 at least the staff consider to be active.

8 So if the cracks are active then the  
9 applicant has to do more work in this area. They  
10 cannot dismiss and say these cracks are  
11 insignificant because it could affect the long-term  
12 -- it could have a long-term impact on the  
13 containment integrity, especially they are going to  
14 grow.

15 So, in conclusion the staff is concerned  
16 that the applicant has not evaluated the effects of  
17 ASR on containment concrete for long-term  
18 degradation of mechanical properties.

19 CHAIR SKILLMAN: Thank you.

20 MR. SHEIKH: Now, I will address the  
21 aging management program which the applicant  
22 submitted on May 16th. As Arthur pointed out we  
23 have not addressed this issue in the Safety  
24 Evaluation Report. But I would like to bring to

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1 your attention the staff on March 30 committed that  
2 they will perform accelerated expansion testing,  
3 perform a full-scale replica of the test which  
4 Professor Bayrak explained. And then they will  
5 determine the crack limits and index based on this  
6 test data. And use these results to develop  
7 acceptance criteria.

8 Those tests are not going to be  
9 completed until 2014 so the acceptance criteria  
10 cannot be developed until 2014. However, on May  
11 16th the applicant submitted a program and our  
12 initial observations are the program acceptance  
13 criteria is not based on full-scale or expansion  
14 test results. It's arbitrary.

15 In addition, the acceptance criteria is  
16 less stringent than the industry stance. The  
17 applicant showed that in, you know, provided you in  
18 their presentation a chart with tier 1, tier 2 and  
19 tier 3.

20 We also looked at the same publication,  
21 the Federal Highway Administration Institute of  
22 Structural Engineers. We have supplemented it with  
23 the French code. And our interpretation is what the  
24 applicant has presented is a very liberal

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1 interpretation from those documents.

2 For instance, the applicant says and  
3 their presentation stated that if you have a crack  
4 of 1 millimeter or 40 mil you just need to monitor  
5 it. You don't need to do any evaluation. But the  
6 ACI standard which is the original GALL document,  
7 ACI-349 tells that if you have exceeded 15 mil you  
8 have to make a structural evaluation in tier 2.

9 In addition, the Federal Highway  
10 Administration report which is produced by  
11 University of Austin, and I repeat here the  
12 following cracking criteria which are obtained from  
13 the crack mapping survey performed as a part of  
14 cracking index matter are proposed to identify an  
15 extent of cracking that should justify more detailed  
16 investigation. And the limit there is crack index  
17 of 0.5 millimeter and crack width of 0.15 millimeter  
18 as compared to what the applicant has interpreted  
19 from this code of 1 millimeter which is double and  
20 the crack width of 1 millimeter instead of 0.1. So  
21 we have some difference of opinion on the  
22 interpretation of the same documents.

23 In addition, the aging management  
24 program states categorically that the ASR will be

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1 detected by visual examination. As we have  
2 discussed -- I've discussed before you cannot rule  
3 out ASR just based on visual examination.

4 In addition, the applicant has stated in  
5 their presentation today on slide 27 that the  
6 accelerated expansion tests are not realistic since  
7 the results indicate reactive silica remains in the  
8 ASR-affected aggregate.

9 So at least there are -- we need to have  
10 more test data on the long-term tests, either the  
11 1293 tests which the applicant is performing or the  
12 SDI tests or some other test to at least establish  
13 how far the ASR has progressed. We cannot have --  
14 develop an aging management program based on an  
15 arbitrary criteria. We need to know what is the  
16 real structure is.

17 However, these are our staff's initial  
18 observations and what we wanted to point out was,  
19 one, the evolving nature of the applicant approach.

20 On March 30 they told us something. On May 16th  
21 they came out with a different approach. However,  
22 we are still reviewing the aging management program  
23 and we will be in touch with the applicant.

24 CHAIR SKILLMAN: Abdul, I commend you

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1 for your patience and thoroughness but we must move  
2 along.

3 MR. SHEIKH: Okay, so that's all. I  
4 have the last slide. This slide provides the staff  
5 current view regarding the ASR issue.

6 CHAIR SKILLMAN: Is there anything here  
7 we haven't heard before?

8 MR. SHEIKH: I think it's just a summary  
9 of what we have. So if you'd like I can skip it.

10 CHAIR SKILLMAN: Please do. Let's go  
11 on.

12 MR. SHEIKH: So finally the applicant  
13 has not yet demonstrated that it could adequately  
14 manage the aging of the Seabrook concrete structures  
15 due to ASR for the period of extended operation.  
16 This is our conclusion for the ASR issue.

17 CHAIR SKILLMAN: Thank you.

18 MR. CUNANAN: Thanks, Abdul.

19 CHAIR SKILLMAN: Arthur, go ahead.

20 MR. CUNANAN: In conclusion the staff  
21 does not agree with the applicant's conclusion.  
22 Until the applicant can resolve all the open items  
23 the staff cannot make a conclusion that the  
24 requirements of 10 C.F.R. 54.29(a) has been met for

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1 the license renewal of Seabrook Station. The staff  
2 also recommends a second ACRS meeting to discuss the  
3 ASR issue further. Subcommittee meeting. This  
4 concludes my presentation.

5 CHAIR SKILLMAN: I thank you very much.

6 On the bridge line, are there any individuals on  
7 the bridge line that wish to have a comment? If so,  
8 please identify yourself.

9 (No response.)

10 CHAIR SKILLMAN: Hearing none, from the  
11 audience are there any members that would like to  
12 make a comment, please?

13 (No response.)

14 CHAIR SKILLMAN: Seeing and hearing none  
15 my colleagues. Dr. Bonaca, might you have any  
16 comment?

17 DR. BONACA: Nothing more than what I  
18 already raised before, the concern that the plant  
19 has over 20 years to go before starting license  
20 renewal. And yet this is a significant issue. And  
21 again, I think that this -- the staff is  
22 appropriately raising this issue with the industry  
23 and checking to see if this is affecting somebody  
24 else. And I agree with the conclusion that we don't

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1 have enough information to support a license  
2 renewal.

3 CHAIR SKILLMAN: Yes, sir. Thank you.  
4 Dr. Shack?

5 MEMBER SHACK: No, this is clearly a  
6 work in progress.

7 CHAIR SKILLMAN: Okay, thank you. Dr.  
8 Powers?

9 MEMBER POWERS: My tendency is to say  
10 the staff's conclusion is gently put here. My -- I  
11 come down to thinking that it's easy to overreact to  
12 this ASR and that what we really need to understand  
13 is that the containment is going to be a functional  
14 entity over the next 40 years.

15 And so my question is can we with the  
16 computer codes that we use for analyzing containment  
17 structures in fact take an appropriate account of  
18 ASR degradation as it is now and as it will be over  
19 the course of 40 years or not. And perhaps we need  
20 experiments such as those at -- planned at the  
21 University of Texas in order to make that judgment.

22 But I mean, that is the question that we're really  
23 struggling with.

24 The other issue that comes to mind is

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1 are we getting degradation of -- or have the  
2 potential of getting degradation of the reinforcing  
3 steel as this ASR progresses. Is there a way that  
4 we can assure ourselves that we're not degrading  
5 that reinforcing steel?

6 Now, the comments that the ASR can  
7 generally be detected by petrographic. While visual  
8 examinations can't rule out the existence of ASR,  
9 visual examinations can very much demonstrate that  
10 you do have ASR. But I think just the existence of  
11 ASR is not really the issue that we're worried  
12 about, it's the containment structural response that  
13 really is the issue we need to get addressed. And I  
14 just don't know whether we have the computational  
15 capability to reliably predict how ASR degrades that  
16 concrete. I simply don't know.

17 CHAIR SKILLMAN: Thank you. Dr. Ryan?

18 MEMBER RYAN: I don't have anything else  
19 specific to add but I do agree with what Mario and  
20 Bill said, what Dana said.

21 CHAIR SKILLMAN: Okay. Thank you, Mike.  
22 Dr. Armijo?

23 MEMBER ARMIJO: Yes, I agree that we  
24 need additional subcommittee meetings specifically

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1 on the ASR and the data that the staff already has  
2 and the applicant has as well as the test program  
3 that's been laid out by the applicant, the most  
4 recent test program to see if it's really  
5 satisfactory. And you know, that's all I have to  
6 add. It's just not ready.

7 CHAIR SKILLMAN: Thank you. John  
8 Barton, please.

9 MR. BARTON: My conclusion is that this  
10 is a work in progress. In fact, my conclusion in my  
11 report says that we need to continue to dialogue  
12 here because there's still a lot of unanswered  
13 questions. And the program that the applicant has  
14 undertaken is just basically still investigative.  
15 It's early. It's too early to make a decision on  
16 the future of this plant.

17 That having been said I have a question  
18 on the spent fuel pool leakage which we didn't talk  
19 about. And I'd like the applicant to address spent  
20 fuel pool and leakage and what they intend to do  
21 about it other than keep installing some non-  
22 metallic liner that has some kind of short half-  
23 life.

24 CHAIR SKILLMAN: Okay. Do you wish to

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1 have that answered right now?

2 MR. BARTON: Yes.

3 CHAIR SKILLMAN: Someone from NextEra,  
4 can you please respond to that? To spent fuel pool  
5 leakage.

6 MR. ROBINSON: Yes, Dave Robinson,  
7 chemistry manager at Seabrook.

8 The spent fuel pool leakage, we  
9 identified it in 1999. We stopped it in 2004 with  
10 the application of a non-metallic liner. The liner  
11 was inspected periodically. We determined that we  
12 needed to replace it in 2010. The leakage has  
13 stopped after the application of each non-metallic  
14 liner. And we plan to continue to inspect the non-  
15 metallic liner and we sample the leakoff zones  
16 looking for the presence of spent fuel pool water.

17 MR. BARTON: So your long-term plan is  
18 to keep replacing non-metallic liners periodically.

19 MR. ROBINSON: Yes, sir.

20 MR. BARTON: Because you can't find the  
21 real leak?

22 MR. ROBINSON: That's correct.

23 MR. BARTON: You also have had concrete  
24 that's been wetted for years because of this

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1 leakage. Do you intend to do anything about  
2 inspecting that concrete? Not for ASR, but for  
3 other reasons.

4 MR. ROBINSON: Yes. We participated in  
5 a study on the evaluation of boric acid on concrete.  
6 Found no significant degradation in that concrete.  
7 And we plan on doing a core bore sample I believe  
8 in 2015.

9 MR. BARTON: 2015 seems to be the magic  
10 number with you guys. Okay.

11 MR. ROBINSON: So we'll validate the  
12 condition at that time.

13 MR. BARTON: Okay.

14 CHAIR SKILLMAN: Thank you. John,  
15 anything else?

16 MR. BARTON: No.

17 CHAIR SKILLMAN: Jack Sieber?

18 MEMBER SIEBER: I agree with everyone  
19 else. It appears that it's still a work in  
20 progress. I tend to conclude that I would favor a  
21 solution more along with essentially the rigor that  
22 the staff proposes on ASR. To find a way --  
23 progress in that area.

24 CHAIR SKILLMAN: Thank you, Jack. My

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1 own personal comment is the containment is just one  
2 of the structures. Any of the structures that is  
3 affected by ASR must be proved to be good for its  
4 extended life period. So I'm not so much fixed just  
5 on containment. Should this committee agree with a  
6 decision to go forward with life extension my view  
7 is that all of the SSCs must be shown to be good for  
8 the period of extended operation.

9 And with that I would like to call on  
10 Brian Holian for any comments that he may wish to  
11 make at this point.

12 MR. HOLIAN: Thank you, Mr. Chairman,  
13 and thank you committee. I just had a couple of  
14 comments and I'll be brief in the matter of time.

15 I thank the ACRS for knowing that this  
16 meeting wouldn't have all the answers from the  
17 staff. And I did want to comment on tone, just tone  
18 from the staff and tone not necessarily from the  
19 licensee but from us. It's awful hard sometimes  
20 when you see the emotion of a technical issue in the  
21 middle of that issue. And so there is some of that  
22 present here today.

23 The licensee has come to a public  
24 meeting in April time frame at the Headquarters One

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1 building and where we aired out some of this  
2 information. So we are trying to publicize it in  
3 those ways also to the industry. I highlighted the  
4 work by the staff and I just echo that again.

5 And my final comment is just to  
6 highlight the work of the DLR staff. And that's  
7 just on behalf of the committee I wanted to mention  
8 I'm moving onto another part of the Agency over in  
9 FSME dealing with materials issues. So after 4  
10 years I just wanted to thank the committee in  
11 general for the thorough reviews of license renewal.

12 The staff learns from them, applicants clearly  
13 learn from them also but we appreciate the  
14 independent view that ACRS has.

15 I have enjoyed these meetings over the  
16 last 4 years and will miss them. And I just wanted  
17 to end with that thought. Thank you.

18 CHAIR SKILLMAN: Thank you.

19 MEMBER POWERS: Finally burned you out?

20 (Laughter.)

21 MR. HOLIAN: Send me the materials.

22 CHAIR SKILLMAN: I would like to thank  
23 all of those who traveled to support this meeting  
24 today. I wish you safe travels on your return. I

NEAL R. GROSS

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1     thank each of you for the even tone even though  
2     there is a difference of opinion. I believe those  
3     differences were expressed professionally, kindly,  
4     with a solid let's keep nuclear safe attitude and I  
5     appreciate that.

6                   Are there any other comments before we  
7     end? Meeting is ended. Thank you.

8                   (Whereupon, the above-entitled matter  
9     went off the record at 5:27 p.m.)

**NEAL R. GROSS**

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# **Seabrook Station ACRS License Renewal Subcommittee**

**July 10, 2012**

# Personnel in Attendance

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Kevin Walsh

Jim Connolly

Mike Collins

Mike Ossing

Mike O'Keefe

Rick Noble

Rick Cliche

Site Vice President

Engineering Director

Design Engineering Manager

Program Engineering Manager

Licensing Manager

Special Projects Manager

License Renewal Project Manager

# Agenda

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- **Background**
  - Plant
  - Status
  - Licensing
- **License Renewal Project Overview**
  - Scoping
  - Time Limited Aging Analysis
  - Application of GALL
  - Commitment Process
- **SER Open Items**

# Background –

---

- Located in the Town of Seabrook, New Hampshire, two miles west of the Atlantic Ocean. Approximately two miles north of the Massachusetts state line and 15 miles south of the Maine state line.
- Seabrook Station is a single unit Westinghouse 4-loop pressurized water reactor with a General Electric turbine generator.
- Reactor housed in a steel lined reinforced concrete containment structure which is enclosed by a reinforced concrete containment enclosure structure.
- 3648 MWt Thermal Power; ~ 1,245 net megawatts electric
- The Atlantic Ocean is the normal ultimate heat sink.
- Approximately 1100 people on site, including contractors.



# Plant Site





# Licensing

---

Construction Permit (CPPR-135)	July 1976
Zero Power Operating License (NPF-56)	October 1986
Low Power Operating License (NPF-67)	May 1989
Full Power Operating License (NPF-86)	March 15, 1990
Commercial Operation	August 1990
Operating License Transfer to FPL Energy (NextEra)	November 2002
Stretch Power Uprate (3587 MW)	February 2005
Measurement Uncertainty Uprate (3648MW)	May 2006
LR Application Submitted	May 25, 2010
Operating License Expires	March 15, 2030

# Plant Status

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- Cycle 15 – Refuel outage 14 completed in May 2011
- Current Plant Status
- Next Refuel Outage – September 2012

# License Renewal Project Overview

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- Site Ownership and Oversight
- Experienced Team (Site, Corporate, Contract)
- Benchmarking
- QA Audits
- Participation/Hosted industry working groups
- Industry Peer Review



# Project Overview – Scoping

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- Utilized site component database, controlled drawings, design and licensing documents
- SSCs Evaluated to Scoping Criteria 10CFR54.4 (a)(1), (a)(2) and (a)(3)
- Identified SSCs that perform or support an intended function
- Non-Safety Affecting Safety (a)(2)
  - Reviewed safety related equipment locations
  - Conservative “spaces” approach
  - Performed walk-downs for verification
- Use of commodity groups when evaluations were best performed by component type rather than SSC

# Project Overview – TLAA

---

- **Design and Licensing Basis reviewed for potential TLAA's**

Keyword Search (UFSAR, NUREG-0896, Calcs, Specs)

Review of previous LRA applications

- **Neutron Fluence**

Determined fluence for operation to 60 years

Materials in the extended beltline identified and evaluated

Upper Shelf Energy values exceed the minimum acceptance limit of 50 ft-lbs

PTS limits are below the maximum allowable screening criteria

- **Metal Fatigue**

Cumulative Usage Factor evaluated for 60 years

Environmentally Assisted Fatigue evaluated for NUREG/CR-6260 locations and we've committed to determine if these locations are limiting

# Project Overview – GALL Application

---

- **43 Aging Management Programs**

- 29 Existing Programs
- 14 New Programs

- **GALL Consistency**

- 16 Consistent
- 11 Consistent with Enhancements
- 6 Consistent with Exceptions
- 4 Consistent with Exceptions and Enhancements
- 6 Plant Specific

–Buried Piping and Tank Inspection

–Nickel Alloy Nozzles and Penetrations

–PWR Vessel Internals

–Boral Surveillance Program

–SF6 Bus

–Alkali-Silica Reaction (ASR) Monitoring

# Project Overview – Commitment Process

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- 68 Regulatory Commitments for License Renewal
- Commitments entered into site commitment tracking system
- Implementation activities underway to ensure completion well in advance of PEO

# SER Open Items

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1. OI 3.0.3.2.2-1— Steam Generator Tube Integrity
2. OI 4.2.4-1— Pressure-Temperature Limit
3. OI 3.2.2.1-1— Treated Borated Water
4. OI 3.0.3.1.7-1— Bolting Integrity Program
5. OI B.1.4-2— Operating Experience
6. OI 3.0.3.1.9-1— ASME Section XI, IWE Program
7. OI 3.0.3.2.18-1— Structures Monitoring Program

# Open Item – Steam Generator Tube Integrity Program

---

## OI 3.0.3.2.2-1

- Cracking due to primary water stress corrosion cracking (PWSCC) on the primary coolant side of steam generator tube-to-tubesheet welds. *Clarify commitment.*
- Industry Experience (foreign) indicates potential degradation of steam generator divider plates. *Commitment to inspect, but not included in UFSAR supplement.*

## Resolution

- LRA program has been enhanced to clarify the tube-to-tubesheet weld inspection commitment.
- LRA commitment to inspect steam generator divider plates has been added to the UFSAR supplement.

# Open Item – Pressure-Temperature Limit

---

## OI 4.2.4-1

- Consistency of methods used to develop the P-T limits with 10CFR50 Appendix G

## **Resolution**

- RAI expected under a separate licensing action. License Amendment Request (LAR) 11-06 requested approval to extend the current curves from 20 to 23.7 EFPY.
- Consistency with 10CFR50 Appendix G will be addressed via response to LAR 11-06 RAI.

# Open Item – Treated Borated Water

---

## OI 3.2.2.1-1

- LR-ISG-2011-01 recently issued with guidance for managing the aging effects of stainless steel structures and components exposed to treated borated water.

## **Resolution**

- LRA updated to add affected components to the One Time Inspection Program population.



# Open Item – Bolting Integrity Program

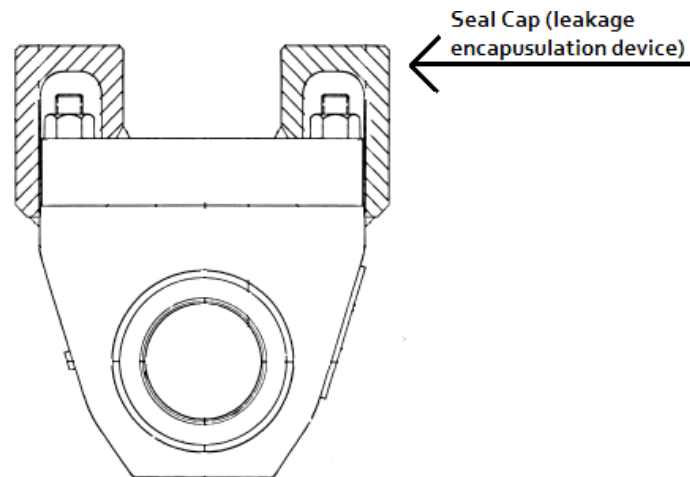
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## OI 3.0.3.1.7-1

- Once a seal cap enclosure is installed, the bolting and component external surfaces within the enclosure are no longer visible for direct inspection.

## Resolution

- NextEra will remove the seal cap enclosure.



# Open Item – Operating Experience

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## OI B.1.4-2

- Describe the programmatic details used to continually identify, evaluate and use Operating Experience.

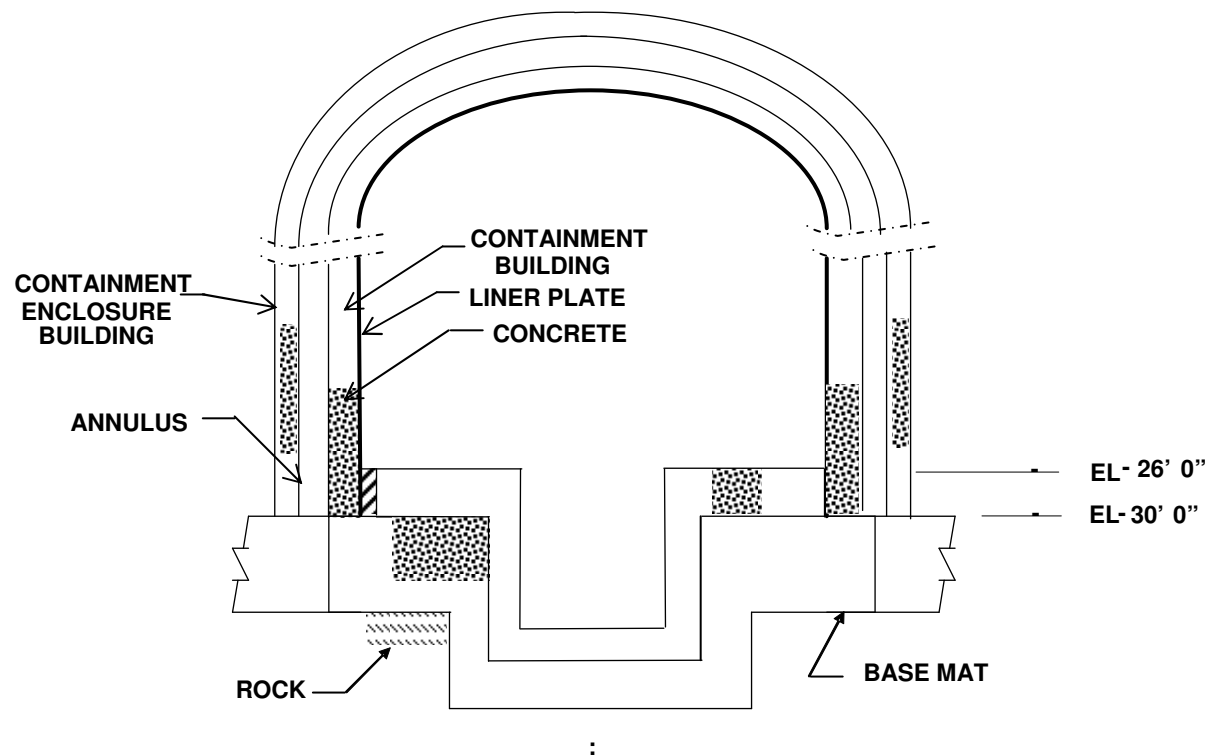
## **Resolution**

- LRA has been updated to document programmatic aspects of evaluating aging related OE and is being reviewed by the NRC Staff.

# Open Item – ASME Code Section XI, Subsection IWE Program

## OI 3.0.3.1.9-1

- Accumulation of water in the Containment Enclosure Building annular space can potentially degrade the containment liner plate.



# Open Item – ASME Code Section XI, Subsection IWE Program

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## Resolution

- LRA updated to:
  - Perform confirmatory UT testing of the containment liner plate in the vicinity of the moisture barrier
  - Implement measures to maintain the exterior surface of the Containment Structure, from elevation -30 feet to +20 feet, in a dewatered state.

# Open Item – Structures Monitoring Program

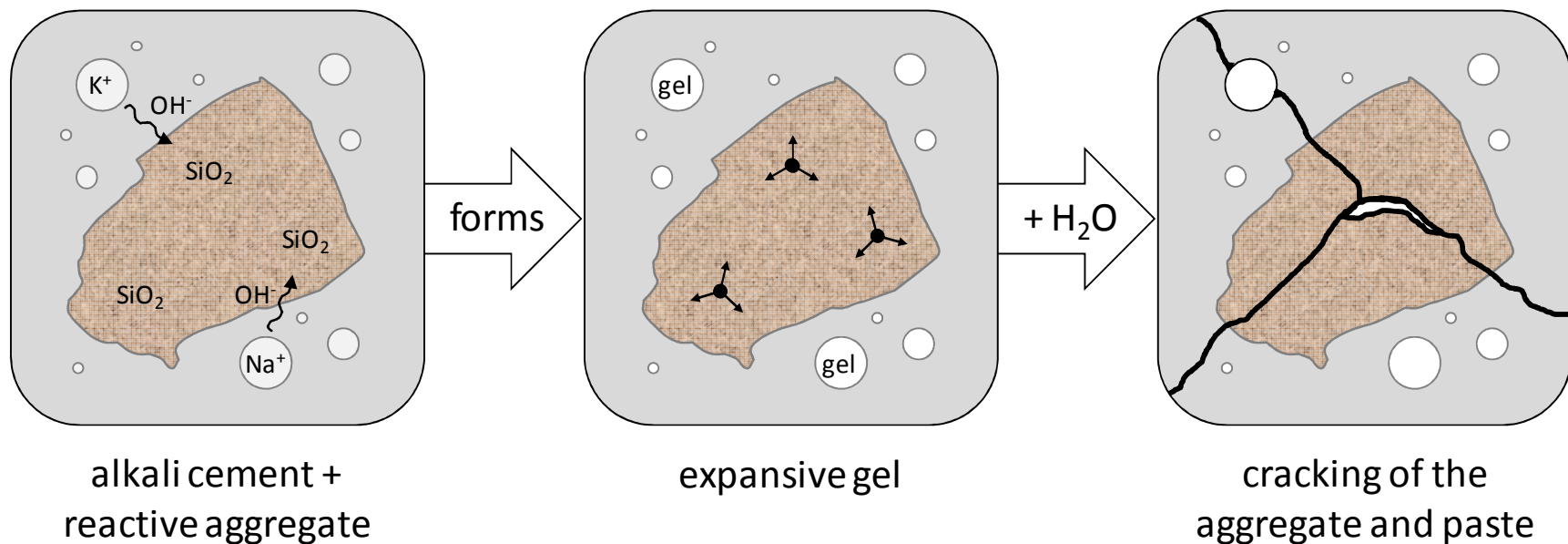
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## OI 3.0.3.2.18-1

- Aging management of concrete structures affected by Alkali-Silica Reaction (ASR).
- **Resolution**
  - LRA updated to augment existing Structures Monitoring Program by addition of a plant specific Alkali-Silica Reaction (ASR) Monitoring Program.
  - The program is in effect and the extent of crack expansion is being monitored.

# ASR - Background

- ASR identified in 1930s mostly in transportation industry and dams.
- Assessments were made of 131 areas of the Plant.



# ASR - *Diagnosis*

---

- Discovery made by petrographic examinations when concrete core samples were removed from below grade structures.
- First core samples were removed in April and May 2010.
- Testing revealed a reduction in modulus of elasticity.
- Additional concrete core samples were removed from the same and five other structures to determine extent of condition.

## Insights

1. Areas affected were highly localized. Core samples taken from adjacent locations did not show signs of ASR.
2. When the length of the cores were evaluated (i.e., depth into the wall) it was observed that the cracking was most severe at the exposed surface and reduced towards the center of the wall.

# ASR - *Structural Impact*

---

- Confinement acts to restrain expansion of concrete similar to prestressing, thus improving performance of structural element.
- Removed cores are tested in an unrestrained condition
- No direct correlation between mechanical properties of concrete cores and in situ properties of concrete.
- Testing full scale structural elements provides more accurate concrete performance parameters.



# RESTRAINED EXPANSION



# UNRESTRAINED EXPANSION





# ASR - *Prognosis*

---

What levels of ASR expansion are expected in the future ?

- Accelerated Expansion Testing
  - Indicates reactive silica remains
  - Tested rate not applicable to Seabrook structures
    - Lack of confinement
    - Severe exposure conditions
    - Unrealistic specimen preparation (aggregate ground to sand)
- Monitoring the progression of ASR can be effectively accomplished by detailed visual inspections and trending of the observable surface of the structures.
- Crack mapping and expansion monitoring provides the best correlation to the progression of ASR in the structure.

# ASR – *Mitigation Strategies*

---

- ASR can be effectively mitigated in fresh concrete by additions during batching.
- ASR mitigation techniques for existing structures have been shown to be ineffective.
- Stopping groundwater intrusion will not necessarily stop the progression of ASR.

# ASR - *Monitoring Program*

---

- The Structures Monitoring Program, has been augmented by a plant specific Alkali-Silica Reaction (ASR) Monitoring Program.
  - NUREG-1800 Appendix A.1, ten element review
  - Guidelines in ACI 349.3R, “Structural Condition Assessment of Buildings”.
- Action Levels developed based on available ASR guidance.
  - “Report on the Diagnosis, Prognosis, and Mitigation of Alkali-Silica Reaction in Transportation Structures,” U.S. Dept. of Transportation, Federal Highway Administration, January 2010, Report Number FHWA-HIF-09-004.
  - “Structural Effects of Alkali-Silica Reaction: Technical Guidance on the Appraisal of Existing Structures,” Institution of Structural Engineers, July 1992.
  - ORNL/NRC/LTR-95/14, “In-Service Inspection Guidelines for Concrete Structures in Nuclear Power Plants,” December 1995.

# ASR - *Monitoring Program*

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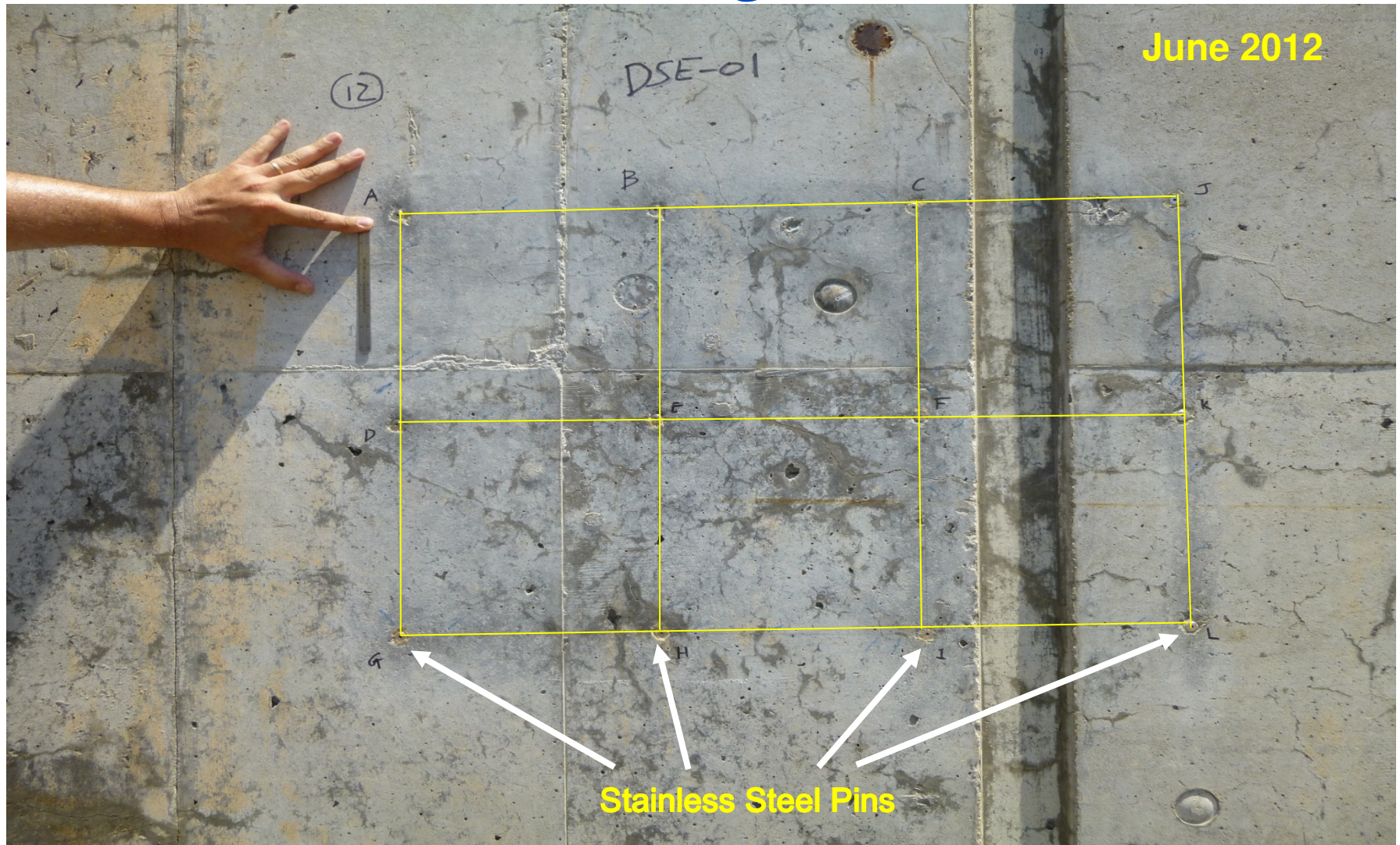
- ASR detected by inspection of concrete structures by visual observation of cracking on the surface of the concrete. Baseline data collected.
- Two parameters are used to monitor the extent and rate of ASR associated cracks. One is Cracking Index (CI) and the other is Individual Crack Width. Baseline data has been gathered.
- Evaluation of a structure's condition completed according to the guidelines set forth in the Structures Monitoring Program.

## **ASR - Monitoring Program**

<b>Structural Monitoring Program</b>	<b>Recommendation for Individual Concrete Components</b>	<b>Combined Cracking Index CCI</b>	<b>Individual Crack Width</b>
Tier 3	Structural Evaluation	1.0 mm/m or greater	1.0 mm or greater
Tier 2	Quantitative Monitoring and Trending	0.5 mm/m or greater	0.2 mm or greater
	Qualitative Monitoring	Any area with indications of pattern cracking or water ingress	
Tier 1	Routine inspection as prescribed by Structures Monitoring Program	Area has no indications of pattern cracking or water ingress – No visual presence of ASR	



# ASR - Monitoring at Seabrook



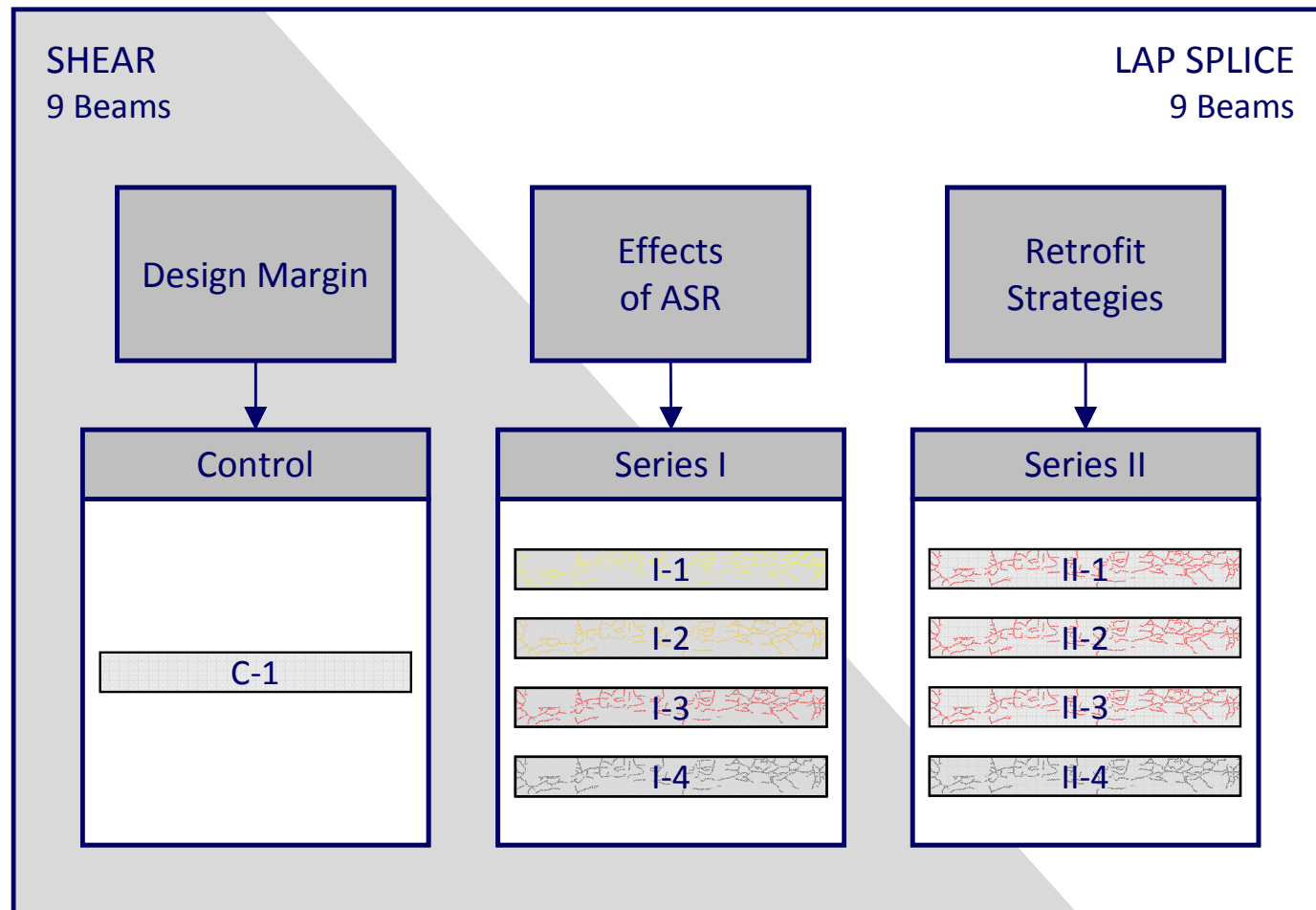


# U-Texas- *Plant Specific Testing*

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- Perform additional anchor testing using concrete blocks with design characteristics similar to Seabrook Station.
- Large scale destructive testing of reinforced concrete beams with accelerated ASR will be conducted to determine the actual structural impact of ASR.
  - Determine the actual structural impact of ASR
  - Actions levels will be established based on correlation between the test results and observed expansion levels/crack indices.  
*Update ASR Monitoring Program with plant specific action levels.*

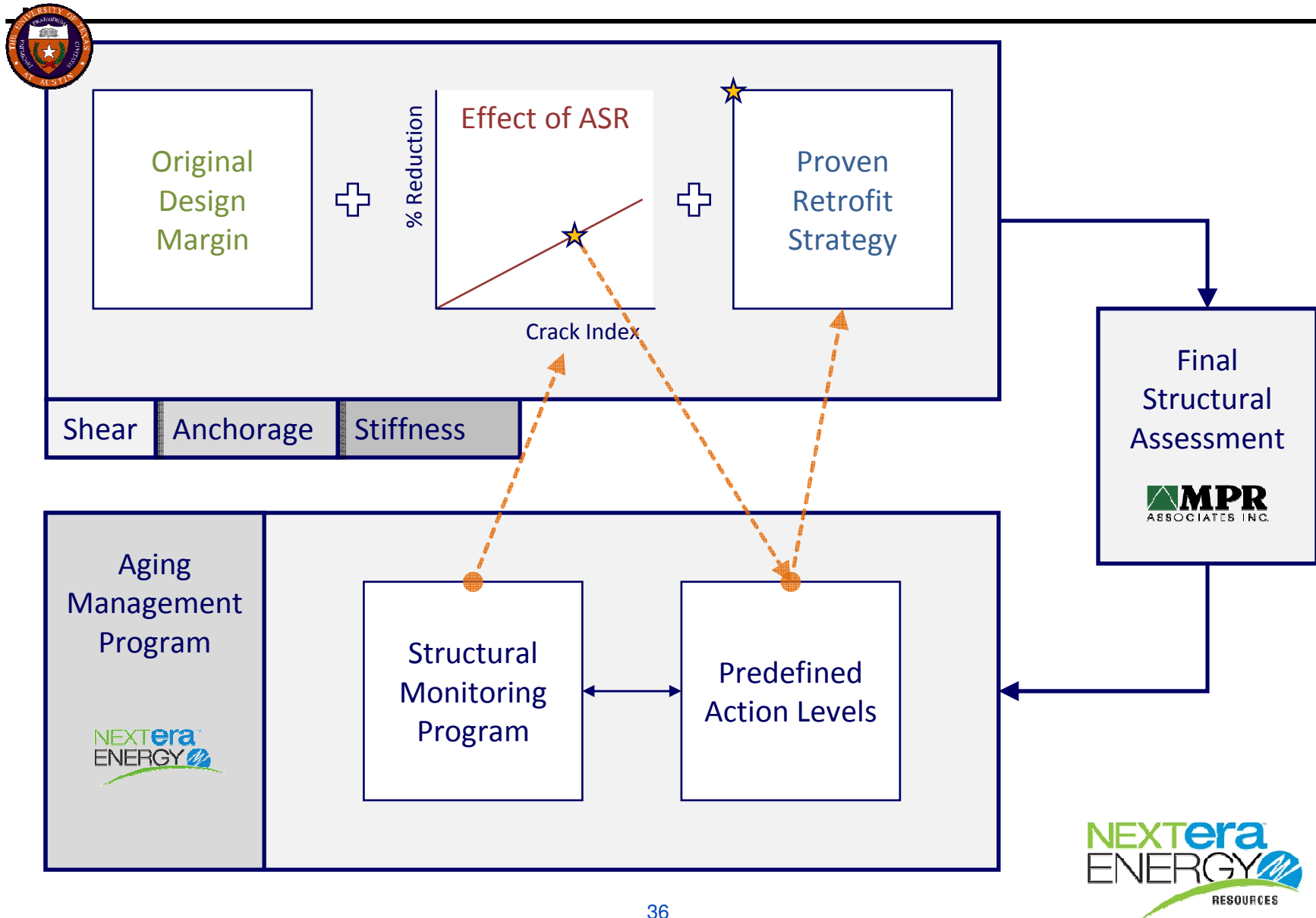
# TEST PROGRAMS



# STRUCTURAL TESTING



# APPLICATION OF RESULTS



# ASR- *Conclusions*

---

- The aging effects of ASR on Seabrook Station concrete structures is understood and manageable.
- Monitoring the progression of ASR can be effectively accomplished by detailed visual inspections and trending of the observable surface of the structures.
- Crack measurement provides the best correlation to the progression of ASR in the structure.
- The Alkali-Silica Reaction (ASR) Monitoring Program provides reasonable assurance that structures will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

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# *Questions?*



**Advisory Committee on Reactor Safeguards (ACRS)  
License Renewal Subcommittee  
Seabrook Station, Unit 1 (Seabrook)**

**Safety Evaluation Report (SER)  
with Open Items**

July 10, 2012

Arthur Cunanan, Project Manager  
Office of Nuclear Reactor Regulation

# Presentation Outline

- Overview of Seabrook license renewal review
- SER Section 2, Scoping and Screening review
- Region I License Renewal Inspection review
- SER Section 3, Aging Management Programs and Aging Management Review Results
- SER Section 4, Time-Limited Aging Analyses (TLAAs)



# Overview

- License Renewal Application (LRA) submitted May 25, 2010
  - Applicant: NextEra Energy Seabrook, LLC (NextEra)
  - Facility Operating License No. NPF-86 requested renewal for a period of 20 years beyond the current license date of May 15, 2030
- Approximately 15 miles south of Portsmouth, NH
- Westinghouse 4-Loop PWR

# Audits and Inspections

- Scoping and Screening Methodology Audit
  - September 20-23, 2010
- Aging Management Program (AMP) Audits
  - October 12-15, 2010
  - October 18-22, 2010
- Region I Inspection (Scoping and Screening & AMPs)
  - March 7, 2010 – April 8, 2011

# Overview (SER)

- Safety Evaluation Report (SER) with Open Items issued June 8, 2012
- SER contains 7 Open Items (OI):
  - Bolting Integrity Program
  - ASME Code Section XI, Subsection IWE Program
  - Steam Generator Tube Integrity Program
  - Operating Experience
  - Treated Borated Water
  - Pressure-Temperature Limit
  - Structures Monitoring Program

# SER Section 2 Summary

## Structures and Components Subject to Aging Management Review

- Section 2.1, Scoping and Screening Methodology
  - Methodology is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21
- Section 2.2, Plant-Level Scoping Results
  - Systems and structures within the scope of license renewal are appropriately identified in accordance with 10 CFR 54.4
- Sections 2.3, 2.4, 2.5 Scoping and Screening Results
  - SSCs within the scope of license renewal are appropriately identified in accordance with 10 CFR 54.4(a), and those subject to an AMR in accordance with 10 CFR 54.21(a)(1)



# **License Renewal Inspections**

**Michael Modes**

Region I Inspection Team Leader

## Overview

- Four inspectors for 3 weeks
- 10 CFR 50.4 (a)(2) inspection, non-safety affecting safety portion
- Selected Aging Management Programs for a more thorough onsite review

## AMP Inspection Results

- Buried Piping and Tanks Inspection
- Lubricating Oil Analysis
- Fire Water System

## Additional Inspection Issue

- ASME Section XI, Subsection IWL
- Structures Monitoring Program



## Walk-downs

- Residual Heat Removal
- Turbine Building
- Primary Auxiliary Building
- East Main Steam & Feedwater Pipe Chase
- West Main Steam & Feedwater Pipe Chase
- Control Building
- Service Water Pumphouse
- Emergency Feedwater Pumphouse and Pre-Action Valve Building
- Steam Generator Blowdown Building
- Emergency Diesel Generator Room B
- RCA Tunnel
- Tank Farm Area
- System Containment Exterior

## Observation and Findings

- Applicant's review of the effects of alkali-silica reaction on structures was incomplete at the time of the inspection
- Water intrusion was noted during RHR walk-down
  - Deposits
  - Brown Stains (Membrane Failure)

## Inspection Conclusions

- Scoping of non-safety SSCs and application of the AMPs to those SSCs were acceptable
- Except for the ASR issue, inspection results support a conclusion of reasonable assurance exists that aging effects will be managed and intended functions maintained
- Documentation supporting the application was auditable and retrievable

## **Section 3: Aging Management Review**

- Section 3.0 – Aging Management Programs
- Section 3.1 – Reactor Vessel & Internals
- Section 3.2 – Engineered Safety Features
- Section 3.3 – Auxiliary Systems
- Section 3.4 – Steam and Power Conversion System
- Section 3.5 – Containments, Structures and Component Supports
- Section 3.6 – Electrical and Instrumentation and Controls System

## SER Section 3

### 3.0.3 – Aging Management Programs

42 Aging Management Programs (AMPs) presented by applicant and evaluated in the SER

	Consistent with GALL	Consistent with exception	Consistent with enhancement	With exception & enhancement	Plant Specific
Existing (29)	10	3	10	4	2
New (13)	6	3	1		3

# **SER Section 3 Open Items**

## **SER Section 3.0.3.1.7 – Bolting Integrity Program**

### **OI 3.0.3.1.7-1**

- Seal cap enclosures can contain water leakage that should be managed for aging
- LRA does not contain AMR items that address bolting and external surfaces in seal cap enclosure environments, which may be submerged due to ongoing leakage within the enclosure

# **SER Section 3 Open Items**

## **SER Section 3.0.3.1.9 — ASME Code Section XI, Subsection IWE Program**

### **OI 3.0.3.1.9-1**

- The applicant has not implemented procedures and inspection requirements to keep this area dewatered in the future

# **SER Section 3 Open Items**

## **SER Section 3.0.3.2 — Steam Generator Tube Integrity Program**

### **OI 3.0.3.2.2-1**

- Cracking due to primary water stress corrosion cracking (PWSCC) on the primary coolant side of steam generator tube-to-tubesheet welds
- One-time inspection of the steam generator divider plate assembly



# **SER Section 3 Open Items**

## **SER Section 3.0.5 — Operating Experience**

### **OI B.1.4-2**

- Details of future operating experience to ensure AMPs will remain effective for managing the aging effects are not fully described

# **SER Section 3 Open Items**

## **SER Section 3.2.2.1 — Treated Borated Water**

### **OI 3.2.2.1-1**

- Recently issued interim staff guidance (LR-ISG-2011-01) recommends additional aging management activities for stainless steel components in treated borated water

## **SER Section 4: TLAA**

- 4.1 Introduction
- 4.2 Reactor Vessel Neutron Embrittlement
- 4.3 Metal Fatigue Analysis
- 4.4 Environmental Qualification of Electrical Equipment
- 4.5 Concrete Containment Tendon Prestress Analysis (not applicable to Seabrook)
- 4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis
- 4.7 Other Plant-Specific TLAA's

# **SER Section 4 Open Item**

## **SER Section 4.2.4 — Pressure-Temperature Limit**

### **OI 4.2.4-1**

- Concerns that the methodology used to develop the P-T limits are not consistent with the requirements in 10 CFR 50, Appendix G.

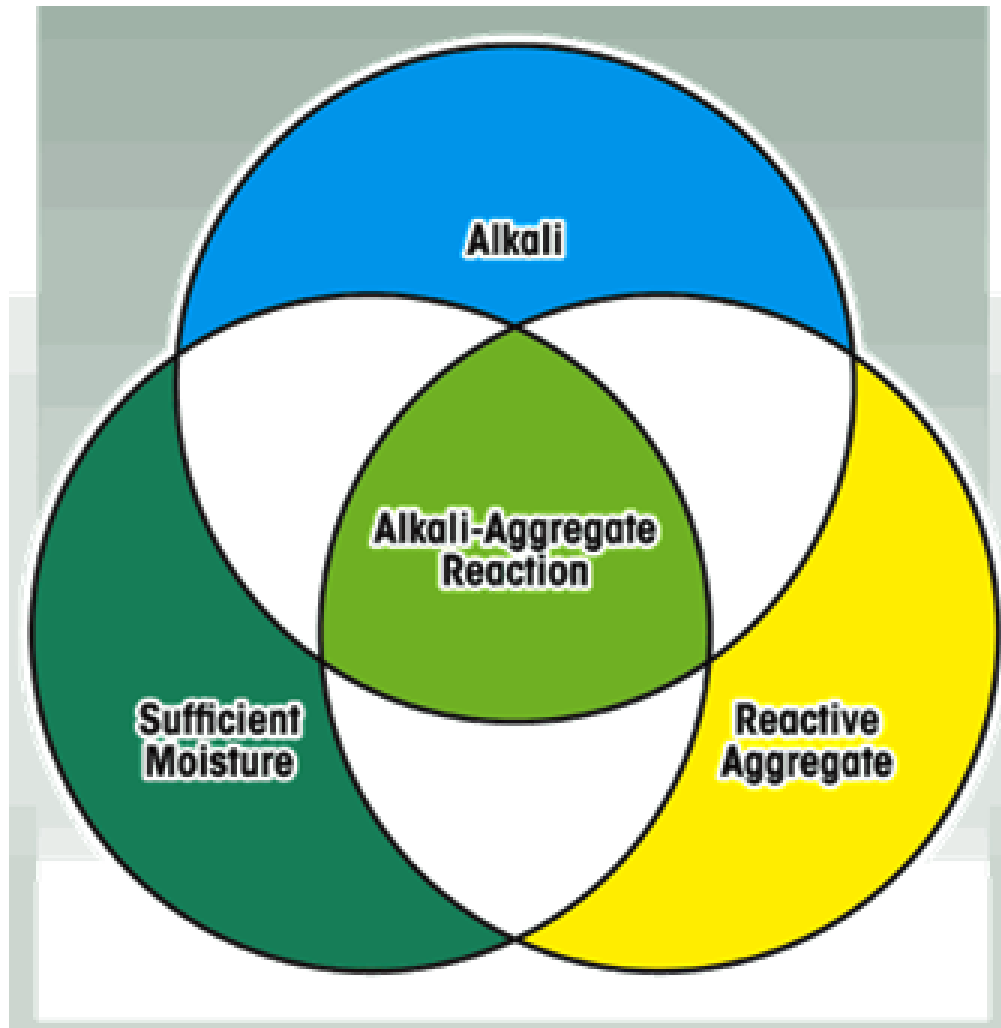
# **SER Section 3 Open Items**

## **SER Section 3.0.3.2.18 — Structures Monitoring and Containment Concrete Inservice (IWL) Inspection Programs**

### **OI 3.0.3.2.18-1**

- The applicant's enhancement to the Structures Monitoring Aging Management Program is not sufficient to manage the effects of ASR
- The applicant has not enhanced the containment IWL program for ASR
- The applicant submitted an ASR monitoring program (May 16, 2012)

# Conditions for Alkali Silica Reaction (ASR)



# Effect of ASR on Concrete

- Aggregate containing silica reacts alkali hydroxides in the cement in presence of water
- An alkali silica gel is formed
- Gel swells expands and cause internal stresses
- Pattern cracking in concrete due to expansion and swelling
- Degradation of mechanical properties of concrete

# ASR at Seabrook Electrical Tunnel





# Seabrook Containment and Enclosure Building



# **Seabrook Operating Experience: Concrete Degradation Due to ASR**

- Compressive strength and elastic modulus tests performed
- Extent and rate of degradation of concrete over time—not completed
- Applicant does not plan to:
  - Perform additional tests on concrete cores
  - Extract cores from concrete containment and perform petrographic examination
- Applicant plans to perform large scale concrete beam tests
- Concrete expansion tests—in process
- Absence of ASR can only be confirmed by petrographic examination of core samples
- Applicant's approach for the aging management of ASR affected structures continues to evolve

# **SER Open Item**

## **OI 3.0.3.2.18-1: Containment**

### **Staff's Concerns**

- Applicant observed cracking at two locations
  - Crack width no more than 8 mils
- Cracking pattern observed is indicative of ASR
- The applicant considers 8 mils maximum crack width insignificant
  - Cracks due to ASR grow over time
  - 15 mil crack width criteria is for passive cracks
  - GALL report and related industry standards require further evaluation of active cracks
- Absence of ASR can only be confirmed by petrographic examination of core samples
- The applicant has not addressed the long term effects of ASR on degradation of mechanical properties of concrete
- The applicant has not enhanced the containment IWL program for ASR

# SER Open Item

## OI 3.0.3.2.18-1: Other Structures

### Staff's Concerns

- On March 30, 2012, the applicant committed to:
  - Perform accelerated expansion testing
  - Perform testing on full-scale replicas
  - Determine crack limits and index based on test data
  - Use test results to develop acceptance criteria
- On May 16, 2012, the applicant submitted ASR Monitoring Program AMP that is under review by the NRC staff
  - Initial Observations:
    - Program acceptance criteria not based on full scale and expansion tests results
    - Acceptance criteria less stringent than industry standards
    - ASR detected by visual examination

# Aging Management of ASR Affected Structures

- GALL Report recommends that the applicant augment the AMPs for the specific conditions and operating experience
- Applicant has proposed a plant specific AMP to manage ASR
- An acceptable AMP for ASR should be based on the following:
  - Baseline inspection of concrete structures to document current condition of structures
  - Extent of aggregate reaction to date and remaining reactivity/expansion going forward
  - Extent and rate of degradation of mechanical properties
  - Appropriate acceptance criteria based on test data and additional analysis

# **SER Open Item**

## **OI 3.0.3.2.18-1: Summary**

The applicant has not yet demonstrated that it could adequately manage aging of the Seabrook concrete structures due to ASR for the period of extended operations

# Conclusion

Until the applicant can resolve all the open items, the staff can not make a conclusion that the requirement of 10 CFR 54.29(a) have been met for the license renewal of Seabrook Station