



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

January 11, 2016

MEMORANDUM TO: ACRS Members

FROM: Christopher L. Brown, Senior Staff Engineer */RA/*  
Technical Support Branch  
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS  
METALLURGY AND REACTOR FUELS SUBCOMMITTEE  
MEETING ON APRIL 8, 2015, IN ROCKVILLE, MARYLAND

The minutes for the subject meeting were certified on November 13, 2015. Along with the transcripts and presentation materials, this is the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc with Attachment: E. Hackett  
M. Banks

cc w/ Attachment: ACRS Members



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

MEMORANDUM TO: Christopher Brown, Senior Staff Engineer  
Technical Support Branch  
Advisory Committee on Reactor Safeguards

FROM: Ronald Ballinger, Chairman  
Metallurgy and Reactor Fuels Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS  
METALLURGY AND REACTOR FUELS SUBCOMMITTEE  
MEETING ON APRIL 8, 2015, IN ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on APRIL 8, 2015, are an accurate record of the proceedings for that meeting.

**/RA/**

**November 13, 2015**

---

Ronald Ballinger, Chairman  
Metallurgy & Reactor Fuels  
Subcommittee

Dated

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**  
**MINUTES OF THE ACRS METALLURGY AND REACTOR FUELS SUBCOMMITTEE**  
**MEETING**  
**NUREG-1927, Rev. 1 Standard Review Plan for Renewal of 10 CFR 72 Specific Licenses**  
**and Certificates of Compliance**

April 8, 2015  
ROCKVILLE, MD

The ACRS Materials, Metallurgy, and Reactor Fuels Subcommittee held a meeting on April 8, 2015, in T2B1, 11545 Rockville Pike, Rockville, MD. The meeting convened at 8:30 p.m. and adjourned at 12:26 p.m.

The meeting was opened to the public.

No written comments were received from members of the public.

**ATTENDEES**

**ACRS Members/Staff**

Ron Ballinger, Subcommittee Chairman  
Charlie Brown, Member  
Joy Rempe, Member  
Dana Powers, Member

Gordon Skillman, Member  
Mike Corradini, Member  
Mike Ryan, Member  
John Stetkar, Member

Christopher Brown, Designated Federal Official

**NRC Staff**

Gordon Bjorkman  
Mark Lombard

Al Csontos  
Carol Nove

Darrell Dunn  
Greg Oberson

K. Banovac  
Patrick Raynaud

**Industry**

Kris Cummings, NEI  
Rod McCullum, NEI

Robert Einziger, NWTRB

Matt Keen, Duke

**SUMMARY**

The purpose of this meeting was to review the staff's Standard Review Plan (SRP) for spent fuel dry storage systems license renewal. The Subcommittee heard presentations and discussions with representatives of the staff and NEI.

NUREG-1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificate of Compliances" provides NRC staff with guidance for renewal of ISFSI licenses and CoCs for storage cask design. Recent staff renewal review experience indicated a need for a revision and expanded guidance.

The meeting transcript is attached and contains an accurate description of each matter discussed during the meeting. The presentation slides and handouts used during the meeting are attached to the transcript.

| SIGNIFICANT ISSUES  |                               |
|---|-------------------------------|
| Issue (s)   | Reference Pages in Transcript |
| 1. Opening remarks by NMSS staff. It was indicated that over 20 public meetings were on this topic.   | 6                             |
| 2. Discussion of the regulatory framework for 10 CFR Part 72. Renewal of specific licenses and CoCs for storage of spent fuel for a period not to exceed 40 years. Further discussion was presented on time-limited aging analyses and description of the aging management programs.      | 8 - 18                        |
| 3. Discussion on lessons-learned from the GALL report used by NRR. Other guidance documents and corrective action programs were also discussed during the meeting. Discussion on storage operating experience, staff's storage renewal review experience, and reactor renewal experience. | 18 - 24<br>31                 |
| 4. Use of "tollgates" or periodic assessments of operating experience/confirmatory research.  | 31 - 33                       |
| 5. Discussion of specific changes to NUREG-1927. Items discussed included the following: 1) environmental data and identification of aging effects and mechanisms, 2) high burnup fuel, 3) expanded discussion on aging management programs, and 4) inclusion specifics in NEI 14-03.     | 42 - 63                       |
| 6. Discussion on SNF retrievability. The current and proposed definition were discussed. Further, how this topic along with risk assessment and high burnup fuel fits together with license renewal.  | 66 - 66                       |
| 7. Overview of the appendices in the NUREG, such as, lead system inspections and storage terms. Discussion on the infrastructure for operations-focused approach to aging management. Discussion on NRC technical support activities and stakeholder engagement.                          | 66 - 69                       |
| 8. Discussion on the aging management program for concrete.   | 70 - 79                       |
| 9. Detailed discussion on aging management program for localized corrosion and stress corrosion cracking of welded stainless steel canisters.   | 80 - 110                      |
| 10. Discussion of the high burnup fuel monitoring program and parameters monitored or inspected.  | 110 - 134                     |
| 11. Discussion on industry guidance for operations-based aging management for dry cask storage (NEI 14-03) and toll gates for license renewals.   | 134 - 161                     |

|                            |           |
|----------------------------|-----------|
| 12. Public comments.       | 172 - 180 |
| 13. Subcommittee Comments. | 181 - 183 |

# Official Transcript of Proceedings

## NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards  
Metallurgy and Reactor Fuels Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, April 8, 2015

Work Order No.: NRC-1504

Pages 1-187

NEAL R. GROSS AND CO., INC.  
Court Reporters and Transcribers  
1323 Rhode Island Avenue, N.W.  
Washington, D.C. 20005  
(202) 234-4433

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

METALLURGY & REACTOR FUELS SUBCOMMITTEE

+ + + + +

WEDNESDAY

APRIL 8, 2015

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

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

COMMITTEE MEMBERS:

RONALD G. BALLINGER, Chairman

CHARLES H. BROWN, JR. Member

MICHAEL L. CORRADINI, Member

DANA A. POWERS, Member

JOY REMPE, Member

PETER C. RICCARDELLA, Member

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

MICHAEL T. RYAN, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

CHRISTOPHER L. BROWN

ALSO PRESENT:

EDWIN M. HACKETT, Executive Director, ACRS

HUDA AKHAVANNIK, NMSS

KRISTINA BANOVA, NMSS

GORDON BJORKMAN, NMSS

JOSEPH F. BOROWSKY, NMSS

ALADAR CSONTOS, NMSS

KRISTOPHER CUMMINGS, NEI

DARRELL DUNN, NMSS

BOBY EID, NMSS

ROBERT EINZIGER, NWTRB

STEVEN EVERARD, NMSS

DONNA GILMORE\*

ACE HOFFMAN\*

A.H. HSIA, NMSS

DANIEL HUANG, NMSS

MATT KEENE, Duke Energy

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

MARVIN LEWIS\*

BRUCE LIN, RES

MARK LOMBARD, NMSS

RAY LUTZ, Citizens' Oversight\*

DAMARIS MARCANO, NMSS

ROD MCCULLUM, NEI

CAROL NOVE, RES

GREG OBERSON, RES

JESSIE QUINTERO, NMSS

PATRICK RAYNAUD, RES

HAROLD SCOTT, RES

DON SHAW, AREVA

JEREMY SMITH, NMSS

DAVID TANG, NMSS

DAVID TARANTINO, NMSS

RICARDO TORRES, NMSS

BHASKER P. TRIPATHI, NMSS

\*Present via telephone

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

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

|  |     |
|--|-----|
| Opening Remarks and Objectives   |     |
| by Dr. Ron Ballinger, Chair.....   | 5   |
| Staff Opening Remarks  |     |
| by Mr. Mark Lombard.....   | 6   |
| Operations-Focused Approach to Aging Management<br>for Spent Fuel Storage                      |     |
| by Ms. Kristina Banovac.....   | 7   |
| Changes in NUREG-1927 Rev. 1   |     |
| by Mr. Ricardo Torres.....   | 42  |
| Example AMP for Reinforced Concrete Structures   |     |
| by Mr. Ricardo Torres.....   | 71  |
| Example AMP for Localized Corrosion and Stress<br>Corrosion Cracking for Dry Storage Canisters |     |
| by Mr. Darrell Dunn.....   | 81  |
| Example of a High Burnup Fuel Monitoring Program   |     |
| Industry Presentation on Operations-Focused<br>Approach to Aging Management                    |     |
| by Mr. Kristopher Cummings.....  | 137 |
| Development of Infrastructure for Operations-<br>Focused Approach to Aging Management          |     |
| by Dr. Aladar Csontos.....   | 164 |
| Public Comments.....   | 176 |
| Committee Discussion   |     |
| by Dr. Ronald Ballinger, Chair.....  | 185 |

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

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

(8:29 a.m.)

1  
2  
3 CHAIRMAN BALLINGER: Good morning. The  
4 meeting will now come to order. This is a meeting of  
5 the Advisory Committee on Reactor Safeguards  
6 Subcommittee for Metallurgy and Reactor Fuels.

7 I'm Ron Ballinger, Chairman of the  
8 Subcommittee. Subcommittee Members in attendance are  
9 Pete Riccardella, Gordon Skillman, Dana Powers, John  
10 Stetkar, Mike Ryan, Joy Rempe and there used to be Mike,  
11 lose by five, Corradini.

12 The purpose of this meeting is to receive  
13 information, an information briefing from the staff and  
14 NMSS on NUREG-1927, Rev. 1, the standard review plan for  
15 license renewal of dry cask storage systems. The  
16 Subcommittee will gather information, analyze relevant  
17 issues and facts, formulate proposed positions and  
18 actions as appropriate for deliberation by the full  
19 committee.

20 Chris Brown is the designated federal  
21 official for this meeting. He is right here. The  
22 rules for participation in today's meeting have been  
23 announced as part of the notice of this meeting  
24 previously published in the Federal Register on March  
25 27, 2015.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           A transcript of the meeting is being kept  
2 and will be made available as stated in the Federal  
3 Register notice. It is requested that speakers first  
4 identify themselves and speak with sufficient clarity  
5 and volume so they can be readily heard. Also please  
6 silence anything that's electronic that beeps, except  
7 for maybe pacemakers.

8           We do not receive, we did not receive any  
9 requests from members of the public to make oral  
10 statements or written comments. The staff has  
11 requested a phone bridge line which is on. The bridge  
12 line will be opened at the end to receive public  
13 comments.

14           We'll now proceed with the meeting. And I  
15 call upon Mark Lombard, Division Director of the Spent  
16 Fuel Management to begin.

17           MR. LOMBARD: Thank you, sir. I  
18 appreciate it. I just want to say a few words. We  
19 certainly appreciate the Subcommittee's review of this  
20 important document NUREG-1927. And we wanted to have  
21 your early involvement in this process before we sent  
22 the document out for public comment so again look  
23 forward to your questions and comments on it.

24           This project is really the culmination of  
25 about 18 months of very hard work by the Renewal Team

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and it covers both certificate of compliance, CoC and  
2 Spent Fuel Storage and Installation reviews for  
3 renewal. There's been significant collaboration in  
4 that 18 month time frame.

5 Over 20 public meetings were held including  
6 the general public and industry on this topic. The  
7 goal, and I believe we have achieved this goal, is to  
8 create a learning, predictable, sustainable framework  
9 for renewals going forward and this is really the first  
10 piece of several products that will define that  
11 framework and do make it sustainable for now and for the  
12 future.

13 So with that I just want to turn it over to  
14 you, Kris Banovac.

15 MS. BANOVA: Thank you. My name is Kris  
16 Banovac. I'm a project manager in the Renewals and  
17 Materials Branch in the Division of Spent Fuel  
18 Management and I'll be providing an introduction to our  
19 meeting today and talking about our operations- focused  
20 approach to aging management for spent fuel storage  
21 renewal.

22 On Slide 2, just an outline of my talk.  
23 I'll be providing some background on our regulatory  
24 framework for spent fuel storage and also our  
25 requirements and guidance for spent fuel storage

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 renewals. I'll talk about some of the current  
2 challenges that we're facing with our storage renewal  
3 framework and then I'm going to talk about our path  
4 forward, what we've been doing and what we'll continue  
5 to do to have our operations-focused approach and to  
6 have a stable framework for spent fuel storage renewals.

7 And I'll talk about our plan for our  
8 revision to NUREG-1927. And then finally I'll just  
9 touch on the agenda for today and what you'll be hearing  
10 for the rest of the meeting.

11 As far as background for regulatory  
12 framework for spent fuel storage we have a two part  
13 regulatory framework in 10 CFR Part 72. There's an  
14 option for a specific license for storage of spent fuel  
15 in an independent spent fuel storage installation or  
16 ISFSI.

17 And there's also an option for a general  
18 license for storage of spent fuel at reactor sites with  
19 a Part 50 or Part 52 license as long as that storage is  
20 in an approved, an NRC approved dry cask storage system  
21 design. The general license provisions are in Part 72,  
22 Subpart K. And the NRC reviews and approves storage  
23 cask designs per the requirements in Part 72, Subpart  
24 L.

25 Approved designs are certified by the NRC

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 through rulemaking, through a rulemaking process.  
2 They're provided a Certificate of Compliance or a CoC  
3 and they're added to the list of approved systems that  
4 are listed in 10 CFR 72.214. And at that point the  
5 systems are available for use by general licensees.

6 The general license term is tied to the term  
7 of the CoC that is being used at that site. So general  
8 licenses themselves are not renewed, CoCs are.

9 This next slide goes over the requirements  
10 for both renewal of specific licenses and CoCs. The  
11 regulations do allow for renewal of ISFSIs and the  
12 storage cask designs for a period not to exceed 40 years.

13 And specific license renewal applications  
14 must be submitted two years before license expiration.  
15 And CoC renewal applications must be submitted 30 days  
16 before CoC expiration.

17 MEMBER CORRADINI: How did the 40 years  
18 come about?

19 MS. BANOVA: The 40 years. There was a  
20 rulemaking in 2011 for license and certificate terms.  
21 And in that rulemaking that extended the period both for  
22 the initial storage period and the renewal period for  
23 40 years. And at the end of my slide I have references  
24 with a link to the Statement of Considerations for that  
25 rulemaking.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So for renewals both specific license and  
2 CoC applications have to include a time limited aging  
3 analysis or TLAA's. And these consider the effects of  
4 aging on structure systems and components that are  
5 important to safety and it assesses their capability to  
6 continue to perform their intended functions for the  
7 period of extended operation.

8           The renewal applications must also include  
9 a description of the Aging Management Programs or AMPs.  
10 And those are for management of aging issues that could  
11 adversely impact structure systems and components  
12 important to safety.

13           In addition the renewal application must  
14 include design basis information as documented in the  
15 most updated final safety analysis report. And in  
16 order for NRC to approve storage renewals the licensees  
17 or CoC holders need to demonstrate that any aging  
18 effects on their dry cask storage systems will be safely  
19 managed and addressed so that they can continue to meet  
20 their safety functions in the period of extended  
21 operation.

22           On Slide 5 our guidance for the staff safety  
23 review of renewal applications is located in  
24 NUREG-1927. And Revision 0 to this guidance was issued  
25 in March 2011 to accompany the license and certificate

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 rulemaking. So that provided the implementing  
2 guidance for that rule. And --

3 MEMBER CORRADINI: And so and just --

4 MS. BANOVA: Sure.

5 MEMBER CORRADINI: -- under the, that's  
6 okay. I just wanted to make sure. So under the two,  
7 you identified two paths, under both paths it's 40  
8 years?

9 MS. BANOVA: Forty years, yes.

10 MEMBER CORRADINI: And under both paths --

11 MS. BANOVA: Up to 40 years.

12 MEMBER CORRADINI: -- up to 40 years, up  
13 to.

14 MS. BANOVA: Yes.

15 MEMBER CORRADINI: And in both paths it's  
16 a consistent set of guidance and rules?

17 MS. BANOVA: Yes.

18 MEMBER CORRADINI: So it doesn't matter  
19 whether I do it as an independent dry cask or within the  
20 plant license?

21 MS. BANOVA: Yes. The regulation, so  
22 I'll go back, so the two regulations there's 72.42 as  
23 far as specific license renewals and 72.240 is for our  
24 CoC renewals and they're almost identical. And so the  
25 key points that TLAAs and AMPs need to be submitted as

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 part of the application, those are both for the specific  
2 license renewals and the CoC renewals.

3 One of the differences is when they need to  
4 submit the renewal application and timely renewal.  
5 Okay. And since we issued Rev. 0 of NUREG-1927 we have  
6 reviewed applications for both specific license  
7 renewals and CoC renewals. And so we did have a chance  
8 to use and test our guidance in NUREG-1927.

9 And what we found in our review experience  
10 was that there were several areas where we thought the  
11 guidance could be expanded and clarified. So we did  
12 identify a need to update NUREG-1927. And this slide  
13 lists a few other challenges.

14 Both storage and reactor operating  
15 experience has indicated potential degradation of  
16 structure systems and components during the period of  
17 extended operation. And in addition to known  
18 degradation mechanisms there's always the potential for  
19 unknown degradation mechanisms.

20 And also our dry storage systems are  
21 deployed at ISFSIs throughout the country so they are  
22 subjected to different climates and environments. And  
23 particularly for our CoC renewals, CoCs can be used at  
24 various sites throughout the country and so there's a  
25 challenge for a CoC renewal application to define and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 assess all the operable degradation mechanisms for  
2 those different environments where the CoC could be  
3 used.

4 CHAIRMAN BALLINGER: I have a question  
5 that with regard to known versus potential. In the Reg  
6 Guide it says the applicants should include aging  
7 effects that may theoretically occur. What does  
8 theoretically occur mean?

9 MS. BANOVA: Has the potential to occur.

10 CHAIRMAN BALLINGER: Okay. So it's the  
11 same as that. So it's a known mechanism that has the  
12 potential to occur.

13 MS. BANOVA: Yes.

14 CHAIRMAN BALLINGER: Not an unknown,  
15 unknown mechanism that theoretically might maybe occur?

16 MS. BANOVA: I think, yes.

17 MR. TORRES: And also aging degradation  
18 mechanisms might be, might have been seen in similar  
19 locations but not exactly in dry cask storage. So those  
20 types of degradation issues.

21 CHAIRMAN BALLINGER: I just was concerned  
22 about the word theoretically.

23 MEMBER CORRADINI: Since he asked is it  
24 physically existing and operating as a dry cask storage  
25 or does transport after the license removal or renewal

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 or end of license for removal to another site part of  
2 the requirements?

3 MS. BANOVA: So the requirements are just  
4 for the storage. There is a requirement in Part 72, I  
5 believe it's 72.236M where we do need to consider  
6 transport and sort of the next steps after storage when  
7 we do our reviews for issuance of the initial licenses  
8 and CoCs.

9 But our guidance in NUREG-1927 is just for  
10 the extended storage period.

11 MEMBER CORRADINI: Is there a judgment by  
12 the staff which is more limiting? I would expect  
13 transportation after the license is over is more  
14 limiting than having it sit there.

15 MR. TORRES: So I think that the way the  
16 rule is written it says that I think to the extent  
17 practical consideration should be given to  
18 transportation. I think that the staff evaluates the  
19 suitability for transportation but not to the specific  
20 requirements in Part 71.

21 MEMBER CORRADINI: Where I'm going, it's  
22 probably outside of the scope so I'll just say it and  
23 then I'll let it go. Where I'm going is that you give  
24 the licensee a license to keep it there but then they  
25 can't move it afterwards because somehow its degraded

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 in some sense that it's not allowable to move or it  
2 becomes incredibly economically, an economic penalty.

3 So I'm trying to figure out have you figured  
4 out not only is it there and it's going to stay there  
5 for x years but then it moves because eventually it will  
6 move, if it can be moved and where that criteria is.

7 DR. CSONTOS: That's a Part 72 to 72.  
8 There are two rules. So that's a really good point and  
9 we are discussing that internally. For this discussion  
10 it's more on the 72 part.

11 MEMBER CORRADINI: I understand. I  
12 gather it's out of the scope but on the other hand, you  
13 know, --

14 DR. CSONTOS: But it's very valid because  
15 what we are right now wrestling with internally is this  
16 what you call Part 72 to 71 back to 72 words, okay.  
17 Meaning that if you go to another consolidated storage  
18 facility or if you go to some other place that may store  
19 this but it's going to be transported in an intermediate  
20 step, those are considerations we need to start thinking  
21 about.

22 Okay. And so the transportation piece is  
23 something that we are looking into. But it's not a part  
24 of this right now in terms of the license renewal aspects  
25 because we're looking at 40 years of license renewal,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 okay, up to 40 years.

2 MEMBER CORRADINI: But you guys are aware  
3 and thinking?

4 DR. CSONTOS: Yes, we are thinking about  
5 it.

6 MEMBER CORRADINI: So as you've been  
7 thinking are there limits that might conflict or  
8 interact?

9 DR. CSONTOS: We are, you will probably get  
10 a presentation or a set of presentations from Meraj  
11 Rahimi in I think a month or two the high burnup fuel  
12 and the whole RIS and --

13 MR. BROWN: No, we're not going to --

14 DR. CSONTOS: No, okay. There is another  
15 set of presentations that we were supposed to give to  
16 you, all right, not as part of the renewal piece but as  
17 part of the high burnup fuel, the regulatory information  
18 summary and the whole process and the whole plan that  
19 we have there.

20 That takes into account the storage and  
21 transportation interfacing.

22 MEMBER CORRADINI: Okay, thank you.

23 DR. CSONTOS: And just to answer Professor  
24 Ballinger's question about the known and unknown that's  
25 a good question, that's a good point. We are looking

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 at operational experience and operational experience  
2 from, you know, other industries as well as the nuclear  
3 industry so if things have happened in a reactor that's  
4 on the same site as an ISFSI is those are things that  
5 are the known but they're unknown for canisters.

6 So it may, it's what they call a known  
7 unknown if you want to call it that.

8 CHAIRMAN BALLINGER: That could work.  
9 But theoretically it's just abstracts.

10 DR. CSONTOS: Yes, I understand that.  
11 We'll, good comment.

12 MEMBER STETKAR: As long as we're sort of  
13 just, you know, getting some general questions out on  
14 the table here, I'm pretty familiar with NUREG-1801 the  
15 GALL Report for operating reactors. And I would  
16 appreciate it, I see the parallels between these  
17 obviously.

18 How are these two NUREGs coordinated? For  
19 example, I think the staff is working on a yet, you know,  
20 Rev. 3 of the GALL Report. We've entered into  
21 discussions with the staff about extension of the GALL  
22 Report for life beyond 60 or subsequent license renewal.

23 How are, because there are a lot of very  
24 similar materials, you know, programmatic type aspects  
25 how are they coordinated to make sure that we're on track

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 with both of these?

2 DR. CSONTOS: I will talk to it at the last  
3 slide.

4 MEMBER STETKAR: Thanks. I gave you a  
5 heads up on that.

6 DR. CSONTOS: We have staff who we borrow  
7 from NRR as part of our Renewal Strategy Team that Kris  
8 led, all right, and that we also have contracted with  
9 the folks who do the GALL revision, okay, as well. And  
10 our GALL-like document is called MAPS, Managing Aging  
11 Processes for Storage.

12 And we're trying to do that corollary, just  
13 like you said, and I'll go into that in a lot of detail.  
14 But we are well aware of it. That's exactly why, you  
15 want to hear some of the AMPs that we have here the  
16 concrete and the corrosion AMPs. Those are right from,  
17 you know, our knowledge base from --

18 MEMBER STETKAR: But what I'm worried  
19 about is getting out of sync.

20 DR. CSONTOS: Yes, and we have, what you'll  
21 hear from Ricardo is how we are in sync. He's been part  
22 of some of that work going on from the NRR side. We  
23 brought over some of the NRR folks over here to help us  
24 on our side.

25 So we're trying to be as much in sync as

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 possible and not --

2 MEMBER STETKAR: Just having bodies  
3 doesn't necessarily mean --

4 DR. CSONTOS: They're the experts in, we  
5 have a materials generic, John Wise who is not here today  
6 because he's on, this is Montgomery County's holiday  
7 week. So, but he is from NRR, Division of License  
8 Renewal.

9 He was one of the technical experts in  
10 materials degradation and the GALL revision, the latest  
11 revision up. And the technical experts that our  
12 contractor who also are developing that revision.

13 MEMBER STETKAR: Okay. Whoever has got  
14 the thing beeping there please figure out who you are  
15 and turn it off. Thank you.

16 MS. BANOVA: Okay. Any other questions  
17 or is it okay to pick back up? Okay. And so we're also  
18 expecting 15 renewal applications both for specific  
19 licenses and CoCs over the next ten years.

20 So given this wave of upcoming work we  
21 realized that now was the time to update NUREG-1927 and  
22 also take a hard look at our framework to determine what  
23 other guidance was needed.

24 So what we did, I think it's already been  
25 alluded to, we created a Storage Renewal Team with folks

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 from the Division of Spent Fuel Management and the  
2 Office of Nuclear Material Safety and Safeguards and  
3 also to draw on the staff experience from the reactor  
4 renewal to have those parallels and also research in  
5 corrosion and degradation mechanisms and also in  
6 inspection.

7 We had staff from the Division of License  
8 Renewal and Office of Nuclear Reactor Regulation and  
9 also staff from the Office of Research that were on our  
10 team. We also had representation from our Office of the  
11 General Counsel.

12 And so what we did is we talked about the  
13 issues and the questions that came out of our storage  
14 renewal review experience, so the issues we had  
15 identified over the last few reviews. And we also  
16 reflected on the reactor renewal experience and the  
17 lessons learned from that.

18 And in addition to our team discussions and  
19 deliberations we have had extensive stakeholder  
20 engagement. That's also been, Mark had mentioned we  
21 had a two day public meeting in July of last year that  
22 was focused solely on potential changes to NUREG-1927.  
23 We got some very valuable feedback from that.

24 And we're also reviewing guidance in a  
25 document NEI 14-03 which is an industry effort to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 develop parallel guidance for applicants. And so this  
2 would be a guidance that would complement NUREG-1927.  
3 And Kris Cummings will be speaking to that later after  
4 our break.

5 So we had a chance to review that and  
6 comment on that. And we have had very valuable  
7 stakeholder feedback over the last year.

8 And so what we realized after talking in our  
9 team and receiving the stakeholder feedback, you know,  
10 we need an operations-focused approach that is  
11 learning, proactive and responsive. I'm going to talk  
12 a little bit more about what that means.

13 And as Mark mentioned, we ultimately want  
14 a stable, predictable framework that has clear  
15 expectations. And so how do we do that? We feel a key  
16 piece is this revision to NUREG-1927 that is the focus  
17 of our meeting today. And I know we've already talked  
18 a little bit about the further guidance.

19 There's other guidance products that we've  
20 identified that we need and also additional work which  
21 Al is going to speak to at the end of our meeting. And  
22 so what we mean by operations-focused approach it's  
23 based on achievable operational methodologies.  
24 Monitoring and in-service inspection should be based on  
25 parameters that are capable of identifying degradation

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 before it challenges the structure system and  
2 component's ability to meet its intended function.

3 Those parameters should be based on  
4 technically defensible criteria. Operations-focused  
5 approach should include assessment of monitoring data  
6 and inspection findings to determine what actions  
7 should be taken. It should also include reporting,  
8 aggregating and trending of operational experience.

9 And one key here is we feel that these Aging  
10 Management Programs should be a learning program. So  
11 we feel that it should be a dynamic program that they  
12 should continue to consider and respond to operating  
13 experience for that particular ISFSI, for that dry  
14 storage system or other relevant operating experience  
15 within the nuclear industry and even outside of the  
16 nuclear industry.

17 CHAIRMAN BALLINGER: Okay. I have a  
18 question that will probably keep coming up. And that  
19 is the, some of the degradation modes, in particular  
20 this stress corrosion cracking that we're all familiar  
21 with are of necessity probabilistic in nature. There's  
22 no way that you can inspect a canister and then guarantee  
23 that you won't propagate through the wall crack between  
24 the two inspections.

25 Now that compromises the intended function

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 of that barrier, correct. And in the NUREG it says no  
2 leaks period. So what happens if in fact you do get a  
3 through-wall between inspection periods? Is that  
4 allowed? It doesn't sound like it's allowed here?

5 MS. BANOVA: Yes, Professor Ballinger, is  
6 it okay if we push that question and that discussion?  
7 We do have a separate presentation that will be on the  
8 aging management, an example Aging Management Program  
9 for corrosion and stress corrosion. Is that okay? I  
10 think we could get into a good discussion.

11 CHAIRMAN BALLINGER: It heads up to where  
12 my head is going with this question.

13 MS. BANOVA: Yes, so we'll get into a good  
14 discussion I think in that presentation. Thank you.

15 MEMBER SKILLMAN: Kris, let me ask this  
16 please. Your last bullet learning that word is kicked  
17 around a lot in this business and very often it's a word  
18 that doesn't carry a lot of discipline with it.

19 We talk about we're a learning organization  
20 and three months later you say, so what. What did you  
21 learn? Well I learned a lot. Well did you write it  
22 down? No. Was it recorded anywhere? No. Has it  
23 been codified? No.

24 What is the discipline behind ensuring that  
25 when new information is available that the AMP really

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 is modified? Where's the discipline? Is it subject in  
2 part to Appendix B, Corrective Action Program? What  
3 makes it happen?

4 MS. BANOVA: So, yes, the existing  
5 Quality Assurance programs and Corrective Action  
6 programs, those would have to respond to any aging  
7 issues that were identified. So those continue for  
8 storage not just for the reactor.

9 MEMBER SKILLMAN: And if they're not?

10 MS. BANOVA: But as far as capturing the  
11 learning that's a very important piece. And I think  
12 probably Kris Kummings will get to it a little bit in  
13 his presentation. But, you know, we think that the  
14 learning aspect, it's continuous.

15 So on a daily basis as you are finding  
16 things, as the industry is responding to things it  
17 happens continuously. But there's also an idea to sort  
18 of capture or I think I forget the word you used but to  
19 make sure it happens, an idea that on a periodic basis  
20 there will be essentially a pause and the licensees or  
21 CoC holders would need to take a look at the operating  
22 experience that's related to either that ISFSI, that dry  
23 storage system and essentially do an assessment and say,  
24 okay, you know, here's what's happened in this period  
25 of time.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   Do I need to go back and change any of my  
2 parameters of my Aging Management Program? The word  
3 that industry has actually coined this term it's called  
4 a tollgate. And this is an idea that's presented in NEI  
5 14-03 which, as I mentioned, I think Kris Kummings will  
6 be talking to that.

7                   But there is this idea that there will be  
8 a pause that sort of forces the licensee and the CoC  
9 holder to stop and take a look at what has happened in  
10 that period of time and change as needed.

11                  MEMBER SKILLMAN: Well let me continue. I  
12 understand the tollgate concept as it's described in  
13 14-03. The real question is, what's the NRC going to  
14 do? I lived in a world of inspections of inspectors of  
15 findings --

16                  DR. CSONTOS: That's, what you're talking  
17 about is how do we enforce it.

18                  MEMBER SKILLMAN: That's the question.

19                  DR. CSONTOS: And so we have a situation  
20 over here that's unlike the reactor side. Okay, we, the  
21 AMPs that we have in the GALL that's on the reactor side  
22 has thousands of years= worth of operational experience  
23 collectively internationally from all the reactors on  
24 how they're degrading or they're aging.

25                  We don't have that much over here. We have

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 some, okay. But we're getting some inspection data.  
2 We're getting some types of other information,  
3 operational experience data for concrete degradation  
4 and corrosion, things like that.

5 But it's much more limited compared to what  
6 we have on the reactor side. We have and this comes into  
7 where, how I'm wrapping it up at the end. We're looking  
8 at the sectional level. Right now we don't have a  
9 sectional level.

10 We don't have an inspection criteria. We  
11 don't have an inspection criteria that, you know, AMPs  
12 on the reactor side are on top of existing Section XI,  
13 ASME Section XI requirements, inspection and  
14 remediation and such. We don't have that yet here.

15 Okay. We are embarking on a process on  
16 going forward to develop that inspection criteria.  
17 That will then be enforceable by inspectors which you'll  
18 also see in my slides the inspection guidance that we're  
19 going to be looking into. And that's not inspections  
20 like in technical this is how you do a non-instructive  
21 examination.

22 Rather it's how do we tell the inspectors  
23 how to go out and inspect for these types of issues and  
24 how do we enforce that and get this learning, like the  
25 tollgate that Kris talked about, how that learning piece

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 comes in and it's somehow brought into the system to  
2 update AMPs.

3 Industry has a concept called the popup  
4 tollgates which is every, once every so many years  
5 everyone gets together and sits down and talks about  
6 operational experience and then comes back and says how  
7 do we change these Aging Management Programs?

8 That would also be incorporated into the  
9 GALL-like document we have, updates to that document.  
10 So I'll, it's kind of, I'm down on my slides here but  
11 that will give a preview to my slides if that helps out  
12 with the enforcement question I think that you had.

13 MEMBER REMPE: Well I have a question  
14 about, I'm sorry, are you done?

15 MEMBER SKILLMAN: I'm good. Thank you.

16 MEMBER REMPE: Okay. On the tollgates and  
17 the issues that are not included in it and it kind of  
18 goes with this operations-focused approach. For  
19 example, I know a couple of issues were mentioned in the  
20 material we were provided.

21 But what about other things? We learned  
22 about seismic issues and other things that are not  
23 currently, what's the dividing line of what's in and  
24 what's out on issues that will be identified and  
25 addressed in the tollgates?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: Well that's part of the next  
2 step with the MAPS report. That is where we're trying  
3 to, you're going to hear three Aging Management Programs  
4 that are example ones for what we've thought were the  
5 high priority ones to address right now, okay.

6 MEMBER REMPE: And how do you know high  
7 priority ones is something I'm --

8 DR. CSONTOS: Well and those were because  
9 of the operational experience that we've had out there.  
10 We've had concrete degradation. We've had corrosion  
11 issues that we've seen, okay. The high- burnup fuel AMP  
12 is one that, you know, we've had research data that shows  
13 that there's, you know, possibility of issues out there.

14 And so we wanted to make sure that, you  
15 know, what we see is or what we're predicting in ISG-  
16 11 is okay.

17 MEMBER REMPE: Why isn't seismic included  
18 because you've had something at North Anna where they  
19 saw changes occur?

20 DR. CSONTOS: And that, and I think let's  
21 see, does anyone want to speak to the seismic piece? I  
22 think there is, we have been evaluating.

23 MEMBER REMPE: So anything is on the table.  
24 There's not just, because traditionally seismic has  
25 been addressed and doesn't change because of new

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 experience that much. I mean maybe they would be. But  
2 it's not as easy to get it changed.

3 DR. CSONTOS: We have evaluated for  
4 certain cases, certain cases that are more specific.  
5 And the other piece to it is the coupling. And that's  
6 the piece that's the next stage as well, coupling  
7 between let's say degradation and seismic.

8 You know, what if we have a degraded  
9 condition, extended degraded condition? What does  
10 that impact and how does that, how does that play a role  
11 that we ensure that these systems are maintaining its  
12 performance.

13 MEMBER RICCARDELLA: And you know  
14 licensees are updating their seismic analysis and  
15 response to new ground motions. Is that happening?  
16 Has that happened?

17 DR. CSONTOS: Whereabouts?

18 MEMBER RICCARDELLA: Mostly in the east  
19 coast this year.

20 DR. CSONTOS: It's the east coast, okay.

21 MEMBER RICCARDELLA: Central and eastern  
22 United States. Is that being done on the casks as well?

23 DR. CSONTOS: Do you want to talk a little?

24 MR. TRIPATHI: Yes, since you asked about  
25 the seismic I'm, let me understand the question first.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Are you --

2 CHAIRMAN BALLINGER: Identify yourself  
3 before you speak.

4 MR. TRIPATHI: I'm sorry. I'm Bob  
5 Tripathi. I'm the DSFM, Mark Lombard's group in the  
6 CSTB. It's changing every day. But I think it's CSTB.

7 Anyway, my question to you, ma'am, was can  
8 you specify exactly what the question is about the  
9 seismic because we are fully aware of the, what's going  
10 on with the NGA East, NGA West and we are completely  
11 familiar with what's going on, on the reactor side with  
12 the expected new demand in the seismicity in certain  
13 portions of the country.

14 So we will take care of all that information  
15 once it's, you know, trickled down. And once the  
16 licensees of the ISFSIs, not the reactor, licensees  
17 committed that okay we will follow these new guidelines.  
18 And there are some ISFSIs out there which may have to  
19 revisit for the upgraded seismic demand.

20 So we're going to incorporate all that  
21 information as it becomes available and as the  
22 commitment from the licensees are in place.

23 MEMBER REMPE: So that, sort of my question  
24 is it was more what's in and what's out with the  
25 tollgates and the prioritization and are some things

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that are traditionally addressed but not regularly  
2 updated to be included.

3 DR. CSONTOS: Part of it is the Section XI  
4 piece. There's two pieces of Section XI that we're  
5 looking into. One is inspections and the other one is  
6 assessment methodologies. And that is where you're  
7 loading characteristics go into how do we evaluate for  
8 degraded conditions for seismic and such like that.

9 MEMBER REMPE: Okay. Thank you.

10 MEMBER SKILLMAN: Let me go back to my  
11 question about AMPs and let me explain why I asked the  
12 question. Al, as you point out on the reactor side in  
13 some cases AMPs have thousands of data points because  
14 there's so much information.

15 DR. CSONTOS: Yes.

16 MEMBER SKILLMAN: And there is generally  
17 not a large change from day to day or month to month  
18 because most of the information is very well known. On  
19 the other hand, on dry fuel storage any new information  
20 needs to be disseminated quickly because there isn't  
21 that much information available.

22 And there's some interesting things that  
23 can happen. You can have a cask down on the tidewater  
24 area and you can have osprey decide to nest on a cask.  
25 We probably haven't done a whole research on the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 chemistry of guano and casks.

2 And if you try to take the osprey nest off  
3 the cask you are probably up against the wildlife people  
4 in the state who say you can't touch that because that's  
5 a protected bird.

6 MEMBER CORRADINI: That's actually right  
7 on the money.

8 MEMBER SKILLMAN: My only point is that  
9 there's a lot we don't know in the cask area and any  
10 little bit of information needs to get to all the license  
11 holders so everybody's on a, kind of alert for what they  
12 need to know. So updating the AMPs, the discipline of  
13 updating the AMPs is a good thing. End of story.

14 DR. CSONTOS: Well it's also about  
15 dissemination. We have a process in place for the  
16 reactors which is INPO-based as well as international  
17 based.

18 And on this side of the house and we're  
19 working with our, you know, our friends in the industry  
20 to try to figure out how are they going to create a system  
21 like INPO, a system on the reactor side for  
22 dissemination.

23 Right now there are users groups that are  
24 specific to each individual cask vendor that tries to  
25 promulgate that information within its membership.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 But like you said before, the materials are similar. I  
2 think it was Dr. Stetkar said the materials are similar  
3 between, you know, what we have on reactors to here.

4 Stainless steel is here and it's stainless  
5 steel in the reactor. So getting that information out,  
6 you know, and disseminating it also across vendors is  
7 something that we're also interested in.

8 MEMBER SKILLMAN: And as you point out, you  
9 know, in a control room if you have an incident overnight  
10 your first action is to report it the next morning to  
11 INPO. Your OE is your, almost as important as  
12 notifying your region or doing your operability review.

13 So it's part of the process and it's not  
14 instantaneous. But it's very timely within hours.

15 DR. CSONTOS: And that's exactly why we are  
16 moving to this operations-based approach. We wanted  
17 to, I think, in a similar fashion learn, we've learned  
18 from the reactor side and we feel that this is a path  
19 forward for us.

20 And we're at the early stages of developing  
21 that infrastructure and that piece. We've been at this  
22 for about 14 months. But it's important that we get  
23 this OpE, I think OpE is the key crux to this whole  
24 effort.

25 MEMBER SKILLMAN: Thank you.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. BANOVAČ: Okay. So I'm now on Slide  
2 10. So this just outlines our plan for our revision to  
3 NUREG-1927. So we do appreciate your time and your  
4 comments, thoughts that you'll be sharing today.

5 So after today's meeting we're going to go  
6 back. We're going to consider what we heard here today  
7 and we're going to further revise our guidance in the  
8 draft Revision 1. We then expect to publish that for  
9 public comment in the May/June time frame of this year.

10 We'll address the public comments as we  
11 finalize our guidance. And then we do plan to engage  
12 with ACRS after we have a chance to consider the public  
13 comments and address them as we finalize the guidance.  
14 And so we expect to do that in spring of next year.

15 And at that time we're planning for a second  
16 subcommittee meeting and then also the full committee  
17 meeting with a letter for the final guidance. We expect  
18 to publish the final guidance in summer of next year and  
19 throughout the process we're going to continue our  
20 stakeholder engagement.

21 As I mentioned we have received very  
22 valuable feedback so far and so we want to continue to  
23 get that feedback. And we're planning a public meeting  
24 during the public comment period for NUREG-1927. And  
25 then we're going to continue to engage with industry on

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the development of NEI 14-03 which will be complementary  
2 guidance to NUREG-1927.

3 MEMBER CORRADINI: So can I ask my last big  
4 picture question. So this all sounds very good. So is  
5 there an overall roadmap so that this doesn't ten years  
6 from now come in conflict with wanting to move the things  
7 from dry cask to something else? What is the big  
8 picture plan on the regulatory side?

9 I know industry is developing one. Does  
10 staff, is staff developing something so that if I agree  
11 to let it be stored here I don't find that I've just  
12 created a problem because there is a limiting agent that  
13 has to be refurbished to get it from here to there? What  
14 is the picture plan or who is doing that in staff?

15 MS. BANOVA: Going from storage to  
16 transportation.

17 MEMBER CORRADINI: Well transport to  
18 somewhere else. I assume interim storage which is the  
19 current favorable option.

20 MS. BANOVA: And I think Al kind of  
21 alluded to it. So there's a separate effort to look at  
22 the, going from storage to transportation and maybe back  
23 to storage. And what would need, do we need to make any  
24 changes to the current framework?

25 You have your requirements of Part 72. You

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 have your requirements in Part 71 for transportation.  
2 But as you go from one phase to the next then maybe back  
3 to storage again as far as making that a smooth  
4 transition we were looking at that.

5 That's a separate effort. And we'll look  
6 at whether any changes are needed either to regulations  
7 or --

8 DR. CSONTOS: But we have considered it.  
9 We have considered it. In some of our deliberations on  
10 certain topics we have discussed them, you know, going  
11 to the ASME Code approach for degraded conditions.

12 Those can be ported over to, instead of  
13 taking the storage loads and seismic loads you take the  
14 transportation loads and you throw them in. Okay. So  
15 there are things that you can do that we are starting,  
16 okay, because of this potential interim consolidated  
17 storage application.

18 But those are things that for this group we  
19 have only touched on in some of our deliberations and  
20 discussions. So we don't impact that, what you're  
21 talking about.

22 But I think that the high burnup RIS, the  
23 high burnup fuel RIS worked by Meraj and Huda in our  
24 group, in our division would be I think valuable for you  
25 to see some of that discussion of how we are looking into

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that transportation piece as well because --

2 MEMBER CORRADINI: So I guess would end  
3 this way. The Chairman is the boss on this sort of  
4 stuff. But it seems to me that whenever you come back  
5 and discuss these things always, I would always present  
6 the big picture because I'm always worried about an  
7 interaction that we solved this local technical issue  
8 or at least agree to it and then somehow now you put  
9 yourself in a box for something that's bigger.

10 And I'm sure industry is worried about  
11 this. I assume staff is and has a plan. It would be  
12 nice to see the plan every time you return so that we  
13 understand how the plan is changing.

14 DR. CSONTOS: And the public is also  
15 concerned about that because the public also, they would  
16 not like to see the canisters on their sites for  
17 perpetuity because of a regulatory --

18 MEMBER CORRADINI: Maybe they would. But  
19 it's got to be a plan.

20 DR. CSONTOS: Well what I've heard from the  
21 public has always been we don't want something to stop  
22 it being able to be moved away some place. That's, you  
23 know, so that's what we have to be careful about in terms  
24 of what our guidance is.

25 MS. BANOVA: And then finally just to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 close I wanted to go over the agenda for the meeting.  
2 So we have made changes throughout NUREG-1927. So  
3 following my presentation Ricardo Torres will be  
4 providing an overview of the changes that we've made  
5 throughout NUREG-1927.

6 Those changes do include the development of  
7 these example Aging Management Programs for reinforced  
8 concrete, for canisters and also for high burnup fuel.  
9 And we included those example AMPs as an appendix to  
10 NUREG-1927.

11 And since that is the start of some further  
12 developments that Al will talk to at the end of the  
13 meeting, we thought to spend some time today giving an  
14 overview of those three example AMPs. So we'll have a  
15 presentation on each of those.

16 And then after the break we'll have  
17 Kristopher Kummings from NEI will present on the  
18 industry efforts to develop NEI 14-03. And then  
19 finally I think, Al, by the time we get to your  
20 presentation it will probably be all presented.

21 But Al will give his presentation on the  
22 other guidance that we are planning to develop in other  
23 work. So Al will be presenting that to close out our  
24 meeting. And so with that I know we've been asking  
25 questions throughout.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           But are there any other questions on sort  
2 of this broad overview? So, Professor Ballinger, it is  
3 okay to move on to the next presentation?

4           MEMBER BROWN: I guess I will ask one  
5 question since I was late and I apologize for that.  
6 Maybe this was overtaken by other questions. But when  
7 I was trying to find, when I was looking through this  
8 a little bit like Mike was there's a bunch of stuff  
9 stored in dry cask now.

10           Is there, and I was reading part of your  
11 slides here, is there something that assesses stuff  
12 that's been in storage in known condition for 30 or 40  
13 years or 30 years? We've had stuff out there for a long  
14 time and I just don't know how long they've been in  
15 casks, to then reassess those to see if they're suitable  
16 for additional periods of storage even at the same  
17 location.

18           Is that, the thought process is along but  
19 what is the big picture game plan for all the stuff? How  
20 do you handle stuff that's been sitting around for a long  
21 time?

22           Is it included in the reevaluations for  
23 just the basic storage not just necessarily  
24 transportation to some other site?

25           MS. BANOVA: Yes, so the renewal review is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 focusing just on storage and continued storage.

2 MEMBER BROWN: Including the cask or just  
3 the installation facility itself?

4 MS. BANOVA: I would say, so if it's a  
5 specific license for an ISFSI it's the installation  
6 itself and the system.

7 MEMBER BROWN: It does include the cask in  
8 the system, correct?

9 MS. BANOVA: Yes. And then the  
10 Certificates of Compliance would be just for that system  
11 and that design.

12 MEMBER BROWN: So there's a possibility  
13 you might have to take it, if you decide that those old  
14 casks are no good they would have to be taken out and  
15 put in new casks. Is that, that is a possibility?

16 MS. BANOVA: That could be a corrective  
17 action if there was any --

18 MEMBER BROWN: All right. I just wanted  
19 to make sure that was in the game plan, that was all.

20 MS. BANOVA: Yes, if there was aging or  
21 degradation where you could no longer use a canister or  
22 an overpack that could be one of the corrective actions,  
23 replacement.

24 DR. CSANTOS: We're in the early, early,  
25 early stages of that debate and that discussion

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 internally.

2 MEMBER BROWN: I was trying to figure out  
3 how you figure out whether they're okay or not since  
4 they're --

5 DR. CSONTOS: Well and that's part of what  
6 the future holds in terms of evaluating for degraded  
7 conditions and degraded state. We, it's too premature  
8 to talk about here at this point.

9 But it is something that we are taking into  
10 consideration and trying to figure out what that path  
11 is to get that 72 to 71 and 71 back to 72 space.

12 MEMBER REMPE: But there have been  
13 examples like out in Idaho where they detected some  
14 degradation and had to take corrective actions.

15 DR. CSONTOS: Correct. And you'll see  
16 that in the next or two slides from now.

17 MS. BANOVA: So if that is okay for now,  
18 okay. So our next presenter is Ricardo Torres and he'll  
19 be providing an overview of the changes in our draft  
20 Revision 1 to NUREG-1927. Ricardo.

21 MR. TORRES: Perfect. Thank you, Kris.  
22 Well good morning, Committee Members. Now that Kris  
23 has provided a good overview of our challenges and our  
24 updated renewal framework and how we're addressing that  
25 which Al Csontos will also speak to additional guidance

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 we'll be putting out.

2 I'll go straight into the specific changes  
3 that were incorporated in Revision 1 of NUREG-1927.  
4 Next slide please. So Slide 2 provides a general  
5 overview of the structure and format of Revision 1 of  
6 1927 which has stayed consistent with Revision 0.

7 Just, I'll point out that we've made  
8 changes to the 100 plus page guidance. But my plan  
9 today is to highlight some of the specific changes where  
10 the staff is seeking your feedback on.

11 Slide 3 please. The up front and general  
12 information chapters were revised to provide new  
13 definitions and clarify existing ones. We also revised  
14 them to ensure compliance with Part 72 and also the  
15 standard review plans for initial safety review update  
16 of the ISFSIs and storage cask systems, NUREG-1536 and  
17 NUREG-1567.

18 The staff also expanded guidance on  
19 application content, particularly for CoC renewals  
20 which was found lacking in Revision 0. A new section  
21 was also added to discuss timely renewal. And in this  
22 chapter we also provide guidance for the review of  
23 amendment applications submitted during the review of  
24 the renewal application as well as once the renewal has  
25 been issued.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           And we also provide a section on the use of  
2 conditions to ensure AMPs remain effective during the  
3 period of extended operation. Next slide please.

4           Chapter 2 discusses the scoping  
5 evaluation. The scoping evaluation is the process by  
6 which the applicant assesses and determines which SSCs  
7 are within the scope of renewal and need to be reviewed  
8 for degradation modes.

9           In this chapter we clarified sources of  
10 information that may be used for the scoping evaluation  
11 and the specific content that supports that evaluation.  
12 We also expanded guidance for the review of SCC  
13 subcomponents. We have an expanded discussion on fuel  
14 internals and additional clarification for identifying  
15 SSCs within the scope of renewal.

16           In this chapter we also provide guidance  
17 for ensuring that the reviewer is aware that exclusions  
18 from the scope of renewals should be properly justified  
19 in the application. Slide 5 please.

20           Chapter 3, this is pretty much the meat of  
21 the document. This is, was considerably revised.  
22 This is where the aging management review, the section  
23 on Time Limited Aging Analysis and Aging Management  
24 Programs is included.

25           The aging management review is a process by

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 which the applicant determines what are the applicable  
2 degradation modes to the specific SSCs within the scope  
3 of renewal and also identifies the aging management  
4 activities that will be used to handle those degradation  
5 modes. In this chapter we clarify the sources of  
6 information that may be used for identifying  
7 environmental data such that the operating in-service  
8 conditions of the SSCs can be properly determined.

9 Particularily for CoC renewals we  
10 emphasized that the reviewer should pay attention to all  
11 of the potential service environments where the dry  
12 storage system may be located when identifying these  
13 service conditions. And this could be done by the use  
14 of maintenance records, operating experience and so on.

15 The sections on the, the section on aging  
16 mechanisms and affects was also expanded to clarify  
17 valid sources of information that may be used to  
18 identify operable degradation modes including the use  
19 of site-specific and industry-wide operating  
20 experience, consensus code and standards as well as  
21 other applicable NRC guidance.

22 Slide 6. We also expanded discussion on  
23 aging management of fuel internals. We, this section  
24 was existing and we expanded it to address high burnup  
25 fuel. The section on Time Limited Aging Analysis was

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 also considerably revised. This was done to ensure  
2 consistency with the rule, Part 72.3 and also provide  
3 guidance to the reviewer for review of calculations and  
4 analysis not part of the approved design basis therefore  
5 not by definition TLAAs.

6 But these calculations could be submitted  
7 in support of the aging management review. As Kris  
8 alluded to or discussed we're seeking these Aging  
9 Management Programs, that they be learning so that they  
10 evaluate operating experience not just for the  
11 particular ISFSI but generic operating experience for  
12 the specific dry storage system as well as other dry  
13 storage systems using similar materials in similar  
14 environments.

15 We also expect AMPs to incorporate results  
16 from longer terms complementary research. So  
17 following this premise we expanded considerably the  
18 discussion on all ten AMP elements. These AMP elements  
19 mirror those of NUREG-1801, the generic aging lessons  
20 learned report for reactor license renewal.

21 In the section we clarify that monitoring  
22 and in-service inspections should include parameters  
23 capable of identifying degradation and that prior to a  
24 loss of intended function. And the use of these  
25 parameters should provide the technical basis,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 technically defensible criteria for why they were  
2 chosen and how they tied to the specific degradation  
3 mode.

4 CHAIRMAN BALLINGER: Okay. Now I have a  
5 question. What do you mean by loss of intended  
6 function?

7 MR. TORRES: So there are a series of  
8 intended functions for the system including  
9 subcriticality control, criticality control, shielding  
10 radiation, shielding structural support that must be  
11 maintained. Each of those SSCs when the application  
12 comes in the applicant identifies which are the intended  
13 functions that each SSC should maintain and what are the  
14 potential degradation modes that may affect.

15 CHAIRMAN BALLINGER: Is a barrier like  
16 stainless steel canister barrier, what do you mean by  
17 loss of intended function?

18 MR. TORRES: That would be confinement.

19 CHAIRMAN BALLINGER: Confinement, no  
20 leaks.

21 MR. TORRES: Yes.

22 DR. CSONTOS: There is a certain leak rate.

23 MEMBER CORRADINI: There's got to be a leak  
24 rate. It's not zero.

25 DR. CSONTOS: It's not zero, yes. It's a,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Joe, can you talk to what that leak rate is?

2 MEMBER CORRADINI: If I could just broaden  
3 Ron's question. What I guess I was expecting is there  
4 somewhere we could go look and see a list of design  
5 limits, leak rate, temperature, et cetera and I think  
6 that's where you were going.

7 CHAIRMAN BALLINGER: Well I think when  
8 they say leak rate they mean at closure time you seal  
9 it up and then you measure some kind of leak rate that's  
10 allowed.

11 MEMBER CORRADINI: But I assume there's  
12 also, I was looking in some of the pre-reading I was  
13 looking at some things. There were temperature  
14 observations, et cetera that they've got to maintain and  
15 check as time marches on, right?

16 CHAIRMAN BALLINGER: But I mean as aging  
17 occurs a through-wall crack, that is a violation of  
18 intended function.

19 DR. CSONTOS: As long as it's above the  
20 leak rate.

21 MR. BOROWSKY: This is Joe Borowsky,  
22 Division of Spent Fuel Management. It's important to  
23 recognize that the design basis has a certain leak rate  
24 associated with it. Oftentimes that will be some  
25 specific value or the generic leak type criteria.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           But even that has a certain value of what  
2           1 times  $10^{-7}$  ccs per second. So the system does have  
3           a leak rate associated with it.

4           CHAIRMAN BALLINGER: I guess what I'm  
5           trying to get at is that this, the Reg Guide is very,  
6           very good when it talks about operations-focused  
7           storage and tollgates and those kinds of things.

8           But is there, is it possible for a licensee  
9           to come in and take a risk-based approach to the license  
10          renewal that says okay, we're going to ensure that the  
11          probability of a perforation or a loss of intended  
12          function, that one of these things is less than x.

13          And we're going to demonstrate that it's  
14          less than x by a series of inspections and those kinds  
15          of things in the future. Is it possible for a licensee  
16          to take a risk-informed or risk-based approach?

17          MR. TORRES: We'd evaluate it. Yes, I  
18          mean there's nothing that I think --

19          CHAIRMAN BALLINGER: But it's not  
20          explicitly stated in the Reg Guide.

21          MR. TORRES: So that's I think where the  
22          discussion on TLAA comes in. The TLAA must have six  
23          criteria that must be met. On the last one we clarify  
24          that additional calculations and analysis could be  
25          provided in support of the, its criteria.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 CHAIRMAN BALLINGER: It sneaks up on it.  
2 But it doesn't explicitly say that this is an approach  
3 that could be taken.

4 MEMBER BROWN: I thought the NEI had some  
5 specific guidance relative to the alternate approaches  
6 could be submitted other than what's specified in the  
7 NUREG.

8 CHAIRMAN BALLINGER: Yes, but in the NUREG  
9 it says you can do whatever you want, but buyer beware.

10 MEMBER STETKAR: It's standard NRC  
11 guidance.

12 (Simultaneous speaking.)

13 DR. CSONTOS: Right. As long as you  
14 justify it and such this is one approach that you can  
15 take, what we're talking about here.

16 MR. LOMBARD: If I might say, Mark Lombard  
17 from DSFM, if you find something during an inspection  
18 it goes in a Corrective Action Program. Following the  
19 Corrective Action Program they would do the assessment  
20 evaluation against our requirements and determine if it  
21 passes or it doesn't pass.

22 And then if it doesn't pass they have to  
23 take mitigating measures at that point.

24 CHAIRMAN BALLINGER: But that's still  
25 deterministic.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MR. LOMBARD: Absolutely, yes. There is  
2 a, we haven't plugged into our regulatory framework yet  
3 a total risk-informed framework into it. But we're  
4 looking at that and now actually have a separate  
5 initiative to put that together over the next year or  
6 so.

7                   CHAIRMAN BALLINGER: So that's in the  
8 plan.

9                   MR. LOMBARD: Yes. Not specifically part  
10 of renewals but overall from a Part 72 standpoint to  
11 build a risk-informed framework.

12                  MR. TORRES: So in the section we also  
13 expand on, as I said on the other elements and we state  
14 that the acceptance criteria should be justified by  
15 operating experience, consistent codes and standards.  
16 And the application should justify this acceptance  
17 criteria is achievable and actionable based on the  
18 information provided in the other elements.

19                  We also clarified that the AMP should  
20 assess monitoring and inspection findings to clearly  
21 determine actions to be taken including prevention,  
22 repair, replacement and litigation. And the  
23 corrective actions should also be consistent with the  
24 quality assurance requirements in Part 50 Appendix B or  
25 Part 72, Subpart G.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   We also make it clear on the learning AMP  
2 section on the operating experience element that we  
3 expect applicants to commit to future reviews of  
4 site-specific as well as industry-wide operating  
5 experience.

6                   We wanted this proactive approach to ensure  
7 that as data from future inspections comes in as well  
8 as data from longer term complementary research data  
9 comes in that licensees and CoC holders will evaluate  
10 whether or not their existing Aging Management Programs  
11 or procedures for implementing those AMPs need to be  
12 revised based on the review of that operating  
13 experience.

14                   MEMBER SKILLMAN: Ricardo, going back to  
15 our prior discussion with Kris, is there anything in the  
16 update of the Reg Guide that points to either a  
17 suggestion or some form of verbal urging for timeliness  
18 for reporting for findings. Is there anything in there  
19 that says or that guides industry when you determine  
20 that there is a change or there is a finding of  
21 substance, it's recommended that you make a timely  
22 report 30 days like you do on the reactor side?

23                   MR. TORRES: So there are requirements in  
24 Part 72 that have a pretty high threshold for  
25 reportability. But as far as requirements for updating

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the NRC on whether or not they have reviewed this  
2 operating experience we're, we discussed this and we  
3 feel that the inspection procedure that AI will be  
4 talking about will provide further guidance to the  
5 actual inspectors when they go in to determine whether  
6 or not the licensees have properly done their reviews.

7 But the guidance here does not go into those  
8 specific details. It's, as you say --

9 DR. CSONTOS: It's a good comment about the  
10 timeliness of reporting. I think we'll have to take  
11 that into consideration.

12 I think the other answer to your question  
13 is that some of our AMPs don't, you know, what we've done  
14 so far is we've conditioned the licenses that we have  
15 approved for AMPs and not being able to change the AMPs  
16 which is different from what the reactors do because the  
17 reactors can go ahead and the reactor will, they can  
18 change AMPs quite often by themselves, okay.

19 But because of the limited data that we have  
20 from our personal experience we felt it important that  
21 we condition the license that if you want to change an  
22 AMP you need to come before us, okay. So that was a  
23 little bit of a tweak that we had between ourselves and  
24 the reactor side to get to your, some of your concerns.

25 So we know that if somebody wants to augment

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 their inspections they can do that. Okay, if they get  
2 OpE that says they need to shorten up their inspections  
3 that's one thing. But if they want to reduce it that  
4 is not going to be allowed unless they come before us.

5 MEMBER SKILLMAN: What I'm thinking is  
6 that Reg Guide compliance is voluntary, correct. So  
7 this is not a regulation.

8 DR. CSONTOS: Correct.

9 MEMBER SKILLMAN: It's basically a strong  
10 suggestion. And to industry's credit, industry wants  
11 to do the right thing because they have investment  
12 issues and they've got safety and they've got 10 CFR 20  
13 issues that they need to contend with.

14 At the same time, 72.48 lets the licensees  
15 change anything they want any time they want and not tell  
16 you.

17 DR. CSONTOS: And that's exactly why we did  
18 what we did for the conditions because that was a debate  
19 internally for a long time.

20 MEMBER SKILLMAN: If you want to have new  
21 information that helps everybody there needs to be some  
22 guidance that says, hey, team come on. Let us know or  
23 at least let your peers know so we are collectively  
24 getting smarter.

25 And unless that's embedded somehow in your

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Regulatory Guide you've probably missed an opportunity.

2 DR. CSONTOS: And that's where, it's a  
3 tough one for us because, like you said, this is  
4 guidance. We can't require the licensees and there's  
5 another nuance to this which is you have the CoC holders  
6 which are some of the vendors, okay.

7 And how does a Part 50 general licensee  
8 provide that information back to the holders and then  
9 disseminate it out everywhere? How do we get to those  
10 Corrective Action Reports? We see that as an  
11 inspection function, okay, an inspector is from a  
12 region.

13 That's part of what we're looking to  
14 augment in guidance space, in internal guidance space  
15 for our staff coming forward too. But that, your  
16 enforceability question and this how do you promulgate  
17 in getting some sort of hard and fast, that's one we've  
18 been discussing reporting requirements and such  
19 internally for a long time as well.

20 I think what we've gone to is going saying  
21 that the regional inspectors are going to need to go  
22 check that and we'll have to go and figure that out in  
23 terms of the next inspection guidance which I'm sure  
24 we'll come and talk to you about as well.

25 MEMBER SKILLMAN: Thank you.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER STETKAR: I think we have to be a bit  
2 careful because there's no requirement on the reactor  
3 side that operating experience needs to be either shared  
4 among reactors or reported to the NRC. We rely on the  
5 resident inspectors to, you know, discover things that  
6 have happened.

7                   We rely on INPO and, you know, various  
8 owners groups to share that information. But there is  
9 no, to my knowledge, there is no NRC --

10                  DR. CSONTOS: There is a requirement to  
11 report to us so much as I think to a certain safety  
12 threshold.

13                  MEMBER STETKAR: That's right, but that's  
14 based, yes --

15                  DR. CSONTOS: Because it goes to what Dr.  
16 Ballinger's comment was which is, you know, a  
17 through-wall leak, is it something that is  
18 safety-significant enough if there's no real release  
19 out to the public to warrant a report to us? The problem  
20 is it's a compliance issue so therefore it is.

21                  But for the reactor side leaks happen, you  
22 know, small leaks happen and they're not --

23                  MEMBER STETKAR: I mean it's part of, you  
24 know, the reactor oversight process. That's an  
25 inspection process.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: Correct. It's an INPO  
2 function and it's not, when it reaches a certain safety  
3 threshold then we get reports.

4 MEMBER SKILLMAN: 50.72 and 73 drive the  
5 reporting and the documentation. What I'm envisioning  
6 is the public's growing awareness of how much fuel is  
7 stored in ISFSIs and makes no difference what  
8 application you look at.

9 The public is learning, golly, here are all  
10 these things sitting out there and is this safe. And  
11 I think industry and the NRC need to be thinking we need  
12 to head this off at the pass. We need to be able to say  
13 we know how much fuel is there now, how much fuel is going  
14 to be there in the future, how it can be moved around  
15 and transported like Dr. Corradini said, how lessons are  
16 being shared throughout industry for how safe these  
17 casks are and if there are findings how those findings  
18 are communicated.

19 Now industry is working to take corrective  
20 action to protect this growing force of casks. The  
21 public has become aware of it. It's an issue at the  
22 Environmental agencies and a lot of places.

23 MEMBER RYAN: If I may add I think that  
24 leads to the question and what does the future hold in  
25 terms of its reliability as we go forward.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MEMBER SKILLMAN: And that's --

2 MEMBER RYAN: For ten years, 50 years.

3 MEMBER SKILLMAN: And that's where the  
4 lessons on the AMPs are so important.

5 DR. CSONTOS: We have well-informed  
6 members of the public who are well aware of this and well  
7 aware of the concerns of degradation and reliability and  
8 maintenance and inspection issues, all these things  
9 that they are well aware of and we are too. So we're  
10 trying to get there.

11 MEMBER STETKAR: On the other hand, you  
12 know, the risk is, well this is zero. The public also  
13 needs to be aware that the NRC will focus its efforts  
14 on areas of higher risk and that --

15 MEMBER SKILLMAN: And that's appropriate.

16 MEMBER STETKAR: Indeed I, you know, I live  
17 under an air traffic control pattern and there's some  
18 likelihood that a plane is going to whack me some day.  
19 But I don't particularly worry about that. I'm aware  
20 of it.

21 MEMBER CORRADINI: I think all that Dick is  
22 saying I mean I appreciate and agree with what you are  
23 saying. But I don't think the perception is equal. So  
24 I think to the extent that it's a holistic approach on  
25 how you're doing that I think it's to the staff's benefit

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 now because I'm sure industry is aware of this and are  
2 thinking about it.

3 But staff has got to, I guess I think Dick's  
4 point at least to think about it and have it connected.

5 DR. CSONTOS: Risk is a, is something we're  
6 thinking about.

7 MEMBER CORRADINI: The public doesn't view  
8 this risk like other risks. Whether or not we agree  
9 with that they just don't.

10 MEMBER POWERS: The trouble is we do look  
11 at risk.

12 MEMBER CORRADINI: I understand that.  
13 But it's the perception of risk as well as the risk  
14 itself.

15 MEMBER POWERS: The trouble with the  
16 perception of risk. We look at risk. And we are  
17 creating a structure that's very parallel to what we do  
18 in aging management of reactors. And it looks like it's  
19 completely out of proportion to what the risk is.

20 MEMBER CORRADINI: How do we square that?

21 CHAIRMAN BALLINGER: That's why I keep a  
22 little bit focusing on this risk-informed and risk-  
23 based approach to this problem might yield some  
24 information that we don't have right now.

25 MEMBER STETKAR: Well on the other hand you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 can also take the position that this does not preclude  
2 the industry coming in with a risk-informed approach and  
3 saying consider this. You know, if the industry feels  
4 that this approach is too onerous.

5 DR. CSONTOS: Well and you'll hear from --

6 MEMBER STETKAR: Let folks take the lead  
7 and --

8 DR. CSONTOS: Right. And you'll hear from  
9 both the folks here. You know, we are well aware of the  
10 risks and associated risks. So you'll see that some of  
11 the requirements that we have made or some of the  
12 suggestions that we have made for inspections and such  
13 is not on the par of a Class 1 pipe, okay, or a Class  
14 1 system in a reactor.

15 You'll see that it's commensurate with a  
16 lower threshold.

17 MEMBER POWERS: But we still invoke  
18 Appendix B. Have we ever shown that Appendix B does us  
19 any good, that Appendix B does any good?

20 DR. CSONTOS: It's well before my time here  
21 and it's a criteria that's for quality assurance that  
22 is maintained throughout the nuclear industry and it's  
23 served us well I think. So for me to make a judgment  
24 on that now I can't do that.

25 MEMBER POWERS: I mean it seems to me this

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 is a good place to try to make that judgment.

2 CHAIRMAN BALLINGER: But we're getting  
3 into a region here again I think what we're thinking  
4 about is where the degradation and the progression of  
5 the degradation is inherently probabilistic and not  
6 verifiable. With Section XI you go and look at the  
7 pipe, you get at it and you actually characterize the  
8 defects and then you take action based on those defects.

9 In this case it's entirely possible that  
10 you can't characterize the defects to the degree that  
11 you can with a Section 11 inspection and you can't  
12 characterize the going forward propagation of that  
13 defect to a degree that you can say, okay, this is it.  
14 So that's I think where we're going.

15 MR. LOMBARD: If I may, Mark Lombard here.  
16 I think you can't say today that we have the technology  
17 to actually identify let's say for a stainless steel  
18 canistered system which I know you're very familiar  
19 with.

20 But we're pushing industry to develop those  
21 technologies and the inspection methods and techniques  
22 to, going forward to be able to identify those  
23 technologies.

24 CHAIRMAN BALLINGER: My problem is that if  
25 you had 100 percent reliability on inspection that is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 to say you could characterize whatever defect it is to  
2 whatever precision that you want, the inherent nature  
3 of the propagation of those defects is such that you  
4 can't predict what's going to happen because there's a  
5 distribution.

6 MR. LOMBARD: Yes, I understand.

7 CHAIRMAN BALLINGER: Okay, that's --

8 MEMBER CORRADINI: But you're also saying  
9 that in some cases you can inspect.

10 CHAIRMAN BALLINGER: Well you, it depends  
11 on how much money you want to spend. You're right.  
12 They're doing an admirable job, a really good job of  
13 developing techniques of industry and everything to try  
14 to get at this.

15 But the very nature of the propagation  
16 process doesn't adhere itself to the kind of  
17 predictability that you might need. It could be a  
18 Friday weld, a Monday weld, who knows.

19 DR. CSONTOS: There are a lot of parameters  
20 that come into play.

21 CHAIRMAN BALLINGER: Yes, a lot of  
22 parameters.

23 DR. CSONTOS: And the same thing comes with  
24 a through-wall, if there is a through-wall crack there  
25 are things that we would have to try to ascertain to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 understand the risk. And that's where, you know,  
2 that's, you open up a large box if we go down that path  
3 of trying to evaluate what happens from a through-wall  
4 crack.

5 On our side we would prefer that we don't  
6 have to do that. I think that industry prefer we don't  
7 go through all that and its guidance and our  
8 requirements that we're trying to create here are such  
9 that we don't get a through-wall crack.

10 CHAIRMAN BALLINGER: I guess again, for  
11 the last, in this case the wish is not always the deed.

12 DR. CSONTOS: Correct. And that's, that  
13 was the details. So we'll get into that I think at a  
14 later point.

15 MR. TORRES: So just to continue, next  
16 slide please. So again in Chapter 3 we also include a  
17 discussion of some specific concepts of NEI 14-03 that  
18 the staff found complementary to this learning AMP  
19 approach.

20 Specifically the use of tollgates which are  
21 additional assessments to DOE's HBU report of the  
22 Quality Assurance program that we'll evaluate for new  
23 information coming in. NEI 14-03 also describes a  
24 general framework for the aggregation and dissemination  
25 of operating experience that we see immense value to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that as well.

2 We, what we have done in NUREG-1927 is  
3 obviously better in the perspective of the reviewer and  
4 get some guidance for the potential review of that  
5 information if it comes in, in an application. We  
6 haven't yet endorsed NEI 14-03.

7 Finally, in Chapter 3 we found redundancy  
8 between the retrievability section and the expanded  
9 section on fuel internals and the Scoping and Relation,  
10 Chapter 2 and the Aging Management Review, Chapter 3.  
11 So we consolidated those details.

12 MEMBER SKILLMAN: So retrievability is in  
13 or out? It's just changed in location or it's out all  
14 together?

15 MR. TORRES: It's, retrievability still is  
16 defined in the definition section as an intended  
17 function. But it's, as far as the details of what  
18 regulations ensure retrievability, those are already  
19 discussed in Chapter 2 and Chapter 3.

20 So that information just seemed to be  
21 somewhat off. Also the way that we write our SCR it  
22 follows the format of 1927 so that the way that works  
23 is when you get to the spent fuel assemblies that's  
24 discussed in the Aging Management Review that's  
25 discussed in the scoping and relation and compliance

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 with those regulations is addressed there.

2 So it just seemed it was a superfluous  
3 section to have also in the SCR because it's already  
4 addressed in both the scoping and relation and the aging  
5 management review.

6 MEMBER SKILLMAN: It's still in. Thank  
7 you.

8 CHAIRMAN BALLINGER: I'm reminded by Kris  
9 that there's some ongoing discussion about changing the  
10 retrievability criteria based on the fact that we don't  
11 have Yucca Mountain. There's a lot of things that are  
12 going on.

13 DR. CSONTOS: The debate internally right  
14 now is to discuss whether or not they should be on a  
15 canister basis or a fuel assembly basis.

16 MEMBER CORRADINI: But I mean, this goes  
17 back kind of going toward what Dick said and Dana said  
18 and Ron, which is it strikes me that with all due  
19 compliments to the staff, you're looking at this and  
20 you're doing this really well.

21 But I am trying to look at this and work from  
22 that down so that you don't over engineer this and then  
23 something over here that's, is going to get you later.  
24 And I still don't sense that.

25 DR. CSONTOS: Well we're not, we're a in a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 very high flux period right now. And things are moving  
2 and such that we are evaluating various pieces of this.  
3 You're only seeing one piece of it. There's the high  
4 burnup piece, the whole Regulatory Commission summary  
5 about storage and transportation.

6 There's discussion about changing some of  
7 the other SRPs as well. And also the retrievability  
8 debate and discussion of the paper that's going up that  
9 we're thinking about, we have a team right now looking  
10 at this retrievability issue.

11 MEMBER CORRADINI: So maybe looking at  
12 this paper will help us understand the big picture.

13 DR. CSONTOS: I think maybe we need to come  
14 before you, maybe think about a bigger picture type of  
15 discussion about where we see this whole area moving  
16 forward.

17 MEMBER CORRADINI: Because what Ron is  
18 getting at, which actually would link up with Dick and  
19 Dana, is that if I look at the big picture and I find  
20 the big picture has a certain level of risk that is not  
21 as big as one would expect but you've to do it  
22 holistically, then you might offer some risk-informed  
23 analysis or you would allow for the industry to be  
24 somewhat creative or innovative in how they do it  
25 because the long-term solution eventually is what's

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 going to dictate this.

2 It's not going to be the ten year or the 20  
3 year solution.

4 CHAIRMAN BALLINGER: By the way we're  
5 running the risk of getting way behind.

6 MR. TORRES: So as you all are aware there  
7 were five appendices in Revision 0 of 1927. Out of  
8 these appendices in Revision 1 we only retained Appendix  
9 A on Non-Quantifiable Terms as is.

10 We moved those appendices that the staff  
11 determined that added minimal value to the review  
12 process based on the experience that we had with the  
13 previous applications. However, we replaced those  
14 appendices with new information. Appendix B includes  
15 the three example Aging Management Programs which will  
16 be discussed later this morning.

17 These example AMPs essentially represent a  
18 start to additional guidance that is on the works which  
19 will take form in a separate report in the style of  
20 NUREG-1801, Generic Aging Lessons Learned report for  
21 dry cask storage. Appendix C provides an expanded  
22 discussion on lead system inspections.

23 ISG-24, which was issued last year,  
24 provides guidance for the use of a high burnup fuel  
25 surveillance program for monitoring fuel performance

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 during the period of extended operation. That has been  
2 incorporated in Appendix D.

3 Appendix C provides additional  
4 considerations for CoC renewals and it, this appendix  
5 clarifies the responsibilities of general licensees to  
6 the applicants, generally the CoC holders. And  
7 Appendix F provides a flow chart for calculating storage  
8 terms of dry storage systems.

9 Appendix C, as I said, is only a discussion  
10 that expands on Appendix E in Revision 0. That is, has  
11 been renamed to address what we now call a lead system  
12 inspection. We clarify what's the purpose of that  
13 inspection. How do you, generic guidance for selection  
14 of systems realizing that multiple systems may need to  
15 be inspected to capture variations in designs, loadings  
16 applicable degradation modes.

17 We also provide generic guidelines for  
18 conducting the lead system inspection itself. We  
19 provide reviewer guidance on the use of surrogate  
20 inspections and we have an additional section on  
21 considerations for CoC renewals and more specifically  
22 the implementation of baseline inspections by all  
23 general licensees.

24 We hope that this, the information in this  
25 appendix will be useful to applicants for conducting

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 these inspections and understanding what the NRC staff  
2 looks for when evaluating data and results from such  
3 inspections. Next slide please.

4 CHAIRMAN BALLINGER: In the text of the  
5 document it gives, when it talks about the lead system  
6 inspection it implies, it gives some criteria hottest,  
7 highest burnup, highest temperature, et cetera. And I  
8 think the words highest temperature are actually in  
9 there.

10 But in fact the selection of the lead  
11 canister should be the one that has the highest  
12 probability of compromising its intended function and  
13 highest temperature isn't necessarily that one.

14 DR. CSONTOS: That's one of the major  
15 reasons why we changed this area because that --

16 CHAIRMAN BALLINGER: Some wording in  
17 there, you would think that some wording needs to be put  
18 in there that would imply that it's the highest  
19 temperature one or in other words --

20 MS. BANOVA: I think that was in Rev. 0.  
21 Yes, so in Rev. 1 we kind of completely revamped this  
22 discussion, lead system inspection.

23 DR. CSONTOS: Right. So Rev. 0 had the  
24 highest temperature, hottest canister and that was  
25 fundamentally, you know, not correct. It was flawed.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   CHAIRMAN BALLINGER: Okay. I thought I  
2 was reading Rev. 1 last night.

3                   DR. CSONTOS: We took that issue to heart  
4 and revised it to be more, looking at it from a larger  
5 perspective.

6                   MR. TORRES: Next slide please. So  
7 Appendix C, as I said, provides clarification, provides  
8 additional information for considerations on CoC  
9 renewals. Who is responsible for developing the TLAAs  
10 and AMPs? The AMPs are implemented and in citing the  
11 applicable regulations and also discussing the use of  
12 72.212 reports or documenting compliance with aging  
13 management activities.

14                   Next slide please. Appendix F, as I said,  
15 provides a flow chart for calculating storage terms of  
16 dry storage systems loaded during either the initial  
17 storage period or during the renewal period. And we  
18 hope that this appendix will help clarify the timing for  
19 implementing aging management activities for general  
20 licensees.

21                   And this concludes my overview of changes  
22 to 1927 Revision 1. I'll address any additional  
23 questions you may have.

24                   CHAIRMAN BALLINGER: You're still on.

25                   MS. BANOVA: Okay. So no further

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 questions we'll move on. And let me just pull up,  
2 Ricardo is also going to present the next talk. Just  
3 give me one moment here. And this will be the example  
4 AMP for reinforced concrete structures. All right,  
5 Ricardo.

6 MR. TORRES: Thanks, Kris. So as I said in  
7 Appendix B we've incorporated three example Aging  
8 Management Programs to provide additional guidance for  
9 licensees on what we look for when evaluating AMPs.

10 One of these AMPs is for reinforced  
11 concrete structures which will be the focus of this  
12 talk. Slide 2 please. The AMP for reinforced concrete  
13 structures was developed based on guidance in consensus  
14 codes and standards as well as NUREG reports including  
15 ACI 349.3R, Evaluation of Existing Nuclear  
16 Safety-Related Concrete Structures, ASME Code Section  
17 XI, Subsection IWL, Requirements for Class CC Concrete  
18 Components of Light-Water-Cooled Plants, in NUREG-1801  
19 the GALL Report for reactor license renewal.

20 We clarify that an applicant is, in the  
21 initial guidance an applicant can propose AMPs based on  
22 alternate criteria. These are not requirements by  
23 itself. We are looking for that exclusions of aging  
24 effects and mechanisms be properly justified with a  
25 technical basis based on site-specific or industry-wide

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 operating experience as well as engineering analysis.

2 Also the justification should demonstrate  
3 the degradation mode will clearly not affect the ability  
4 of the SCC within scope of renewal from performing its  
5 intended function. Slide 3 please. So Slide 3  
6 provides a list of aging mechanisms and effects covered  
7 by this AMP.

8 These are consistent with ACI 349.3R, ACI  
9 201.1R, which is ACI Guides for Conducting a Visual  
10 Inspection of Concrete In-service and the American  
11 Society of Civil Engineers Code 11 which is the  
12 Guidelines for Structural Condition Assessment of  
13 Existing Buildings.

14 These include degradation due to  
15 freeze-thaw, aggressive chemicals, aggregate  
16 reactions, corrosion of steel reinforcement, bleaching  
17 of calcium hydroxide, long-term settlement,  
18 irradiation and thermal desiccation. Slide 4 please.

19 And Item 1 of the AMP identifies the scope  
20 of the program. The AMP includes visual inspection of  
21 services, which is a condition monitoring activity. It  
22 includes a groundwater chemistry program for mitigating  
23 effects due to an aggressive water environment which  
24 include corrosion of reinforcement steel and chloride  
25 or sulfate induced degradation.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           It includes periodic radiation surveys, a  
2 performance monitoring activity and continuance of  
3 daily inspection of the vents or inlet and outlet vents  
4 that provide passive cooling to the system to ensure  
5 that the design basis temperature limits are not  
6 exceeded due to reduced convection.

7           Item 2 of the AMP identifies the preventive  
8 actions. The AMP does not require additional  
9 preventive actions for structures designed and  
10 fabricated in accordance to ACI 318, Code Requirements  
11 for Structural Buildings and ACI 349, Code Requirements  
12 for Nuclear Safety-Related Concrete Structures.

13           Next slide please. Item 3 identifies the  
14 parameters monitored or inspected. For additional  
15 inspections this should be able to quantify the aging  
16 effects of cracking, material loss, loss of bond and  
17 increased porosity and permeability.

18           The groundwater chemistry program monitors  
19 for pH and concentration of chlorides and sulfates as  
20 part of the mitigative actions. The irradiation  
21 service monitor for gamma dose and neutron fluence.  
22 And finally, inspections of the air inlet and outlet  
23 vents monitor for blockage that may lead to the design  
24 temperature limits being exceeded.

25           Next slide please. Item 4 the AMP

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Detection of Aging Effects. On this AMP the detection  
2 of aging effects provides the details of the when, where  
3 and how of the AMP. The specific aspects of the aging  
4 management activities for collecting data for  
5 evaluation.

6 In this element we clarify in NUREG-1927  
7 that we're looking for information about the method or  
8 technique to be used, the frequency of inspection,  
9 sample size, data collection and the timing of these  
10 inspections for monitoring activities. Visual  
11 inspections in this AMP rely on visual methods  
12 consistent with ACI guidance or a site-qualified system  
13 for remote inspections which is able to meet the  
14 acceptance criteria in the AMP.

15 Visual inspections include a base line  
16 inspection prior to entering the period of extended  
17 operation which provides the basis for monitoring and  
18 trending. And the inspection schedule is commensurate  
19 with ACI 349.3R, Chapter 6.

20 The areas of examination include all areas  
21 or as justified according to accessibility and previous  
22 operating experience. The AMP should clearly define  
23 accessible versus inaccessible areas and the respective  
24 sample sizes and data collection for visual inspections  
25 should be commensurate with applicable codes, standards

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and reports, ACI codes.

2 Next slide please. The groundwater  
3 chemistry program uses an analysis method able to meet  
4 the acceptance criteria and radiation surveys and  
5 performed using a calibrated detector with valid energy  
6 range. Both of these aging management activities  
7 include base line measurements prior to entering the  
8 period of extended operation and similar to visual  
9 inspections the sample size should clearly be  
10 identified by the applicant with specific locations or  
11 a process for identifying specific locations where  
12 measurements will be taken.

13 The method of inspection of air inlet and  
14 outlet vents is through visual observation and the  
15 sample size is defined in the technical specification  
16 documenting the specific requirement. Next slide  
17 please.

18 In NUREG-1927 Revision 1 we emphasize that  
19 monitoring and trending should provide for an  
20 evaluation of the extent of the effects of aging and the  
21 need for timely corrective actions. This AMP  
22 describes, the AMP should describe how the data will be  
23 collected and evaluated.

24 This includes an evaluation of the results  
25 against the acceptance criteria and an evaluation

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 regarding the rate of the degradation to ensure that the  
2 timing of the next inspection will occur before there's  
3 a loss of intended function. In this specific AMP the  
4 methods for monitoring and trending should be  
5 commensurate with ACI codes and standards which have  
6 been listed in Appendix B.

7 Slide 9 please. In NUREG-1927 we also  
8 clarify that the acceptance criteria again should  
9 ensure that the SCCs intended functions are maintained  
10 for the renewal period. The proposed acceptance  
11 criteria should be justified by operating experience,  
12 engineering analysis or the use of consensus codes and  
13 standards.

14 And that's the approach that this AMP  
15 follows. The acceptance criteria is commensurate with  
16 ACI 349.3R-02 criteria. Acceptance, that three-tier  
17 criteria acceptance without further evaluation,  
18 acceptance after review and acceptance requiring  
19 further evaluation.

20 We look for the applicant to define when a  
21 finding is to be entered in the Corrective Action  
22 Program in the acceptance criteria element. For  
23 example if tier two criteria is exceeded, it's not met,  
24 that's when the Corrective Action Program would be  
25 triggered. Those details we're looking for on the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 application.

2 Next slide please. With the groundwater  
3 chemistry program the acceptance criteria is  
4 commensurate with ASME Code Section IX, Subsection IWL  
5 which defines an aggressive below-grade environment  
6 which is defined as pH lower than 5.5, chlorides  
7 exceeding 500 parts per million or sulfates exceeding  
8 1,500 parts per million.

9 Radiation surveys should be performed to  
10 ensure compliance with 72.104 and the adequacy of the  
11 acceptance criteria at or near overpack locations  
12 should clearly consider the design basis calculation  
13 documented in the FSAR. And the acceptance criteria  
14 again for air inlet and outlet vents the absence of any  
15 blockage that may lead to design temperature limits  
16 being exceeded.

17 Next slide please. Timely corrective  
18 actions including root cause determination and  
19 prevention of recurrence for significant conditions  
20 adverse to quality are critical for maintaining the  
21 intended functions of the SSCs. The corrective actions  
22 taken in the program again are consistent with Part 72,  
23 Subpart G, Part 50 Appendix B, security program  
24 requirements.

25 And the existing Corrective Action Program

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 provides for the assessments listed in this slide. In  
2 the interest of time I'll skip through them. But the  
3 AMP, at this specific AMP references applicable  
4 concrete rehabilitation standards.

5 ACI has put guidance which is, has been  
6 referenced in Appendix B. And we look for referencing  
7 of some of those codes in this specific element. Next  
8 slide please.

9 The confirmation process which is Element  
10 8 of an AMP is intended to verify that preventive actions  
11 are adequate and that appropriate corrective actions  
12 have been completed and are effective. Administrative  
13 controls, Element 9, provide a formal review and  
14 approval process for activities performed under an AMP.

15 Both the confirmation and administrative  
16 controls should be commensurate with the QA program.  
17 Again, Part 72 as well as Part or Part 50 depending on  
18 the licensee, the QA Program again ensures that the  
19 precluding of repetitions of significant conditions  
20 adverse to quality.

21 And the QA Program also ensures that  
22 administrative controls include provisions that  
23 defined inspector requirements, instrument calibration  
24 and maintenance, record requirements, record retention  
25 requirements and documented control. Next slide

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 please.

2 Operating experience you see is in  
3 providing justification for the effectiveness of each  
4 AMP program element. And it also provides critical  
5 feedback for enhancement of the aging management  
6 activities.

7 The operating experience cited in the AMP  
8 should support the determination that the effects of  
9 aging will be adequately managed for, to maintain the  
10 SSC intended functions. And this AMP should review  
11 applicable operating experience including internal and  
12 industry-wide condition reports, Corrective Action  
13 Reports, vendor issued safety bulletins, NRC  
14 information notices as well as other applicable  
15 industry initiatives.

16 For example the, any additional  
17 EPRI-sponsored inspections. Degradation in the  
18 referenced AMP should clearly identify the degradation  
19 as either age-related or event-driven and should  
20 provide some justification for that assessment so that  
21 it's put into perspective for the upper coordinates of  
22 the AMP.

23 So this finalizes just my overview of the  
24 concrete AMP in Appendix B. I would be glad to answer  
25 questions.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER SKILLMAN: A question back on your  
2 Slide 12, Subpart G in Appendix B, 50 are clones.  
3 They're basically the same guidance. Not mentioned in  
4 your bulleted presentation here is configuration  
5 control.

6                   And would it be fair for us to assume that  
7 since you're citing Part 50, Appendix B, that this is  
8 a partial listing on this slide and that configuration  
9 control is also part of this?

10                  MR. TORRES: Yes.

11                  MEMBER SKILLMAN: Okay, thank you.

12                  MR. TORRES: And if it's not listed in 1927  
13 we can expand on that.

14                  MEMBER SKILLMAN: Thank you.

15                  CHAIRMAN BALLINGER: Any questions on  
16 this? Darrell, I think.

17                  MS. BANOVA: Yes, let me just pull up the  
18 next presentation. So our next presenter will be  
19 Darrell Dunn. He'll be presenting the example AMP for  
20 localized corrosion and stress corrosion cracking over  
21 canisters. So, Darrell.

22                  MR. DUNN: Okay, thank you. So 1927  
23 Revision 1, Appendix B contains an example AMP for  
24 localized corrosion and stress corrosion cracking of  
25 welded stainless steel dry storage canisters which we

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 have identified in this revision of 1927 as a potential  
2 aging effect that may affect canisters in some  
3 environments largely based on operating experience with  
4 operating reactors.

5 I'll also mention that we've had the  
6 opportunity to come before the ACRS and including this  
7 subcommittee I believe and we've had some discussions  
8 with respect to this potential aging mechanism and got  
9 many, those discussions have been beneficial. And  
10 finally I'll just point out before I start we're  
11 continuing to, our evaluation of this as a potential  
12 aging mechanism for the stainless steel canisters and  
13 we look forward to your feedback.

14 Okay. So the basis for development, this  
15 example AMP is based on a consensus code and standard  
16 and we used in the development of this example AMP the  
17 ASME boiler and pressure vessel code, Section XI which  
18 is Rules for In-service Inspection of Operating and  
19 Nuclear Power Plant Components because at this time  
20 there is no equivalent Section XI requirement for dry  
21 cask storage systems.

22 But, well I'll address that in a later  
23 slide. That, the use of Section XI is identified in  
24 NUREG-1801, the GALL Report as being effective in  
25 monitoring or effective in managing aging effects for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 operating nuclear power plant components.

2 That said, we recognize that  
3 chloride-induced stress corrosion cracking is a complex  
4 process with multiple dependencies including residual  
5 stress, controls how fast and far a crack might  
6 propagate. The operating environment which controls  
7 what type of atmospheric deposits get put on the  
8 canister.

9 And there could be local variations and  
10 seasonal variations in environmental conditions that  
11 are important to consider and also canister temperature  
12 which is a function of the design, the loading of the  
13 canister and of course time. And that also has a big  
14 effect with the operating environment and the residual  
15 stress in terms of what we could potentially expect for  
16 localized corrosion and stress corrosion cracking  
17 initiation and propagation.

18 So next slide please. So the next ten  
19 slides I'm just going to walk through a high level  
20 summary of the example Aging Management Program. So  
21 the first element of the AMP is the scope of the program.  
22 And the scope of the program here is essentially  
23 in-service inspection for localized corrosion and  
24 stress corrosion cracking on welded stainless steel dry  
25 storage canisters.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   We focused the scope of this program to  
2 areas of the canisters where we believe that localized  
3 corrosion would be, and stress corrosion cracking would  
4 be more likely to occur. So this includes fabrication  
5 and closure welds, the heat affected zones of those  
6 closure welds and fabrication welds, potentially  
7 locations where temporary supports or fixtures are  
8 attached by welding and then subsequently removed, if  
9 those processes have resulted in a significant change  
10 in the residual stress or a micro-structure in those  
11 locations.

12                   We know that crevices can be locations  
13 where chlorides can concentrate and localized corrosion  
14 can initiate. Horizontal surfaces tend to be surfaces  
15 where atmospheric deposits can accumulate and then of  
16 course surfaces that have lower than average  
17 temperature may be areas where localized corrosion or  
18 stress corrosion cracking initiates sooner than the  
19 average locations on the canisters.

20                   Okay, so maybe back up, I do want to  
21 point out that we don't expect that localized corrosion  
22 by itself will be a degradation mechanism that could  
23 threaten the confinement boundary of the canister. But  
24 we also recognize that it's a potential location for  
25 which SCC can initiate and so that's why we're

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 interested in looking at that particular degradation  
2 mechanism along with stress corrosion cracking.

3 MEMBER RICCARDELLA: Pitting and  
4 localized corrosion.

5 MR. DUNN: Pitting and crevice corrosion.  
6 Okay. So AMP Element 2 is Preventative Actions. This  
7 example AMP is a condition monitoring AMP and so at  
8 present we recognize that preventative actions are not  
9 presently incorporated into existing dry canister  
10 storage system designs.

11 But we also understand that future designs  
12 or amendments could include different preventative  
13 actions such as surface modifications to impart  
14 compressive residual stresses on welds and weld heat  
15 affected zones or the use of materials with improved  
16 localized corrosion and stress corrosion cracking  
17 resistance.

18 Next slide. So the AMP Element 3 is  
19 Parameters Monitored or Inspected. This is, we have  
20 identified here as the canister surfaces, the welds, the  
21 weld heat affected zones or discontinuities and  
22 imperfections which is language that is consistent with  
23 ASME Section XI.

24 Specifically we would be looking for areas  
25 that, where localized atmospheric deposits can

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       accumulate on the canister surfaces and indications of  
2       potential corrosion products on the canister surfaces.  
3       That type of examination could be conducted using a  
4       visual inspection which I'll get into in the next slide.

5                 However, the size and location of localized  
6       corrosion such as the size of pitting corrosion or  
7       crevice corrosion or stress corrosion cracking would  
8       likely require some other more complicated examination  
9       method such as a surface or volumetric method.

10                AMP Element 4 is Detection of Aging  
11       Effects. And what we've identified here in the example  
12       AMP is a qualified and demonstrated technique to detect  
13       evidence of localized corrosion and stress corrosion  
14       cracking. We've taken sort of a hybrid approach to  
15       doing this.

16                We know that remote visual inspection has  
17       been used in previous canister inspections and we know  
18       that remote visual inspection has been able to identify  
19       areas on canisters where there has been iron  
20       contamination and subsequently corrosion of that, there  
21       was iron contamination on the surfaces. And so  
22       corrosion products were identified on the canister  
23       surfaces even though corrosion of the canister itself  
24       was not occurring.

25                In addition, some of the testing that we've

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 conducted indicates that when we get conditions where  
2 cracking can occur we also get pitting to occur, we get  
3 the formation of corrosion products which are very  
4 readily visible using visual methods. If those were to  
5 be identified in a remote visual inspection then the  
6 suspected areas, areas with corrosion products, those  
7 areas would need to be, undergo some additional  
8 evaluation and that would likely again have to be done  
9 with some type of volumetric to determine or to  
10 characterize in size the nature of those areas.

11 CHAIRMAN BALLINGER: Okay. This is a very  
12 weighty sentence which the devil is definitely in the  
13 details and the wish is not the deed. Is there a  
14 qualified and demonstrated technique to detect evidence  
15 of localized corrosion in the canister, in the  
16 configuration itself?

17 MR. DUNN: By visual methods there have  
18 been the, so for example the Calvert Cliffs inspection  
19 was done using a system that's capable of an EVT-1  
20 inspection which can detect localized corrosion, the  
21 initiation of localized corrosion. Okay, so it's very  
22 capable for doing that.

23 CHAIRMAN BALLINGER: Evidence of  
24 localized corrosion.

25 MR. DUNN: Yes.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   CHAIRMAN BALLINGER:    Okay.    Let's give  
2                   the fact, okay, so we have evidence.    If we have  
3                   evidence then what do we do?    Is there another technique  
4                   that's coming down the pike that's, has to be much higher  
5                   resolution than these that can actually characterize  
6                   it?

7                   And if we characterize it and say okay, yes,  
8                   there's a crack.    It's half an inch deep.    Now what  
9                   happens?

10                  MR. DUNN:        Okay.    I'll get into the  
11                  acceptance criteria to address the crack.    But the  
12                  answer to your first part of the question is there a  
13                  technique coming down the line, yes, we hope so it's  
14                  coming down the line.    Has it been demonstrated today,  
15                  no.

16                  MEMBER RICCARDELLA:    I mean Eddy current  
17                  could certainly find it.

18                  MR. DUNN:        Eddy current could certainly,  
19                  well I qualified it by saying in the configuration that  
20                  we have in the, for the canisters with the shield and  
21                  everything.

22                  DR. CSONTOS:        But there are, so EPRI  
23                  through the industry has, they are working on it.    They  
24                  are developing and I know Eddy current is one of the ones  
25                  that they are focusing, I know vendors are focusing on

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 it.

2 Eddy current is one that they're really  
3 focusing on from the industry point of view to address  
4 this particular subject. So it was sizing, things like  
5 that because two stages and Darrell will get into it,  
6 two stages, detection, sizing. Two different pieces.

7 CHAIRMAN BALLINGER: And disposition.

8 DR. CSONTOS: And disposition. That's  
9 the assessment piece. That's Section XI that we're  
10 talking about.

11 MR. DUNN: So but to be clear that is the  
12 volumetric, any volumetric or even surface examination  
13 of the canister using Eddy current for example, is  
14 something that has to be developed. Okay. We can do  
15 the remote visual inspection of a large fraction of the  
16 canister surface can be done using existing technology.

17 And we have pretty high confidence that if  
18 there is areas of localized corrosion from which stress  
19 corrosion cracking can initiate those can be detected.  
20 You've got to keep in mind that this is a very different  
21 process from something that's completely immersed in  
22 solution.

23 Those corrosion products don't get to get  
24 transported away. There's no solution there. So they  
25 stay there on the surface and they're --

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: That's the --

2 MEMBER RICCARDELLA: I mean if it was  
3 really bad couldn't you pull the canister and do the  
4 inspection? I mean if your visually detected something  
5 that was really bad.

6 CHAIRMAN BALLINGER: You're talking 10<sup>8</sup>R.

7 MR. DUNN: Okay. There has been a system  
8 proposed for doing that. I don't think that it's been  
9 built or demonstrated. But, yes, conceivably you could  
10 do that.

11 DR. CSONTOS: And EPRI is also looking into  
12 this issue with their technologies as well and those  
13 are, you know, things that they can talk about. I don't  
14 want to go into them. We just are aware that they're  
15 working on these areas of you may not have to pull out  
16 the canister to do the repairs.

17 CHAIRMAN BALLINGER: But again there's  
18 ongoing work that may or may not prove fruitful in the  
19 future. But for a licensee that's going through this  
20 process of renewing a cask, what of those techniques are  
21 not available?

22 MR. DUNN: Well, okay for the visual, yes.  
23 If you're talking about for surface and volumetric we  
24 really believe it's a matter of getting a deployment  
25 technology. We believe the inspection technology

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 exists. It's a matter of deploying it into these  
2 systems as they sit today.

3 DR. CSONTOS: And when you're saying, you  
4 know, if we need to have sizing, if there is a sizing  
5 piece of the inspection that may not work inside a  
6 canister, then maybe the requirement is to pull it out,  
7 you know, and do the inspection. But there are other  
8 ways that we can skin this cat than just saying it can't  
9 be done.

10 MR. MCCULLUM: Al, is it appropriate for  
11 industry to speak?

12 CHAIRMAN BALLINGER: Go ahead.

13 MR. MCCULLUM: Rod McCullum with NEI here.  
14 There is a lot going on in industry. EPRI has inspected  
15 three canisters at EVT-1 level as I'm sure you're aware  
16 of.

17 All three vendors are developing and it is  
18 delivery. There are inspection technologies. You're  
19 not hearing much about it because they're highly  
20 competitive and it's proprietary at this point. But I  
21 think, I know there have been proprietary discussions  
22 in the TN renewal that's going on.

23 Industry is also, through the EPRI effort,  
24 working on susceptibility criteria. We've done crack  
25 growth rates. So we know these are very slow processes.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 That gives us time from the first indications of  
2 corrosion and the three casks we inspected were in what  
3 we consider some of our more vulnerable locations  
4 environmentally and of course lead canister inspections  
5 on the series that are coming up now are going to look  
6 at that as well using susceptibility criteria being  
7 developed by EPRI.

8 So the bottom line is we are doing  
9 everything we can do at this point. The tollgates are  
10 designed to progressively, as we go to later tollgates,  
11 use more advanced technologies. Those works are  
12 underway.

13 And industry is finally committed to a  
14 White Paper that the gentleman to my right here, Kris  
15 Kummings is leading the effort on which will address  
16 this. Okay, what happens when we find the first  
17 evidence of corrosion?

18 Again we know from what we've got now that  
19 we have time. I mean obviously you can put it in a  
20 transportation overpack to give you an additional layer  
21 of confinement. We know how to do that and that would  
22 be the first response if anything emergent happened.

23 MEMBER RICCARDELLA: I'm sorry. Put it in  
24 a what?

25 MR. MCCULLUM: A transportation overpack.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 We know how to, a transportation overpack gives you an  
2 additional confinement boundary. So if you get to  
3 tollgate at site x, and you find evidence of corrosion  
4 you could, we have the technology and it's deployed  
5 every day, you know, to take a canister out of a storage  
6 overpack and put it in a transportation overpack.

7 That then gives us time to develop  
8 mitigation. We understand that is not a fully  
9 satisfying answer to members of the public and so that's  
10 why we're working on this White Paper to further  
11 develop, you know, the what if scenarios and how we would  
12 respond to those.

13 And we know in parallel in the proprietary  
14 world the vendors are all working on things. And as  
15 license applications move forward or renewal  
16 applications move forward some of those would at least  
17 begin to see the light of day.

18 Finally, I think there is one that is  
19 somewhat public that with the situation in Monticello  
20 where you have a cask where the initial weld, not an  
21 aging issue but was questioned that some advanced NDE  
22 is being deployed there. And so that's part of these  
23 efforts and evidence that the efforts are bearing fruit.

24 So I think what we're keeping up with the  
25 pace of which things corrode fairly nicely.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: And I think the Monticello  
2 example is a good one to show also about the  
3 transportation overpack. That was a transport or  
4 transfer overpack. But that's another, that's the  
5 confinement boundary then.

6 Once you stick the canister into one of  
7 those the confinement boundary is now changed to that.

8 MR. DUNN: Okay. So I think I'm on the  
9 third bullet here the sample size. We identified in  
10 this example AMP a minimum of one canister at each site.  
11 And that would have to be canisters with the greatest  
12 susceptibility for this type of aging mechanism.

13 So longest time in service, coldest  
14 temperature where we can presence of the deposit itself  
15 and localized corrosion and stress corrosion cracking  
16 could potentially initiate. That would be the criteria  
17 for evaluating susceptibility.

18 Data collection is documentation and  
19 examination of the canister inspection and the location  
20 and appearance of deposits in areas that have undergone  
21 aging, localized corrosion or stress corrosion  
22 cracking. We picked a frequency of five years.

23 This is consistent with other inspection  
24 criteria in ASME code. But we also did some very  
25 conservative calculations of what we expected a maximum

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 possible crack growth rate to be. And we wanted to have  
2 inspection frequency more, such that we could have  
3 multiple inspections before we would expect the  
4 confinement boundary of the canister to be compromised.

5 Now if we take that data and when we marry  
6 it with actual environmental data we find that we're  
7 quite conservative. So a five year inspection interval  
8 would give us many opportunities to examine the  
9 canisters.

10 CHAIRMAN BALLINGER: So the five year  
11 criteria is based on, is going to be documented based  
12 on engineering judgment or based on facts? How is the  
13 five years arrived at in a way that can be followed by  
14 somebody that's looking at it?

15 In other words it's just we think it's five  
16 years and we think it's okay or the reason it's five  
17 years is because of da, da, da, da and it couldn't be  
18 any longer than this or that.

19 MR. DUNN: Right. We can provide and  
20 I'll, I don't believe in this example AMP that we have  
21 clearly defined how we got to that criteria. But that  
22 can be added if that's desirable.

23 MEMBER RICCARDELLA: There were some crack  
24 growth calculations that led to that?

25 MR. DUNN: Yes, yes. So we can add that

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 information. But again, it's really a very  
2 conservative criteria that led us to that point. And  
3 also it's important to remember that it is an example  
4 AMP.

5 A licensee can come with or a CoC holder can  
6 come with their AMP, propose an inspection frequency and  
7 justify that. Okay. The next slide is AMP Element 5,  
8 which is Monitoring and Trending. Here we looked for  
9 documentation of the canister condition, particularly  
10 with those areas of interest where we think that  
11 localized corrosion and stress corrosion cracking might  
12 initiate.

13 And this needs to be done in such a way that  
14 subsequent examinations can utilize that information to  
15 determine if there's a change in condition that warrants  
16 some additional assessments. Change in the size and  
17 number of any corrosion product accumulations.

18 We recognize that not all corrosion product  
19 accumulations on these canisters are going to be  
20 indications of localized corrosion. It could be iron  
21 contamination as we've seen before.

22 But if they are indications of localized  
23 corrosion we would expect over time the size and number  
24 of those areas would likely change or increase as the  
25 canister temperature decreases and the probability for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 localized corrosion occurring may increase with time.  
2 And then finally the location and sizing of localized  
3 corrosion and stress corrosion cracking.

4 So AMP Element 6 is the Acceptance  
5 Criteria. And the acceptance criteria, the highest  
6 level of acceptance criteria that doesn't involve any  
7 additional actions would be no indications of pitting  
8 corrosion or crevice corrosion, no indications of  
9 stress corrosion cracking or no indications of the  
10 corrosion products on or adjacent to fabrication and  
11 closure welds or welds for any temporary supports or  
12 attachments that may have been used.

13 If there are locations where corrosion  
14 products are found that does require an additional  
15 examination for the presence of localized corrosion and  
16 stress corrosion cracking and canisters with localized  
17 corrosion and stress corrosion cracking must be  
18 evaluated for continued service.

19 In this example AMP we identified some  
20 potential ASME boiler and pressure vessel code Section  
21 XI acceptance criteria. The first one is defined in  
22 IWB-3514 which is allowable pre-service and in-service  
23 planar and linear flaws for pressure vessel, for  
24 pressure retaining pipes or pressure retaining welds in  
25 piping.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           And this includes austenitic materials.  
2           That has defined an acceptance criteria for the depth  
3           of a flaw as a function of thickness of the piping  
4           system.

5                   MEMBER   RICCARDELLA:       Basically   ten  
6           percent.

7                   MR. DUNN:   Maybe up to 15 percent if, with  
8           certain aspect ratios.   But, yes, basically ten  
9           percent.   IWB-3640 if IWB-3514 was exceeded and there  
10          was, a licensee wanted to justify the continued use of  
11          that system beyond that IWB-3640 is an analytical  
12          evaluation and acceptance criteria for planar flaws in  
13          stainless steel piping.

14                   That is a, that analysis requires an  
15          analysis of flaw growth and also service load conditions  
16          including all potential service loads that the system  
17          would see in the period of time for which the evaluation  
18          was applied.

19                   CHAIRMAN   BALLINGER:       Is there any  
20          consideration for listing as a reference Fitness for  
21          Service-1, which has chapters in it on exactly the  
22          disposition of stress corrosion cracks themselves not  
23          just club surface defects and things like that?

24                   MR. DUNN:   Are you talking about --

25                   CHAIRMAN   BALLINGER:   It's an ASME.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. DUNN: It's a newer one.

2 CHAIRMAN BALLINGER: The new ASME derived  
3 from API-579 and 580 or something like that which is  
4 basically ported over to an ASME document which is 1,000  
5 pages long.

6 MR. DUNN: Right.

7 CHAIRMAN BALLINGER: But it's Chapter 7  
8 and 8 and 9 in those deal with environmental degradation  
9 and specifically the disposition of stress corrosion  
10 cracks.

11 MR. DUNN: Yes, we've actually seen that  
12 being used in previous renewal applications. So we  
13 didn't base this example AMP on that. But that's  
14 certainly something we could consider.

15 CHAIRMAN BALLINGER: As far as I know  
16 that's the first example in the ASME Code where there's  
17 been a specific attempt at dealing with environmentally  
18 assisted cracking.

19 MEMBER RICCARDELLA: I know there are some  
20 others as well.

21 CHAIRMAN BALLINGER: But that's  
22 inspection and repair, okay.

23 MEMBER RICCARDELLA: I know but it's crack  
24 growth analysis of stress corrosion cracking in  
25 stainless steel and in --

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: Or fatigue, or environmental  
2 fatigue.

3 MR. DUNN: So the 2013 version of the ASME  
4 Code and this particular section has specific sections  
5 that deal with, so they specifically identify stress  
6 corrosion cracking as a potential aging mechanism.

7 MEMBER RICCARDELLA: They do. But, you  
8 know, it's not the planar, it's not this external  
9 chloride cracking. That's a totally different  
10 mechanism.

11 CHAIRMAN BALLINGER: Yes, this deals, this  
12 comes out of oil and gas industry where they have  
13 specifically this problem.

14 DR. CSONTOS: Yes, and this is why what Dr.  
15 Riccardella just said is why we're asking them to look  
16 into for specifically for our purposes, for Section XI.  
17 And so hopefully at some point we can replace these with  
18 one that's geared towards dry cask storage and chloride  
19 stress corrosion cracking.

20 MEMBER RICCARDELLA: I mean it gives  
21 principles. You just have to go out and get the  
22 applicable data that applies to the chloride process as  
23 opposed to IGSCC in boiler and water reactors.

24 DR. CSONTOS: This is a surrogate for this  
25 temporarily.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. DUNN: So we recognize that we're  
2 borrowing from operating reactor, from Section XI from  
3 Operating Reactor. But we have asked the ASME Section  
4 XI Standards Committee to take the actions necessary to  
5 establish rules for in-service inspection of ISFSIs and  
6 that would include development of requirements for  
7 canister and overpack examination and inspection  
8 requirements and also acceptance standards.

9 So and we will participate in that activity  
10 with ASME. So your suggestion about using the document  
11 derived from API-579 might very well be a starting point  
12 for that activity.

13 MEMBER RICCARDELLA: Step back, bigger  
14 picture, what are the consequences of a violation, you  
15 know, of a leak, a violation of containment boundary?  
16 I mean is it an issue?

17 I mean in Section XI we're dealing with  
18 something where you're putting, you know, wrap the  
19 containment and it's a much, it's a significant issue.

20 DR. CSONTOS: It's a difficult question to  
21 answer right now. The, I mean we do have, it's  
22 considered low risk. I don't know if you want to say  
23 something about your PRAs.

24 MR. CUMMINGS: Let me speak to that. So  
25 Kris Cummings, NEI. So in my previous life I had done

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 confinement evaluations for dry cask storage. And the  
2 latest canisters and tested to leak 1 times  $10^{-7}$ .

3 But prior to that they were tested to 5  
4 times  $10^{-6}$  and as part of that you had to do a confinement  
5 analysis dose analysis that even if you leaked at that  
6 design basis rate you could still meet the 25 millirem  
7 per year requirement in 10 CFR 72.

8 So that gives us at least an idea of if we  
9 had a crack and it were to leak at some rate we don't  
10 know what it is, that's a tough problem to crack, you  
11 know, how you do you go from a crack to a leak rate. That  
12 gives us some idea of the order of magnitude that we  
13 think the consequences would be, really low.

14 CHAIRMAN BALLINGER: See we keep circling  
15 around this risk-informed --

16 MEMBER RICCARDELLA: You know in Section  
17 XI we introduced risk-informed in-service inspection  
18 with the idea of evaluating both the potential for a  
19 problem and the consequences.

20 DR. CSONTOS: Right. That's why we  
21 haven't required every canister to be inspected. You  
22 know and that's why we've seen that EVT-1 versus going  
23 directly to a UT or something along those lines there  
24 is a commensurate reduction in the threshold I think for  
25 the inspectability and inspection requirements per the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 risk.

2 But the other part to it is I know we're  
3 dancing around it, but, you know, there are some  
4 unknowns here when you're talking about if we do have  
5 a through-wall crack. Defining what they need to look  
6 at, what crud build up there is that, you know, what,  
7 how much of the fuel has been breached?

8 You have a lot of things that you need to  
9 start thinking about if you really want to quantify it  
10 in a really risk-informed manner. And I know that Dr.  
11 Powers, Dr. Ballinger, Dr. Riccardella, you've worked  
12 on XLPR. And I think this, and I worked on it for a while  
13 and that's how many years have we worked on that and I  
14 thought that was a fairly simple problem.

15 This is easily an order of magnitude harder  
16 problem in terms of risk, okay, analysis then I think  
17 XLPR is, okay.

18 CHAIRMAN BALLINGER: How much harder is it  
19 to do it deterministically?

20 DR. CSONTOS: I think it's a little because  
21 we already have it for Section XI and porting it over,  
22 the deterministic side of it and understanding it from  
23 an engineering judgment point of view about the relative  
24 risk I think we've done a reasonable job in terms of  
25 trying to come up with a reasonable solution to this.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   But it's, you know, it's from a risk, well  
2 I'll just end it there.

3                   CHAIRMAN BALLINGER: But just to give you  
4 an example choosing the appropriate canister you say we  
5 don't, we won't inspect them all. Well just the welding  
6 process itself and how it's done and how it's allowed  
7 and start and stops and weld repairs and stuff like that  
8 sort of tells you that one canister can be, you don't  
9 know how to determine what the most susceptible canister  
10 is to some degree.

11                  DR. CSONTOS: And that's where  
12 susceptibility criteria that, you know, Rod mentioned  
13 we are doing our own modeling in house to look at  
14 environmental, what Darrell had mentioned earlier was  
15 we're looking at environmental pieces.

16                  We're also looking at some thermal results  
17 to see where the temperatures fluctuate on the surface  
18 of a canister so we can pinpoint the percentage as well  
19 as the location of where we need to really be looking  
20 for from a susceptibility criteria point of view.

21                  So we don't, it's not necessarily we have  
22 to have 100 percent coverage. We have to go look at  
23 those highest susceptibility locations to see evidence  
24 of localized corrosion, crevice corrosion, pitting, you  
25 know and such.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER RICCARDELLA:       It would be  
2 interesting to put this through the Section XI  
3 risk-informed RSI process to see where it falls at high,  
4 medium or low.

5                   DR. CSONTOS:   Yes, I actually was thinking  
6 about that a while back too.  But it's something that,  
7 you know, we're going to go see.  We will talk to ASME  
8 about, you know, how we're going to approach that.

9                   MR. DUNN:   Okay.  So the next slide is AMP  
10 Element 7, Corrective Actions.  If there were an  
11 inspection that revealed an indication of localized  
12 corrosion and stress corrosion cracking this example  
13 AMP identifies the need for supplemental inspections to  
14 determine the extent of the conditions at a given site.

15                   So once one canister is found to have an  
16 issue there would have to be additional inspections of  
17 additional canisters to determine the extent of  
18 condition and also the extent of the corrective actions  
19 that are needed.  And this is consistent with what ASME  
20 calls now additional examinations if areas of localized  
21 corrosion or cracking is identified.

22                   It also in the AMP, example AMP also  
23 identifies the need for subsequent inspections of  
24 canisters with indications to monitor and trend the  
25 location where those indications have been identified

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and determine whether or not those are areas of active  
2 degradation.

3 And then finally, canisters that don't meet  
4 the prescribed evaluation criteria would need to be  
5 removed from the service or repaired. And obviously  
6 that is something that we haven't seen yet, hasn't been  
7 done yet and it's, something would have to be developed  
8 by the licensee.

9 Okay. Next slide. So for both the  
10 confirmation process and the administrative controls  
11 these AMP elements need to be consistent with the  
12 licensees Corrective Action Program and consistent with  
13 10 CFR 72 Subpart G or 10 CFR 50 Appendix B, depending  
14 on whether or not they are site specific or are general  
15 licensee.

16 And it's for the confirmation process we're  
17 looking here to ensure that the inspections,  
18 evaluations and the corrective actions that are  
19 necessary are completed in accordance with the site  
20 specific or general licensee Corrective Actions  
21 Program. And so some things that we specifically  
22 identified is the evaluation of the extent of condition.

23 If there's a, if there's localized  
24 corrosion or stress corrosion cracking identified that  
25 has been conducted properly. Evaluation for continued

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 service if that's the path that's chosen or the adequacy  
2 of any repair, replacement or mitigation actions that  
3 were performed.

4 AMP Element 9 is Administrative Controls.  
5 Again this has to be consistent with the licensee's QA  
6 Program. But some of the things that we identified,  
7 specifically we were looking for here was training  
8 requirements for inspectors and the records retention  
9 requirements.

10 And the last AMP Element 10 is Operational  
11 Experience. So we've performed, a limited number of  
12 inspections have been conducted to date. There have  
13 been cases where atmospheric deposits were found on the  
14 surface of these canisters.

15 But in the limited number of inspections  
16 conducted to date there is no reported cases of  
17 localized corrosion or stress corrosion cracking  
18 identified on the welded stainless steel canisters. We  
19 have, of course, published Information Notice 2012-20  
20 which indicates that chloride induced stress corrosion  
21 cracking that occurred from atmospheric deposits  
22 accumulating on surfaces of structure systems and  
23 components and operating reactors and the subsequent  
24 deliquescence of those deposits, you know, that process  
25 can induce stress corrosion cracking.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So going forward we would expect that the  
2           licensees need to continue to evaluate the operating  
3           experience, look at things like the INPO database, NRC  
4           information notices and work that's performed by EPRI  
5           on this subject to inform their Aging Management Program  
6           going forward.

7           We did identify a couple of things that I  
8           think were brought up earlier in the discussion perhaps.  
9           Field data necessary to assess conditions for chloride  
10          induced stress corrosion cracking, whether or not that  
11          actually exists on the welded stainless steel  
12          canisters.

13          There has been a limited number of these  
14          evaluations conducted to date. They are somewhat  
15          challenging to do and I don't think we have a really  
16          great handle on how these need to be done or how they  
17          can be done.

18          MEMBER RICCARDELLA: I'm trying to  
19          understand your third bullet versus your first. First  
20          says no recorded cases and then --

21          MR. DUNN: Sorry, that's from, okay, so NRC  
22          Information Notice 2012-20 identifies cases for  
23          operating reactors.

24          MEMBER RICCARDELLA: Not canisters. I've  
25          got it.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. DUNN: Not canisters. And I  
2 apologize. I should have clarified that in the bullet.  
3 But it's operating reactor components not dry cask  
4 storage systems.

5 And then finally the laboratory data on  
6 chloride induced stress corrosion cracking rates are  
7 really necessary if we're going to have a better process  
8 to inform our in-service inspection intervals. What we  
9 have right now is a limited amount of data.

10 There's caveats with all the data that we  
11 have. We're comparing that to what we have for  
12 operating experience. But we recognize that right now  
13 we probably could use a much better set of quality  
14 controls to inform these in-service inspection  
15 intervals.

16 MEMBER RICCARDELLA: Is there a program on  
17 this in research?

18 MEMBER REMPE: Al, you mentioned earlier  
19 that you have models and to help you inform your  
20 inspection which can, when they inspect and what  
21 confidence do you have in those models?

22 MR. DUNN: Well the, right, the models that  
23 we have right now we're looking at crack propagation  
24 rate is a function of temperature and then marrying that  
25 to environmental data which is obviously site, location

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 dependent. And what we find is that if you're at  
2 elevated temperature just because of the activation  
3 energy you can get higher crack propagation rates.

4 But the environmental conditions occur  
5 very infrequently at those elevated temperatures if the  
6 canister is at elevated temperature to get cracking to  
7 occur. So you, while you can have faster propagation  
8 rates those faster rates occur very infrequently,  
9 typically in humid days in summer where you can get  
10 higher values of absolute humidity in the local  
11 environment.

12 My comment about better laboratory data is  
13 right now we don't, we have a limited set of data and  
14 we have things that we don't like about all of that data,  
15 frankly. And it would be nice to have data that we had  
16 a greater degree of confidence in.

17 That said, what we've done is to take the  
18 data that we do have, build a model and then compare it  
19 to what we actually observed in operating experience to  
20 give us at least some degree of confidence that we're  
21 in the right ball park in terms of what we can expect  
22 for propagation rates.

23 MEMBER REMPE: So basically your models  
24 are predicting more than what you would probably see in  
25 the real world. Is that a true statement? And so you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 don't have a lot of confidence, it's just a close  
2 estimate.

3 MR. DUNN: Right now the models are,  
4 there's other layers of conservatism in the model. So  
5 the answer to your question is, yes. So for example,  
6 we're assuming that initiation or restarting of a crack  
7 if it was growing is instantaneous.

8 And we know for certain that's just not  
9 really the case. So, yes, we are probably over  
10 predicting the rate of degradation based on what we have  
11 now. But again, we have some uncertainty with the data  
12 that we have to build that model.

13 MEMBER REMPE: Thank you.

14 DR. CSONTOS: And that five year interval  
15 so far, okay, is not just for stress corrosion cracking.  
16 It is those unknown knowns or known unknowns from the  
17 reactor side in terms of degradation mechanisms. So we  
18 felt that five years was appropriate just as a, because  
19 of the limited data set that we have right now for the  
20 OpE it was a reasonable approach right now to go with  
21 five years.

22 Reactors are ten years, okay. But at some  
23 point in the future if there is sufficient information  
24 coming in that says look we've done all these exams and  
25 we're not seeing much then we're open to relaxing those

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 ISI intervals as well as looking at the research and  
2 confirmatory research and such to inform us of that as  
3 well.

4 MEMBER RICCARDELLA: Is there anything  
5 that's plant location specific? I mean I think this  
6 would be different for something --

7 DR. CSONTOS: This is why I said unlike  
8 XLPR this is such a more complex problem because it is  
9 environment dependent, it is site dependent, it is what  
10 kind of deposits you have, what, then you also have to  
11 look at problems with if there was welding issues, the  
12 supports.

13 There are just so many other factors that  
14 you have to take into account that's environment  
15 dependent that is very different than some of the other  
16 work that we've done on the reactor side.

17 MR. DUNN: Okay. I think that concludes  
18 my presentation.

19 CHAIRMAN BALLINGER: Thank you. I think  
20 we're one presentation behind because if we know that  
21 then we're on time. I'd like to take a break. I get  
22 tied up sometimes. Let's take a break until five  
23 minutes until 11.

24 (Whereupon, the above-entitled matter went  
25 off the record at 10:40 a.m. and resumed at 10:55 a.m.)

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 CHAIRMAN BALLINGER: Okay. We're back in  
2 session. Thank you very much. You're on next, Al.

3 DR. CSONTOS: My name is Al Csontos. I'm  
4 the Chief for the Renewals and Materials Branch in the  
5 Division of Spent of Fuel Management. This  
6 presentation is really along the margin of Bob Einziger  
7 who is now with NWTRB, really developed this monitoring  
8 program as well as the ISG-24 that is corollary to this.

9 And so I'm giving this out but I'm not an  
10 expert on fuels by any means. So I'm going to try to  
11 go over and give you what we've come up with and what  
12 we're going to be putting into the 1927 Rev. 1.

13 Okay. And it's the example of the High  
14 Burnup Fuel Monitoring Program. This is a program  
15 where we're doing a surrogate surveillance program.  
16 It's akin to something similar to our RPV, the Reactor  
17 Pressure Vessel Surveillance Program in terms of, you  
18 know, for that it's the embrittlement issue.

19 Here we're worried about the cladding and  
20 cladding failures and cladding integrity, okay. And so  
21 as a result of that this is for high burnup fuel. We  
22 have observations that are done for low burnup fuel and  
23 that was the basis for ISG-11.

24 And then this is specifically for high  
25 burnup fuel with discharges greater than 45 gigawatts

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 per metric ton of uranium. And so that was where, the  
2 point of this effort and I think you see it with how we've  
3 moved forward with the concrete, with the corrosion AMP  
4 and now this AMP.

5 We've gone to inspection and monitoring,  
6 okay. And the inspection and monitoring gives us a way  
7 to address or assess how the components and the  
8 subcomponents that are out there for these dry cask  
9 storage units are degrading and how they're being  
10 maintained over the long period of time for storage for  
11 renewals, for example.

12 And so in this case this is a surrogate  
13 surveillance program to check the condition of the high  
14 burnup fuel that's in dry storage to the ISG-11  
15 expectations and the technical basis is in ISG-11. And  
16 then what we're doing here is we're trying to confirm  
17 that the intended function of the fuel and all these  
18 other pieces in there are maintained, internals are  
19 maintained as expected during the period of extended  
20 operation.

21 As a result of that what Bob has created was  
22 one that was using ISG-24 which is this use of a  
23 demonstration program as a confirmation of the  
24 integrity of the continued storage for high burnup fuel  
25 beyond 20 years. That's akin to what it was for the low

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 burnup fuel demo project.

2 So he wrote this ISG out there to say this  
3 is how you would do a demo project for high burnup fuel.  
4 And that is where DOE as EPRI has, as DOE has contracted  
5 to develop this high burnup fuel dry cask storage RNB  
6 project which we refer to HDRP.

7 Next slide please. So a little bit of  
8 information on this DOE-EPRI HDRP. There are intact  
9 those can be loaded it's an AREVA TN-32 bolted lid at  
10 North Anna. We're going to be getting an amended  
11 request in for that.

12 And it's going to store intact high burnup  
13 fuel. It has nominal burnups between 53 and 58 GWD/MTU  
14 of uranium and it will contain about four cladding  
15 types. And these are the four cladding types.

16 And so what this canister or this fuel so  
17 when other licensees come in they have this type of fuel  
18 they can then reference this test as part of their Aging  
19 Management Program. And so it's a surrogate  
20 surveillance of these four, two, four, five different  
21 cladding types and of the burnups that are there as well.

22 And this cask would be licensed to the  
23 ISG-11 temperature limit of 400 degrees and loaded in  
24 such a way that the cladding will, is as close to the  
25 limit as practicable. That's an area of debate right

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 now. I know that Bob before he left and others were  
2 looking at, there are thermal folks who are looking at  
3 and DOE was looking at how to keep the fuel as hot as  
4 possible as far as temperature so that it gets as close  
5 to a conservative number as possible.

6 The problem is that we need an RN on our  
7 thermal analysis are very conservative. And so it's  
8 now that conservatism is actually hindering some of the  
9 higher temperatures that we were trying to push those  
10 fuel rods to.

11 Slide 5, so now we're going through the AMP  
12 element. I am going to not talk about AMP Elements 7  
13 through 10 because they are all basically the same. It  
14 goes from all the different other, the two other AMPs  
15 that you saw here for time. If you have any questions  
16 then I'll go and talk to it.

17 But I'll just talk about AMP Element 1  
18 first, Scope of the Program. Licensee when they come  
19 in with the AMP they need to identify the maximum burnups  
20 for their cladding and their fuel, the cladding types,  
21 the maximum temperature that the cladding saw through  
22 their drying process and then the basket materials, the  
23 welds, identifying what type of neutron absorbing  
24 materials that were, what type of environment. Right  
25 now, it's dry helium, okay.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           What will happen as a part of this demo  
2 project or a like kind demo project, okay, if it's not  
3 this if, for example, if your fuel is not captured in  
4 this demo project as a surrogate that you can't  
5 reference it then there will have to be another one,  
6 okay, somewhere else that you can point to as a surrogate  
7 or just as another surrogate test.

8           But the aging effects that we're looking  
9 to, from NRC's perspective, that we're looking to see  
10 out of this demo project, this DOE demo project is  
11 whether or not the fuel clouding is breached during  
12 storage, if there's any assembly distortion, residual  
13 moisture after drying to see, that's an issue that we're  
14 worried about because whether or not the environment is  
15 really truly dry helium or if there is residual moisture  
16 after the drying process and changes in the hydride  
17 structure of the cladding during storage.

18           So AMP Element 2. It's a condition based  
19 monitoring program, Preventative Actions, making sure  
20 that the back filling is there especially for the demo  
21 project and that the maximum temperature, cladding  
22 temperature is still at the ISG level, 11 level or below  
23 but still getting as close to the ISG level 11 high  
24 temperature of 400 degrees level is important.

25           And it's dried to 1536 and 1567. Next

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 slide. The Parameters Monitored and Inspection. I  
2 know that, Dr. Rempe, you have, we've talked about this  
3 before about the temperature of the clouding and how to  
4 get that a little bit better in terms of DOE demo  
5 project.

6 So we're looking at trying to get what the  
7 temperature of the clouding is and was in terms of during  
8 the drying what was the maximum temperature and also as  
9 it's sitting there in storage what's the temperature of  
10 the clouding. Inspection of the presence of fission  
11 gas in the cover gas. So when we take these gas samples  
12 out of these, the system, okay, to see whether or not  
13 there's fission gases in the helium when we pull it out  
14 as well as is there water vapor.

15 And then how would, can we back calculate  
16 how much damage there was in the cladding or into how  
17 much water is retained? Whether there is hydrogen is  
18 part of the radiolysis of water that's in the canister,  
19 remaining water from the drying process.

20 After the samples will be taken out at some  
21 point later down the line I think, I don't know how long,  
22 is it 20 years, Rod? I'm looking at Rod.

23 MR. MCCULLUM: Yes, Rod McCullum. It's  
24 about 20 years, maybe 25 I think in some cases.

25 DR. CSONTOS: Okay. And looking at the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       profilometry getting some other information about the  
2       gases, the fission gases and then from the fuel and then  
3       also creep calculations to see, get some data from that.

4               And then obviously metallography and to see  
5       what the detail is with the hydrides and how they're  
6       changing as a function of storage for long, long terms  
7       through metallography.

8               MEMBER SKILLMAN:     Let me ask this  
9       question. For these fuel assemblies what is their  
10      original as loaded configuration? Are these pristine?

11              DR. CSONTOS:    They are intact. They're  
12      burned, yes, they are burned.

13              MEMBER SKILLMAN:   But I mean are these --

14              DR. CSONTOS:    They're nominally 53 to 58  
15      gigabyte.

16              MEMBER SKILLMAN:   Are they leakers or are  
17      they known --

18              DR. CSONTOS:    No leakers. So these are  
19      intact.

20              MEMBER SKILLMAN:   Just burned, intact  
21      assemblies with differing clads.

22              DR. CSONTOS:    Correct.

23              MEMBER SKILLMAN:   Simply that.

24              DR. CSONTOS:    Correct.

25              MEMBER SKILLMAN:   Prior to their being

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 loaded was there examination of the oxide layers and  
2 films because there burnups you can have all kinds of  
3 stuff on the exterior based on the chemistry from which  
4 they were pulled.

5 MR. CUMMINGS: Right. So there will be 25  
6 rods pulled from either the fuel assemblies going into  
7 the cask or sister assemblies that will then be loaded  
8 in a transport overpack and taken to a facility that can  
9 do some of those sorts of pre-characterization. Rod,  
10 you might have a little more details on the exact  
11 pre-characterization activities that they're doing.

12 MR. MCCULLUM: Yes, first I need to correct  
13 what I said earlier on the record. Al, I misunderstood.  
14 I thought you were talking about when the first  
15 tollgates were. You were talking about when we're  
16 going to do these tests on the fuel out of the actual  
17 demo cask.

18 DR. CSONTOS: Right.

19 MR. MCCULLUM: That will be any time after  
20 ten years. And the specific time frame will depend on  
21 two things.

22 It will depend on, you know, what we're  
23 seeing elsewhere in the scientific research in terms of  
24 the need to open it up and probably more  
25 programmatically it will depend on when DOE is able to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 move the cask to a facility. But it will be ten years  
2 or longer.

3 DR. CSONTOS: And also if the gas samples  
4 come back and we don't find any fission gases, if we  
5 don't have any evidence of any breaching then we just  
6 say leave it there and let's just see, continue the,  
7 basically the experiment.

8 MR. MCCULLUM: Yes, and to answer the, now  
9 that I've corrected my previous wrong answer, to answer  
10 the specific question I think a good guide for the type  
11 of tests that, I'm not the scientific expert, but a good  
12 guide for the type of tests that will be conducted on  
13 these rods out of the demo cask and on the sister rods  
14 is to go to the ANL and EPRI reports of, remember there  
15 was a demo already on low burnout fuel.

16 In 2011 the cask that was opened at Argonne  
17 National Laboratory, yes, after 15 years in storage.  
18 It will be all of those tests and probably a little more  
19 because I'm sure the scientists out there have gotten  
20 smarter.

21 But if the Committee wants to know what sort  
22 of tests are being done I would, those reports are very  
23 thorough and very good.

24 DR. CSONTOS: We've had a couple of public  
25 meetings on those recently the amendment request. I

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 wasn't at the last one because I was actually here in  
2 this room going over the concrete expert panel.

3 So I'm not as well informed about that last  
4 meeting and what was done there.

5 MR. CUMMINGS: My expectation is that they  
6 are going to capture that stuff. They certainly need  
7 to capture things like what is the hydride distribution  
8 and what the orientation is whether it's  
9 circumferential or radial so that they can understand  
10 later when they do open it up and take some additional  
11 rods out what differences have occurred from when they  
12 first loaded it to later when they drained it, dried it,  
13 back filled it, left it to sit for 20 years or ten years  
14 or however long it ends up being, transport it to a  
15 facility, open it up, take some more rods out.

16 And so that's the scope. But again there's  
17 more detail in some of the public documents.

18 MEMBER SKILLMAN: Thank you.

19 MEMBER REMPE: I had a couple of questions  
20 and comments. First just to hit on a comment I like the  
21 report or review of available methods for functional and  
22 monitoring of the CSS.

23 And I find it interesting that when they  
24 talked about the ultrasound they said it needed to be  
25 less than a centimeter and actually more of an order of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 a millimeter or around that area. Yes, so that's a  
2 little larger than that.

3 DR. CSONTOS: We're not looking at YouTube  
4 by the way. But, yes, go ahead.

5 MEMBER SKILLMAN: Yes, I know. But they  
6 are definitely going to allow you to sample because that  
7 was a discussion first right and they have said, yes,  
8 we will allow you to sample?

9 MR. MCCULLUM: Rod McCullum, NEI. Yes,  
10 the utility there is committed to sampling. There is  
11 still some discussion as to what samples and how  
12 frequently. But the utility is and the project is  
13 moving very much through the design phase which is going  
14 into a license application that's being written now.

15 So I can tell you we are past the point of  
16 no return and we will sample all those specific details.

17 MEMBER REMPE: And do you have a place  
18 where you plan to open and do the evaluations at ten  
19 years or whenever you decide to do it yet?

20 MR. MCCULLUM: As I said earlier, that's  
21 really one of the driving factors on when we'll open it.  
22 DOE opened the first cask out in Idaho in 2001 at a  
23 facility called the Test Area North that they have since  
24 decommissioned.

25 The folks in Idaho would love to build

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 another one out there. However, when I say the folks  
2 in Idaho it's the folks in a certain part of Idaho that  
3 --

4 MEMBER REMPE: The governor is not real  
5 happy.

6 MR. MCCULLUM: Right, right.

7 MEMBER REMPE: Ex-governor, excuse me.

8 MR. MCCULLUM: And, you know, the  
9 politics, I, in a technical meeting will not get into  
10 too much politics here. But it's uncertain where DOE  
11 will build this facility.

12 It's also that ten years from now we may  
13 have a DOE interim storage facility that could build  
14 such a facility and that would be a great combination  
15 to have a hot cell at an interim storage facility.  
16 Whether DOE will choose to do that or not, again I can't  
17 speak for them.

18 But we know we have time to build the  
19 facility. We know we have at least ten years until  
20 we're going to want to open this thing because we do want  
21 ten years of storage. I think that's in the current  
22 test plan.

23 And, yes, that is an issue. And that's  
24 something you should keep your eyes on is DOE's  
25 capability to open the cask because it's not coming back

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 into the pool, number one the utility. That's not part  
2 of the deal they signed up for.

3 But even more importantly if you brought  
4 the fuel back into the pool and you did see some  
5 indications on the fuel you would never know whether  
6 that was due to quenching affects or aging affects and  
7 that would really kind of makes it not a very exciting  
8 test. We want to open it dry.

9 DR. CSONTOS: And the functional  
10 monitoring report is an EST report. It's extended  
11 storage transfer. This doesn't really, it's not really  
12 coming into our area which is right now the first two  
13 renewals. We're getting the first renewal, you know.

14 And so it's something we're aware of but  
15 it's not really, you know, you can see the AMPs that  
16 we've developed and they're more now.

17 MEMBER REMPE: Thank you.

18 DR. CSONTOS: Okay. Going to the next  
19 slide, AMP Element 4. It's consistent with ISG-24, the  
20 thermocouple lances. I think we've talked about that  
21 and the thermocouples for the temperature profiles  
22 throughout the cask of the canister as a function of  
23 time.

24 Fission gas analysis for the cover gas and  
25 getting into the specifics of what fission gases that

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 we need to be able to detect and be sensitive to. The  
2 residual moisture detection, I think that's a big deal  
3 for us and then hydrogen because of the radiolysis  
4 considerations. Next slide.

5 CHAIRMAN BALLINGER: I think you may, in  
6 our conversation you may have said you had, but there's  
7 a lot of experience that inspecting casks with fuel in  
8 them but not light-water-reactor fuel at a N-Reactor  
9 where that storage facility is.

10 And they have had casks out there that have  
11 been being monitored for the last 20 years almost,  
12 especially for moisture, for those kinds of things that  
13 are not related to the fuel itself just the inside.  
14 Have you looked at that --

15 DR. CSONTOS: I am not aware of that.

16 DR. CSONTOS: -- because Bob Einziger was  
17 well aware. What was the N-Reactor fuel stuff, the  
18 monitoring system, the monitoring, have you taken  
19 advantage of the monitoring that I know has had to have  
20 been done for internal pressure, moisture, all kinds of  
21 things?

22 They had a couple of canisters that they  
23 instrumented the daylights out of and I don't know  
24 whether they're still instrumented. They may have just  
25 closed them up because nothing happened.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. EINZIGER: This is Bob Einziger from  
2 the NWTRB. The answer, the quick answer to your  
3 question is, no. I know that in the facility where they  
4 stored those canisters they have at least I think three  
5 slots where they are supposed to periodically monitor  
6 the gas buildup in the canisters.

7 I don't know whether they're just set up to  
8 measure the pressure or the diameter because the big  
9 question is are they going to get bulging on these  
10 canisters due to buildup of gas that's going to prevent  
11 them from ever being pulled out of that facility? And  
12 I don't know what they've done.

13 I haven't seen any external reports. I  
14 don't know if any have been written. That's something  
15 that could be looked into to see what monitoring that  
16 technique they were, but it would be something where  
17 they would have to build into the system the ability to  
18 monitor.

19 It's not something that after ten years,  
20 you know what, I want to monitor these things. Let's  
21 go stick a probe in it.

22 CHAIRMAN BALLINGER: I know for sure that  
23 several canisters were intentionally instrumented  
24 because there was concern about gas buildup just like  
25 --

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. EINZIGER: And the results of it would  
2 be just the monitoring techniques because the fuel is  
3 completely different the results and the monitoring  
4 would not be applicable.

5 CHAIRMAN BALLINGER: Yes, well radiolysis  
6 of excess water in there. Those kinds of things you  
7 might be able to --

8 DR. EINZIGER: The other thing that you  
9 have to remember is that the LWR fuel is "supposed to"  
10 be dried to be less than a mole of water in a canister.  
11 For the DOE N-Reactor fuel, because they have sludge in  
12 those canisters, dry means not more than a couple of  
13 gallons. And so the results could be quite different.

14 CHAIRMAN BALLINGER: The sludge that was  
15 in K-Basin is a lot of different than the fuel itself.  
16 They didn't put sludge in the fuel canisters.

17 DR. EINZIGER: There is a certain amount of  
18 sludge that went with the fuel.

19 DR. CSONTOS: Okay. And just to be clear  
20 I thank you. We'll look into it. Just to be clear  
21 though the bulging that Bob talked about is not for,  
22 that's for the N-Reactor stuff. That's not for dry cask  
23 just for the members of the public who are the phone.

24 CHAIRMAN BALLINGER: Well we better not  
25 have any bulging.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: Yes.

2 CHAIRMAN BALLINGER: Okay.

3 DR. CSONTOS: So let's go to slide, the  
4 next slide, Slide 8, Monitoring and Trending. Evaluate  
5 information from the demo project loading, initial  
6 period of storage along with other information the  
7 pre-service, I would call it pre-service examination of  
8 the fuel. The nondestructive examination with the gas  
9 sampling, temperature data, et cetera.

10 Later on when the project is over the  
11 destructive examination of the cladding and the fuel and  
12 such. And then if we find that there's more things that  
13 we need to look at separate affects, surrogate  
14 experiments, individual, you know, maybe certain types  
15 of cladding or whatnot.

16 But that's down the line. And licensee  
17 monitor and evaluate and trend the information via the  
18 Corrective Action Program. Next slide.

19 This is Acceptance Criteria. Bob was very  
20 good at identifying all the different pieces of what  
21 we're looking for here. And that's clad in creep which  
22 is the operable degradation mechanism that we're  
23 looking into for the renewal period because all the  
24 other ones are right now scoped out because of the drying  
25 process.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           And so we have here the clad in creep that  
2 would, total creep strain extrapolated to the total  
3 approved storage duration is based on the best fit of  
4 data to less than one percent. ISG-11 temperature  
5 limits are based on this less than one percent creep.

6           And so the hydrogen you can see there is  
7 less than five percent and then the moisture --

8           MEMBER POWERS:           Hydrogen ion  
9 concentration is less than five percent?

10          DR. CSONTOS:       Extrapolated from gas  
11 measurements.

12          MEMBER POWERS:       Well I can practically  
13 guarantee you that any place this side of the sun the  
14 hydrogen ion concentration in the cover gas is less than  
15 five percent.

16          DR. CSONTOS:       Well that's worth checking.

17          MEMBER POWERS:       I mean that's in plasma.

18          CHAIRMAN BALLINGER:    I think they're  
19 talking about hydrogen concentrations. But why five  
20 percent. Why do you care unless you're going to  
21 introduce oxygen into the thing the five percent is,  
22 what does it matter?

23          DR. CSONTOS:       Well it could be uptaken into  
24 the cladding and such and other things we have to worry  
25 about. So you have possible hydrogen embrittlement and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 other materials as well for the fuel and the cladding.

2 Drying the moisture, did I go over that or  
3 not?

4 MEMBER REMPE: Not yet.

5 DR. CSONTOS: Okay. So the drying, yes,  
6 that's one that we're really interested in to make sure  
7 that we, that the drying is actually drying and that  
8 there is no residual water.

9 That's why the hydrogen concentration is  
10 important because then if we see a little bit higher  
11 hydrogen concentration that we think is supposed to be  
12 there then that may relate to how moisture in the drying  
13 may not be sufficient. So we have to look into that.

14 And then of course the fuel rod breaches.  
15 I would like to see if whether or not the fuel rods are,  
16 you know, breached over a period of time over storage,  
17 you know, in less than a one percent of the fuel rod.

18 MEMBER REMPE: On the drying I assume  
19 that's because you're going to heat it and you're going  
20 to do it from the gas sampling. But if it's condensed  
21 at the bottom you can't tell.

22 DR. CSONTOS: There are some techniques  
23 that DOE has discussed and those are UT. There are some  
24 things like --

25 MEMBER REMPE: Burnup I mean, right.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DR. CSONTOS: Right. And so they're  
2 thinking about some UT techniques to look at residual  
3 water at the bottom. And so I don't know how far along  
4 those are but that is something that they can do from  
5 the angle at the corner of the base.

6 MEMBER REMPE: But again you have  
7 acceptance criteria. So this is something that you can  
8 only, I mean, how do you monitor that in a longer term  
9 other than initially if you heat it? But how can you  
10 decide whether you accept it or not if you can't monitor  
11 it?

12 CHAIRMAN BALLINGER: There's drying  
13 criteria for the initial emplacement of the fuels which  
14 means you, whatever the temperature is you pump on it  
15 for x, get the pressure down to y, stop and watch the  
16 pressure go, change with time and if it's, doesn't  
17 change within a certain amount over a certain time then  
18 you're below a criteria which has been experimentally  
19 established which I think is one liter of water in the  
20 bottom of the cask.

21 DR. CSONTOS: One mole of water.

22 CHAIRMAN BALLINGER: Right one mole, okay.

23 MR. CUMMINGS: I think it was a P and an L.  
24 From an operational perspective the feedback that we get  
25 from the guys who are drying it is if there's water in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 there you won't meet that criteria. You won't meet the  
2 3 torr for 30 minutes. It just doesn't happen.

3 So you can sit there and you can suck on it.  
4 You can suck on it. It's just, and you can hold it  
5 under. You know, you typically hold it down to 1 torr  
6 and then watch it come up or 2 torr and then watch it  
7 come up.

8 And if you just can't hold that 3 torr for  
9 under 3 torr for 30 minutes it's not dry. So you go back  
10 and you continue your drying process.

11 CHAIRMAN BALLINGER: So this drying is,  
12 there's a go, no go test that already exists?

13 MR. CUMMINGS: Exactly.

14 MEMBER REMPE: At the very beginning.  
15 Well once it's in place or out there --

16 CHAIRMAN BALLINGER: Once it's loaded.

17 MEMBER REMPE: Yes, once it's loaded and  
18 you put it out on the pad and you're out there and the  
19 temperature swings and all that other stuff are you  
20 going to still do some sort of evaluation or that's just,  
21 this is only an initial acceptance criteria?

22 MR. MCCULLUM: This is Rod McCullum here.  
23 On the demo that's one of the things that our sampling  
24 will measure is moisture over time. I would, and I was  
25 about to point out anyway this question of whether or

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 not our drying procedure is adequate or not, we believe  
2 it is, is really not an aging management question. It's  
3 a design basis question.

4 I think if NRC was concerned that our design  
5 basis criteria were incorrect they would be raising that  
6 as a generic safety issue. Nevertheless, and they  
7 haven't, but nevertheless because we always go an extra  
8 mile or 200, we do have under the auspices of DOE's NEUP  
9 program that was birthed out of EPRI's escape program  
10 a process going on at the University of South Carolina  
11 right now where they're going to actually rig up a test  
12 rig and prove that one liter really is one liter or less.

13 And, you know, I know that Dr. Einziger who  
14 is standing up has been involved in that experiment as  
15 well. So there will be more information. But we  
16 believe it's adequate and has been proven over time.

17 DR. EINZIGER: Bob Einziger from the  
18 NWTRB. The first misnomer, there has been no  
19 experimental evidence confirming that the drying  
20 criteria actually gets the cask dry. It's never been  
21 experimentally confirmed unlike the forced helium  
22 dehydration method where they had done some  
23 experimentally confirmatory evidence.

24 The criteria is based on theoretical  
25 considerations of vapor pressure, et cetera. That's

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 one thing. The second thing is there is a lot of places  
2 water can be in that canister depending upon the design  
3 of the canister and design of the fuel that's in there  
4 once it's been drained you could start out with anywhere  
5 between seven and 25 gallons left in the dashpots that  
6 you've got to get out.

7 You can have water sitting under grids.  
8 You could have water if there's failed elements and you  
9 could have any fuel water drain down to the bottom of  
10 the cask. A number of years ago Trevus at one of the  
11 NEI meetings presented that on drying and sort of  
12 shocked people.

13 And he said the time it takes to dry is  
14 independent of the temperature. And the reason for  
15 that is most of the water is down at the bottom of the  
16 canister where it doesn't depend on the fuel  
17 temperature. It's, if you have water in the fuel column  
18 it will be down there.

19 So there isn't a reason to look at whether  
20 it's dry. The NRC recently published a report on  
21 various ways this drying method is done. And there are  
22 some that decide that you can't rise above 3 torr of  
23 pressure so we'll drive the initial pressure well down  
24 below 3 torr and by the time 30 minutes it will get up  
25 there.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           There's other ways of measuring things.  
2           There's a falling rate method that's probably a little  
3           bit better but it's not much more time consuming. And  
4           so there is question in case you don't know recently the  
5           French were doing a very similar method but having  
6           trouble with their transportation cask where when they  
7           got to the hub they open them up and found a lot of  
8           hydrogen in them.

9           And so it's a valid question. It's right,  
10          like Kris said it's not just an extended storage issue  
11          or an aging issue, but the fact is that ISG-11 was  
12          predicated on it being dry. If it's not dry then there  
13          is other mechanisms of degradation that one has to at  
14          least analyze and take into consideration.

15          DR. CSONTOS: And that would be it for me  
16          because AMP Elements 7, 8, 9 and 10 are all very similar  
17          to the previous two that you just saw. Just to save time  
18          if you have any questions I can answer those.

19          MR. CUMMINGS: Great. Thank you very  
20          much. I appreciate the ACRS staff's time and the Board  
21          Member's time to, for NEI to present on our guidance  
22          document on operations-based aging management for dry  
23          cask storage.

24          I want to commend the NRC staff and  
25          management in their efforts to update NUREG-1927. I

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 think they've done a tremendous amount of work to get  
2 the NUREG updated and to provide some additional detail  
3 to the industry so that we do have a clear and efficient  
4 licensing process for license renewal.

5 That being said, we will have comments on  
6 the NUREG-1927 when it's updated after this meeting.  
7 But I won't go into those details today. I'll focus on,  
8 the next slide, I'll focus on, first I want to talk a  
9 little bit about the extended storage safety basis.

10 I'll go through a very brief overview of the  
11 guidance document itself and focus on two specific  
12 aspects and then talk about a little bit of the NRC  
13 comments, the response and some of the industry response  
14 on that. And again I'm going to focus on the things  
15 where I think we have some disagreement which is, I don't  
16 want to say it's relatively little but we have I think  
17 a lot more agreement than we have disagreement.

18 Next slide. So I know you guys probably  
19 all know this. But I think it's important to reiterate  
20 and that came up during some of the previous  
21 conversation in that dry cask storage systems are very  
22 robust with no moving parts.

23 They're passive. They sit there. They  
24 essentially do nothing. They just sit there. The Part  
25 72.42 rulemaking increased the license renewal terms

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 from 20 to 40 years and that was consistent with previous  
2 license renewals.

3 The continued storage rulemaking, again,  
4 had quotes and statements in that rulemaking that the  
5 continued safe storage of spent fuel and dry cask for  
6 the time frames considered in the GEIS is technically  
7 feasible. I want to remind you that in 2007 both the  
8 NRC and EPRI went and did a PRA analysis of dry cask  
9 storage systems.

10 And I don't think it's so much important of  
11 the actual numbers that were created in those two PRA  
12 analyses as it is to compare the number that was in those  
13 reports to the reactor based numbers. And you've got  
14 seven to eight orders of magnitude lower risk associated  
15 with dry cask storage than you do operating reactors.  
16 And so the --

17 MEMBER POWERS: A more perhaps useful  
18 analysis would be to go through and look at the risk  
19 achievement and risk reduction worths of all these vast  
20 number of steps that are used to assure that they don't  
21 get leakage from that. Do we have PRAs of the quality  
22 or the comprehensiveness that would allow us to go  
23 through and look at risk achievement and risk reduction  
24 associated with pages and pages of requirements?

25 MR. CUMMINGS: Yes, my sense is that the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 PRAs that have been done to date are not to the level  
2 of, you know, of full blown seismic or fire protection  
3 PRA or even if you look at the other types of PRAs.  
4 They're kind of a first aspect.

5 And they got them and they said well look  
6 we got this really low number. We don't need to go to  
7 the next step for this more detailed analysis.

8 MEMBER POWERS: I mean I suspect they could  
9 have gotten a low number pretty easily --

10 MR. CUMMINGS: Right.

11 MEMBER POWERS: -- out of that. The  
12 question that comes up is we're imposing huge numbers  
13 of requirements here exacting standards, strict quality  
14 control requirements, elaborate inspections and the  
15 question comes up which of those are giving us bang for  
16 the buck and which ones are just creating, killing trees  
17 from writing reports?

18 And we really honestly need you guys at EPRI  
19 to come up with a PRA that allows us to look at that  
20 because otherwise we're, you gravitate to what you know  
21 and what you're familiar with and that's what this looks  
22 like. And the question is do we want to do that or not?  
23 It's a cost benefit thing I suppose.

24 MR. CUMMINGS: Right, absolutely because I  
25 mean, you know, you had I think a good point, Dr.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Ballinger, about, well, you know, if we can do some sort  
2 of a risk analysis to determine which of the casks is  
3 the most susceptible well we've got 2,200 of these, you  
4 know, sitting out there and doing a full blown risk  
5 analysis to determine which one is the most susceptible  
6 is probably not worth the complete cost that would be  
7 needed to do that.

8                   However, to try to answer your question in  
9 terms of, you know, which ones are the bang for the buck,  
10 certainly, you know, being sure that you have your  
11 confinement boundary intact or you're focusing on that  
12 is certainly the primary focus because that is your  
13 prevention of radiological release or one of the primary  
14 means to prevent radiological release.

15                   MEMBER POWERS: That gives you metric for  
16 success or failure that's a little more discriminating  
17 than cancer risk.

18                   MR. CUMMINGS: Correct.

19                   MEMBER POWERS: Okay. And what you want  
20 to know is focusing entirely on, should I focus on stress  
21 corrosion cracking or wastage, corrosion or something  
22 else? Which ones are really the ones that deserve a lot  
23 of attention, close inspection and which ones kind of  
24 look at every alternate decade and it's going to be fine?

25                   CHAIRMAN BALLINGER: What concerns me is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the difference between risk, doing a risk analysis  
2 versus the path forward that's happening now is let's  
3 say we commit to the path forward now of all these  
4 inspection things and we make assumptions that we're  
5 going to actually have inspection capability that can  
6 actually meet the criteria.

7 So given all that so we've committed and  
8 let's say we fail. For one reason or another some  
9 inspection technique or something that we need we just  
10 simply can't, it's just not, without spending a zillion  
11 dollars we can't do it.

12 Now we're in a hole because we've made a  
13 commitment to do certain things and we've convinced the  
14 public and everybody else that this is the right way to  
15 go and then all of a sudden we find that we're in a hole  
16 when in fact if we had done a rigorous risk analysis of  
17 the system we may have done what Dr. Powers is saying  
18 is that it would point out what may be the obvious  
19 important sets of variables.

20 But we may have concluded that the risk is  
21  $10^{-14}$  and in which case  $10^{-14}$ , you know, is darn low.

22 MEMBER POWERS: I kind of like your  
23 containment boundary integrity. I mean I think that's  
24 a good metric to use. And it's a little more  
25 discriminating than the  $10^{-14}$  which is a number that, you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 know, it borders on the meaningless to me.

2 But if you had an integrity and you've got  
3 a pretty reasonable definition of what you mean by  
4 integrity it's something like  $10^{-7}$  standard cubic  
5 centimeters per second that's kind of a standard number  
6 that a lot of people use for vacuum systems and gives  
7 you a nice metric to do the PRA on and then you can, if  
8 you can do the risk achievement, risk reduction works  
9 on the steps that are being taken you know which ones  
10 to spend time on. That's the advantage of it.

11 CHAIRMAN BALLINGER: It's more like not  
12 necessarily leak rate but it's dose to the public which  
13 is really --

14 MEMBER POWERS: See the trouble is you go  
15 off into numbers that are in Never-Never Land out there.  
16 If you take this metric that Kris has suggested which  
17 is one that's relatively easy to measure, I mean  $10^{-7}$   
18 you can do it kind of routinely on a vacuum system.

19 And you say okay anything between  $10^{-5}$  and  
20  $10^{-7}$  is kind of my acceptance bound. As you get closer  
21 to  $10^{-5}$  I would start getting more and more nervous.

22 Then you don't have to go to these numbers  
23 that news media are very good at saying five cancers will  
24 show up in the public as a result of the failings at this  
25 site and things like that. I mean that's, I think

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that's a great idea, Kris.

2 MR. CUMMINGS: And I know there was a  
3 meeting a few months ago about risk informed framework  
4 and defense in depth and talking about actually  
5 introducing PRA. I know the NRC is working on some of  
6 that with the PRA analysis.

7 And that was one of the things that was  
8 discussed is what's the appropriate metric. Is it a  
9 latent cancer fatality? Should we have dose-based  
10 metric? I think we're still talking about those  
11 things.

12 MEMBER POWERS: I really encourage you to  
13 go to your leak, I mean I like your leak rate a lot  
14 because it gets you out of the headlines and into the  
15 science and engineering here.

16 MEMBER RYAN: The other thing is if you  
17 want to look at a dose scenario of one kind or six  
18 different kinds, whatever it might be, you're at the  
19 source term step which is part of, you know, you're  
20 bouncing around that is your source term, that's your  
21 release rate or it's not.

22 But if you go to apply that release rate,  
23 you know, what happens if I drink it, eat it, give it  
24 to my kid a wide range activities --

25 DR. CSONTOS: That's what I was saying

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 before that this could be an order of magnitude or more  
2 complicated if you do a certain type of PRA if you have  
3 to analyze all those pieces. If your criteria is  
4 through-wall breach than that's easily, I think that's  
5 much more easily manageable.

6 MEMBER RYAN: The leak rate.

7 DR. CSONTOS: Right or given leak rate,  
8 right.

9 CHAIRMAN BALLINGER: He did not say  
10 through-wall breach. He said leak rate.

11 DR. CSONTOS: Leakage and that's what I'm  
12 saying. So those numbers will they, do they have any  
13 leakage?

14 MR. CUMMINGS: No, I don't believe they  
15 will from the perspective of a cask is fabricated and  
16 manufactured in accordance with its certificate. What  
17 now is the risk of a latent cancer fatality to a member  
18 of the public?

19 So, no, it didn't consider necessarily  
20 degradation aspects.

21 MEMBER RYAN: There is so much uncertainty  
22 in the later, in the risk of an exposure to a member of  
23 the public. Let's think about that for a second. Is  
24 that an infant or is that a senior citizen that's, you  
25 know, already got three cancers or is that a robust

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 weightlifter that's in his 20's?

2                   You know, I don't know what to do with that.  
3 That has a magnitude of sensitivity.

4                   DR. CSONTOS: As well as how many sites all  
5 around the country. I mean it's --

6                   MEMBER RYAN: Right. I get a headache  
7 thinking about it.

8                   CHAIRMAN BALLINGER: The leak rate  
9 criteria also establishes a definitive single  
10 corrective action point.

11                   MEMBER RYAN: Well maybe, maybe not.  
12 Except that it's closer to consistency.

13                   DR. CSONTOS: The stainless steel  
14 canisters other than the ones that have a bolted lid that  
15 have this leak detection capability don't have leak  
16 detection or leak rate detection capabilities  
17 associated for monitoring them at this point.

18                   CHAIRMAN BALLINGER: Where there's a will  
19 there's a way.

20                   DR. CSONTOS: It's a little harder than the  
21 inspection piece.

22                   CHAIRMAN BALLINGER: And you're finding  
23 that out.

24                   MR. CUMMINGS: I didn't envision so much  
25 interest going in the first slide.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. LOMBARD: If I could interject some  
2 information here. As Kris pointed out the two PRAs that  
3 were done previously, especially the one by EPRI I'm  
4 probably a little more familiar with it was assumed that  
5 the system that was evaluated was as designed and it only  
6 looked at the first year of operation, not any material  
7 degradation affects.

8 Our approach and we'd love to come and talk  
9 to you about this at some point because we're moving on,  
10 it's a seven step process that we're going through now.  
11 We've already looked at defense in depth and come up with  
12 a three by three matrix of how to define defense in depth  
13 for dry cask storage systems and we're just now starting  
14 our, what are the safety goals?

15 What should the safety goal look like? And  
16 Dr. Powers is right on target. Should it be latent  
17 cancer fatality? I think that's an easy one to go to  
18 but it doesn't make a lot of sense. It's, it makes the  
19 calculation a little more difficult and it doesn't  
20 really bring it to reality.

21 We are not looking to require PRAs for dry  
22 cask storage systems because that would mean there would  
23 have to be a PRA for each different system and there's  
24 a lot of different systems out there right now. Of the  
25 2,000 there's many different designs.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So we're looking at more of a qualitative  
2 approach to come out with a risk informed framework for  
3 dry cask storage systems. And again we would like to  
4 come and talk to you about that if you want to hear more  
5 about it.

6           MEMBER POWERS: It should be interesting  
7 to talk about it. But remember, you know, sometimes you  
8 save on the mackerel and spend on the cod. When you go  
9 to qualitative techniques you can lose this ability to  
10 evaluate your end of the bargain which is where should  
11 I marshal my resources and spend my attentions?

12           So be careful about saying well it's  
13 qualitative techniques will be good because sometimes,  
14 I mean that's the problem we've run into with ISAs where  
15 everything becomes important to safety and all things  
16 important to safety are the same. And it's just not  
17 true. We know some things are important than others.

18           And you've got to commit, you would just  
19 like to know where to spend your time because you haven't  
20 got an infinite number of people. I mean Al works like  
21 20 hours a day I know. But to ask him to go the extra  
22 four may be a bit much. He needs some sleep.

23           MR. CUMMINGS: All right. So the content  
24 of NEI 14-03 is really as a, is process focused. So we  
25 don't get into a lot of the AMP details and things like

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that. It's really, it's how do we implement the overall  
2 program.

3 And so the two key areas of focus are kind  
4 of a forward looking approach to gathering the operating  
5 data and then also kind of the renewal application  
6 format and content. And I'm not going to go too much  
7 into the second one.

8 The main concept that's introduced in the  
9 guidance document, next slide, thanks, Kristina, is the  
10 tollgate concept which we discussed a little bit. It's  
11 really a commitment to do these periodic safety  
12 assessments where you go out, you look at the  
13 operational experience, the various research programs  
14 that have been done at the national labs, EPRI  
15 internationally, what have you.

16 And you look at the collected data and say  
17 am I still doing my Aging Management Program that's  
18 consistent with the data that's new from when the last  
19 time I did it or even my own data that I've collected  
20 at each individual site and then each of the sites that  
21 we'd be doing it.

22 So it's really go out, get the data. Am I  
23 still doing the right thing or am I doing something that,  
24 you know, I've now gotten information to say maybe I  
25 don't need to do that anymore. Maybe it's not five

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 years, it's ten years.

2 But as we collect the data it's going to be  
3 important that we, you know, understand whether that's  
4 an approach that we can take or not. It has been piloted  
5 in the Calvert Cliffs and Prairie Island license  
6 renewals. Calvert Cliffs has been approved.

7 It is a little bit different in there if you  
8 take a look at those. Those tollgates are associated  
9 with specific issues whereas the tollgate concept in NEI  
10 14-03 is more of a holistic safety assessment type  
11 approach.

12 Next slide. This is just giving you  
13 graphically kind of an idea of, you know, how we go along  
14 and you have a tollgate and if you look at all the data  
15 and you say everything looks good you've confirmed that  
16 you're doing the right thing then you move through the  
17 tollgate and you go on over the top of that is things  
18 like the CISCC, aging management, the high burnup R&D  
19 program. Those are two key aspects.

20 MEMBER POWERS: Are we going to run into  
21 the same problem we ran into with Appendix J?

22 MR. CUMMINGS: I'm not familiar with that.  
23 If you could --

24 MEMBER POWERS: We have times for testing  
25 valves and nobody likes to do it because it's a pain in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the neck to do it. And so this tollgate was a ten but  
2 why don't you go to 15.

3 I'm sure it would be okay. And what's  
4 portrayed as four tolls quickly becomes one.

5 MR. CUMMINGS: Well let me try to address  
6 that as I go forward. Next slide. One of the key  
7 concepts especially with regard with licensee  
8 implementation is that for it to be effective the  
9 operations based Aging Management Program requires the  
10 ability to efficiently change the AMAs based on the  
11 feedback from that operating experience and those  
12 safety assessments.

13 And that's what I think that the key areas  
14 that we've been continuing to have some areas where we  
15 need to reach closure with the NRC that if you put all  
16 of that information into the license conditions or into  
17 the tech specs you now can't do that efficiently. You  
18 have to go back to the NRC to get that changed.

19 So let's take the example of CISCC and you  
20 make a commitment to do a visual examination and then  
21 everything goes as planned and we get the new inspection  
22 techniques that's based on eddy current and we can see  
23 cracks or whatever. We have the ASME Code that goes  
24 forward.

25 Rather than being able to implement that

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 essentially I don't want to say immediately but in a  
2 timely manner we would now have to go back to the NRC  
3 and get that revised to allow that new method to be done.  
4 So we're really just looking to ensure that we have that  
5 flexibility in the same way that we had that flexibility  
6 on the reactor side.

7 All of the AMAs are in the license renewal  
8 application. They're put into the FSAR. They're put  
9 into the implementing procedures. We're advocating  
10 for a similar approach here on the dry cask storage side  
11 understanding that there is that kind of nuanced  
12 licensee responsibility between the CoC holder which is  
13 the cask vendor and then the implementer of the CoC which  
14 is the utility.

15 So now if the utility wants to change  
16 something whether it's doing it more often or more  
17 importantly modifying the program something different  
18 than what's in the CoC, they've now got to go back to  
19 the cask vendor to get that done which then the cask  
20 vendor would have to go back to the NRC.

21 Next slide, Operating Experience. Again  
22 that's one of the key areas where we're trying to work  
23 through how is that operating experience being shared.  
24 Right now each of the cask vendors have users groups.  
25 They do a very good job of sharing their operating

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 experience, you know, loading things like that with all  
2 of the members of their users group.

3 So the users of that specific system or more  
4 importantly the users of that specific cask vendor.  
5 The challenge right now is really how do we share that  
6 information amongst cask vendors. We don't have a  
7 process for that and so I'll talk a little bit later  
8 about our ideas on how we might try to make that work.

9 Next slide. So the status is we've  
10 submitted it. We've received some initial comments  
11 from the NRC and we're working through a meeting that  
12 we had about a month ago. The feedback that we hear from  
13 the Board Members here on ways that we can improve the  
14 NEI guidance document.

15 So I want to talk a little bit about the  
16 sharing of operating experience, the change control and  
17 the lead canister inspection. So right now we're  
18 working to develop options for an improved operating  
19 experience program.

20 The two current areas that we're  
21 considering is expanding the cask vendors existing  
22 programs to have them expanding to aging management is  
23 not a big issue. I think the biggest issue is how can  
24 we get these entities that are very competitive and very  
25 proprietary oriented to share some of that information

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 as a holistic industry approach.

2 The other idea is to take the existing plant  
3 operating experience infrastructure, i.e. INPO and find  
4 some way to implement dry cask storage operating  
5 experience and aging management experience into that  
6 sort of infrastructure. Again the challenge there is  
7 that the INPO membership is fairly hefty and so having  
8 some other process within that that's reflective of  
9 facilities that only have dry cask storage, don't have  
10 an operating reactor and then also vendor interaction  
11 with that is some of the key things that we need to try  
12 to address or the challenges that we would need to try  
13 to address in INPO.

14 Next slide. So I think I touched on a lot  
15 of the issues here about placing the Aging Management  
16 Program under licensee control. Having it in license  
17 conditions is inconsistent with the NEI proposed  
18 rulemaking 72-7 and we feel that it's also inconsistent  
19 with a risk informed framework.

20 Really to remain a learning Aging  
21 Management Program we need to ensure that flexibility  
22 is there for the CoC holders and the utilities to  
23 implement the lessons that we learned from the tollgate  
24 assessments. And on top of all that there's also the  
25 underlying QA program that requires maintenance of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 design basis.

2 In the certificate it says you have to  
3 maintain your confinement boundaries. So if we move  
4 along and we get, you know, however long out 60 years,  
5 80 years, you know, the time doesn't matter and we find  
6 that there's some issue with the confinement boundary,  
7 it's a responsibility under the QA program to restore  
8 that design basis.

9 And so that's going to have to be achieved and  
10 that is achieved right now through or can be through the  
11 QA program and the Corrective Action Program.

12 MEMBER BROWN: Maybe I'm wrong and  
13 somebody over here can correct me. But I thought when  
14 we do our license renewals that the Aging Management  
15 Program is a key part of that assessment for extensions,  
16 license extensions and that the Aging Management  
17 Program kind of sets the metrics for the renewal itself.

18 To me I always thought of that as being part  
19 of the license conditions when the license was renewed.  
20 Yet here I'm storing high burnup fuel, all other kinds  
21 of stuff like this and yet an Aging Management Program  
22 in its adequate definition as part of the license is not  
23 part of the license condition? And that's  
24 inconsistent. I guess I don't understand how that's  
25 inconsistent with at least the overall safety and health

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 of the public in terms of allowing license extensions  
2 or even brand new ones to go forward with these  
3 installations and systems.

4 MR. MCCULLUM: This is Rod McCullum at NEI.  
5 I think it's a question of level of detail. Absolutely  
6 there should be a license commitment to have an Aging  
7 Management Program. It's the question of where do the  
8 details of that Aging Management Program reside.

9 Do they reside in procedures? Do they  
10 reside in the safety analysis report or do they reside  
11 in the license themselves? If you look at the Aging  
12 Management Programs the renewed reactor operating  
13 licensees are committed to those details do exist in  
14 those lower tier documents.

15 It comes down to and there's a related issue  
16 that we had a lot of dialogue between industry and NRC  
17 here is it comes down to the utility of the 72.48 process  
18 because in reactor space you have 50.59 and those  
19 details are controlled under 50.59. If you change one  
20 of those details in the way that it creates an accident  
21 different than that described in the SAR you have an  
22 obligation to go out and seek NRC approval of it, 72.48  
23 works the same way.

24 We have struggled with the staff in Part 72  
25 space to gain an acceptance of the use of Part 72 the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 way Part 50.59 is used in reactor space. We have  
2 another NEI guidance document 12-04 which is under  
3 review by the staff to try to get us past those  
4 struggles.

5 And I think we're going to because 12 means  
6 it was created in 2012, we're going to kind of invigorate  
7 our efforts to get past that. But I agree with you  
8 absolutely. There should be a commitment to an Aging  
9 Management Program in the license.

10 It's where the details of that program  
11 exists and who controls them because if it truly is  
12 learning it needs to be able to be adjusted without  
13 having to go through a Notice and Comment rulemaking  
14 with the regulator before you can adjust it.

15 DR. CSONTOS: So in license renewal for  
16 reactors there are a couple of generic license  
17 conditions. To incorporate the Aging Management  
18 activities as a part of the --

19 MEMBER BROWN: It's the GALL, you're  
20 talking about the GALL.

21 DR. CSONTOS: Exactly. It's, they  
22 reference the GALL. They reference all their Aging  
23 Management Programs that are coming from the GALL. We  
24 don't have a GALL here.

25 And so what we've given you is three example

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 AMPs and then the other ones that we're going to be  
2 developing in the MAPS report that's the GALL- like,  
3 I'll go into a little bit.

4 But the difference is that as a result of  
5 not having an ASME Code Section XI type of process and  
6 procedures and criteria and all that that's already  
7 developed, like I said, AMPs in the reactor world are  
8 in addition to the operating piece which is Op Section  
9 11. And those aging management that they do from  
10 looking at hey, well we saw a leaker here.

11 Well we've alleviated it based on Section  
12 XI requirements and such. And so all of these we don't  
13 have that yet. And until we have that I think that is  
14 kind of, that needs to come before we can fix some of  
15 these other things because we also would love to have  
16 a way for the licensees to, you know, incorporate  
17 operating experience at a faster pace because it's more,  
18 it's an incentivization to do the right thing.

19 But we were not comfortable during the, you  
20 mentioned the two license renewals that are ahead of us  
21 that we're doing right now, one that was approved. We  
22 didn't have, the staff did not have the confidence that  
23 we couldn't do that at that point and just give those  
24 generic outs basically.

25 And so we required those and they're more

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 specific. That sort of specificity of the language was  
2 in there. You must inspect here, here, here, here  
3 because we don't have that Section XI yet to reference.  
4 And that's why we're doing what we're doing. And you'll  
5 hear it --

6 MR. MCCULLUM: Rod McCullum if I may. I  
7 just want to point out Al and I are in violent agreement  
8 here. And really we accepted that he had to do or NRC  
9 had to do what had to be done for those first two cases.

10 But we think that the long-term solution to  
11 this is, we embrace the MAPS. We've reviewed the  
12 drafts. We've commented. Our comments have been  
13 incorporated. We're happy with the MAP reports. The  
14 GALL-like thing is almost there whenever NRC says it's  
15 there.

16 We've also expressed a willingness to NRC  
17 to participate in this, Al has used the term and I'll  
18 put it on the record ASMEizing of our world in dry  
19 storage where we do have an ASME Section XI equivalent.  
20 We'd like to have industry people participating on that.

21 To us the answer here is to get those things  
22 in place so we can put the level of detail where it  
23 belongs not to keep putting the level of detail on the  
24 license and potentially stifling learning aging  
25 management.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 CHAIRMAN BALLINGER: Okay. We're running  
2 late so --

3 MR. CUMMINGS: I have one more slide and  
4 then I can finish up.

5 CHAIRMAN BALLINGER: We're not running  
6 too, too late.

7 MR. CUMMINGS: Next slide. Next slide.  
8 And so then the last issue where we need to have some  
9 additional discussions is about this concept of lead  
10 system inspections. You know, it's going to be really  
11 important to kind of distinguish what the scope and  
12 purpose of a lead canister inspection is which would  
13 possibly be done before the renewal application versus  
14 the Aging Management Program inspections.

15 One of the, again one of the nuances  
16 associated with CoC holders with Part 72 general  
17 licensees is that the CoC holder has no legal authority  
18 to require the general licensees to perform inspections  
19 prior to the period of extended operation. They have  
20 a current licensing basis in their original license  
21 which says no inspections.

22 So we think that there's something that we  
23 can discuss there. Does it really make a difference to  
24 do an inspection at year 19 or year 21? We've got the  
25 confidence through 20 years. The NRC has stated that.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 So I think there's some additional discussion that we  
2 need to have about what the scope of those renewal, what  
3 those inspections are and how they get done.

4 And then with regard to CISCC we talked  
5 about it a little bit. EPRI has a forthcoming  
6 susceptibility report that will allow the industry to  
7 rank not only canisters at an individual site but  
8 canisters between sites to determine which would be more  
9 susceptible.

10 It's not a PRA analysis. It's more of a  
11 what are the factors that would go into susceptibility  
12 for chloride-induced stress corrosion cracking. So  
13 that was the gist of my concept. I would be happy to  
14 answer any other questions.

15 MEMBER SKILLMAN: I would like to make  
16 three comments, maybe they're questions but let me  
17 introduce them as comments and perhaps you would  
18 respond. On your Page 19 of NEI 14-03 you introduce the  
19 topic of the tollgates.

20 You write the timing of the initial  
21 tollgate should be chosen to be sufficiently early to  
22 allow any degradation to be addressed before canister  
23 integrity is affected but sufficiently far out in time  
24 to take advantage of anticipated advances in inspection  
25 techniques so on and so forth.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Building on Dr. Powers earlier comment, it  
2 seems to me that there really ought to be a hard stop  
3 for your first tollgate. And it should be something  
4 that industry is comfortable with, but it should  
5 generally be uniform so there's an understanding of when  
6 the tollgate will be arrived at.

7 MR. CUMMINGS: Sure.

8 MEMBER SKILLMAN: And building onto that  
9 comment there is nothing in your tollgate assessment  
10 which at Page 20, 265 that talks about the quality or  
11 the thoroughness or your tollgate assessment. What is  
12 the standard?

13 I can imagine with the types of individuals  
14 that are in the consulting industry one tollgate  
15 assessment might be 5,000 pages and another might be 11  
16 and the 11 would probably be just fine. But there needs  
17 to be some form of a standard so is there a good  
18 understanding of what the utilities are going to be  
19 investing in. They need to know that. That should not  
20 be --

21 MR. CUMMINGS: Sure, good comment.

22 MEMBER SKILLMAN: -- if you will like the  
23 design basis reconstitution that many people went  
24 through 20, 25 years ago, if you remember that activity.  
25 And the third comment has to do with what we just spoke

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 about, the interface with the Aging Management  
2 Programs.

3 On your Page 26 you write it is expected  
4 that these AMPs will be integrated into an existing site  
5 Aging Management Program. Those are your words. Well  
6 if you mean that then you need to clarify this discussion  
7 that we've just had here.

8 If that's something to be done in the future  
9 then that needs to be reflected in NEI 14-03. If you  
10 really do anticipate, like Charlie does, that on license  
11 renewal your AMP for your casks is included in your  
12 license renewal amendment activities, which is what  
13 this infers, then that ought to be clear.

14 MR. CUMMINGS: Okay, okay.

15 MEMBER SKILLMAN: Thank you.

16 MR. CUMMINGS: Those are good comments.

17 MEMBER SKILLMAN: Thank you.

18 CHAIRMAN BALLINGER: Last but not least.

19 DR. CSONTOS: The future. In the year  
20 2000.

21 MR. CUMMINGS: You need a synthesizer to  
22 turn the music on top of that.

23 DR. CSONTOS: So okay, lastly I'll just be  
24 talking about what else we're doing.

25 CHAIRMAN BALLINGER: By the way the car was

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 stainless steel.

2 DR. CSONTOS: The what?

3 CHAIRMAN BALLINGER: Back to the Future.

4 DR. CSONTOS: That's right, the DeLorean.  
5 I'm glad it wasn't near an ocean then. So, yes, so we're  
6 talking about the future. You've already heard this.

7 I wanted to just tell you that what we found  
8 out was that the staff we all got together about 14  
9 months ago said look, there's experience. We need to  
10 change some things. We went through this  
11 operations-focused aging management approach similar  
12 to the reactors developing all this that we talked  
13 about.

14 Rev. 1 of 1927 is the culmination of that  
15 effort. We've heard the comments about the stove  
16 piping or being, you know, myopic and just thinking  
17 about our own little area, okay. We hear you.

18 You know, we haven't come to talk to you  
19 about the larger picture but maybe we should come and  
20 talk to you about the larger picture so we can show how  
21 renewals is a piece of that because, you know, one of  
22 the big picture items of this is that if we ever go, if  
23 the country ever goes to an interim consolidated storage  
24 site for this fuel these AMPs that are here can be also  
25 ported to there, okay.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           The type of work that we're doing, aging  
2 management is something we do for planes, trains,  
3 automobiles, reactors and here. And so it's whether  
4 it's here at all the different sites or at some other  
5 interim site it's still going to be aging management,  
6 okay.

7           So why did we focus on this area alone,  
8 okay, for right now that we came to talk to you about  
9 is because of what we had. We had three renewal  
10 applications in house that we were having some trouble  
11 with, okay, at the time in terms of how do we go forward  
12 with aging managing the degradation or possible  
13 degradation?

14           We also have these 15 renewals coming up in  
15 ten years. And when we go to that slide, that's the next  
16 slide, you can see here this is a slide of the number  
17 of renewal applications that are coming in house by the  
18 fiscal year, okay.

19           And we've had three that I talked about in  
20 2012 and 2013. Two of them were the site specific,  
21 Calvert Cliffs and Prairie Island. The third one was  
22 VSC-24 which is a general or a CoC application, okay.

23           The VSC-24 was at a couple sites and then  
24 the other two were individual sites. We are now  
25 reviewing the 1,004 CoC which is at 17 sites. That's

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 what I'm showing in 2015. And so that's where we were,  
2 we were hit with this difficulty or the challenge for  
3 us was how do we develop a renewal strategy that can be  
4 done and used ubiquitously across the country because  
5 a CoC, they could apply for any place really that they  
6 want to place it.

7 And so having the multiple sites became a  
8 challenge for us. And you can see now 2018, 2019, 2020,  
9 2020 you have a peak applications of six at 35 different  
10 sites. The key to handling this future workload is this  
11 guidance development and the standards development.

12 And that's where I think in the future from  
13 basically 2018 onward we can use this updated guidance.  
14 Okay, next slide.

15 So what are we looking at? This is Slide  
16 4. We are, like I said, we had a meeting here with the  
17 expert panel, a lot of professors and such looking at  
18 degradation of concrete structures, okay. There is a  
19 report that's going to be coming out of that from our  
20 Office of Research colleagues that we'll present in the  
21 near future.

22 That will discuss all the different ideas  
23 of all the different other degradation mechanisms that  
24 we may not have captured in Ricardo's AMP, okay, the  
25 concrete AMP. Next one is Aging Management Tables.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 This is the predecessor to a GALL-like document, okay  
2 and an AMP.

3 We need Aging Management Tables  
4 specifically for individual systems and all the  
5 different components and subcomponents that are  
6 associated with those systems. How do we scope them in  
7 and we scope them out? Those are all, what we do is we  
8 create a big, large table with all ten AMP elements and  
9 we then identify all the different pieces for it.

10 And then that's our contract through our  
11 Office of Research. They provide that to us. We  
12 develop here and then assess internally the Aging  
13 Management Programs. From the Aging Management  
14 Programs we will then incorporate them into this Aging  
15 Management Program that is part of the MAPS report,  
16 okay.

17 And that's on the next slide. Yes, it's on  
18 the next slide. So that's where the MAPS report, I'll  
19 talk about that in a second. The Extended Storage and  
20 Transportation that's our EST program, there's a lot of  
21 things that we worked on that were for, we thought, were  
22 in the long, long-term that came into the nearer term,  
23 okay, aging issues.

24 NDE inspection technology reviews. We  
25 don't develop it here at NRC. We just review what the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 licensees, so vendors or industry have come up with as  
2 a possibility.

3 And I can tell you that we've been at  
4 workshops where they show us robots that are the size  
5 of my hand that they think can go in and out and go  
6 anywhere and vacuum technologies that can just go  
7 anywhere they want and little, miniaturized robot-like  
8 features.

9 MALE PARTICIPANT: Snakes.

10 DR. CSONTOS: Snakes as well, that's  
11 right. And so, yes, so they're very, very innovative  
12 on the, from industry point of view and that's why I  
13 feel, Darrell and I feel confident that these are, you  
14 know, they're achievable.

15 CHAIRMAN BALLINGER: These are industries  
16 that are not, they have to adapt us to our environment.

17 DR. CSONTOS: Adapting the technology to  
18 the real --

19 CHAIRMAN BALLINGER: That's a fairly large  
20 step in all of this.

21 DR. CSONTOS: Yes, and --

22 CHAIRMAN BALLINGER: It costs a lot of  
23 money.

24 DR. CSONTOS: They're working on it. They  
25 called it SCC modeling. I mentioned to you earlier,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Darrell mentioned it to you earlier. Some of that also  
2 includes some work that we're looking into using GoldSim  
3 to do somewhat of a probabilistic but not a full  
4 probabilistic review of that.

5 But to take into account what you said, Dr.  
6 Ballinger, which is the probabilistic nature or I could  
7 call it stochastic nature of stress corrosion cracking,  
8 okay. The thermal analysis that's really important for  
9 the chloride SSC modeling.

10 The thermal analysis does tell us because  
11 one of the things that Darrell has been looking at is  
12 the corrosion and the temperature and relative humidity  
13 affects. And we also need to know what the surface  
14 temperatures are because not only is it that each of the  
15 system by system that we need to segregate or to identify  
16 and prioritize which canister it is.

17 It's also the locations of where on the  
18 canister like for horizontal system it's the hottest at  
19 the top and the center. Well that's not as an important  
20 area, although it has a lot of deposition because of the  
21 flat it's a more, a flatter surface, but it may just be  
22 too hot for cracking to occur.

23 So why look there if we feel confident it's  
24 not going to be, why as Dr. Powers said, you know, we  
25 need to be a little bit more maybe focused in where we

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 use, you know, these, where we focus our efforts.

2 Cladding integrity research. We are doing  
3 work at Oak Ridge National Laboratory. That's why  
4 Meraj Rahimi is actually there at a, what do you call  
5 them --

6 MALE PARTICIPANT: Program review.

7 DR. CSONTOS: Program review, there you  
8 go, program review of our research. And we do fatigue  
9 testing there for high burnup fuel and also some  
10 cladding stress modeling that our Office of Research  
11 does, okay.

12 Stakeholder engagement, we are, you know,  
13 we had public meetings about the DOE, the High Burnup  
14 Dry Cask Research Development Program. That's that  
15 demo program the for the high burnup fuel working with  
16 also the amendment, public meetings with North Anna and  
17 we're interested in this Chloride RIRP program. We  
18 have a public meeting I think next week.

19 CHAIRMAN BALLINGER: The 21st.

20 DR. CSONTOS: The 21st, two weeks from now.  
21 And we'll provide some information on some of our latest  
22 work. And it's a way for us to provide information back  
23 and forth.

24 You had mentioned in your previous, the  
25 previous talk about chloride SCC and we will be focused

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 on that. But there is other aspects that before we went  
2 to chloride SCC we all looked at a larger subset of  
3 corrosion mechanisms.

4 And EPRI developed a report called the  
5 Failure Modes and Affects Analysis Report that  
6 documents all sorts of different mechanisms that we have  
7 seen on the reactor side and then we focused on chloride  
8 SCC because it seemed to be the fastest and the more  
9 difficult mechanism.

10 14-03 we've already provided comments and  
11 we, it would be very good to hear what you all have to  
12 say. Next one is the guidance infrastructure. So  
13 those are all technical pieces. But guidance  
14 infrastructure that we're developing again 1927, we're  
15 hopefully going to get that out for public comment in  
16 the next month or two.

17 Licensees have been really itching for this  
18 information. The draft RIS, this is the RIS I was  
19 talking about will look at the 72 to 71 and back to 72  
20 based this draft regulatory information summary for  
21 high burnup fuel for storage and transportation. It's  
22 out. It's available.

23 I don't have the ADAMS number on here but  
24 I can get it to you. And then there is the MAPS report.  
25 This is the GALL-like NUREG analog that Dr. Stetkar

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 mentioned at the beginning of the whole day here. We  
2 agree with him.

3 This is a, we're calling it the MAPS report.  
4 We're not going to take credit for that naming. That  
5 was Rod, I believe.

6 MR. CUMMINGS: It was Rod. I won't take  
7 credit for this.

8 DR. CSONTOS: So the magic worked out there  
9 and what we're going to do there is part of the Aging  
10 Management Tables that our contract are creating,  
11 actually research is creating and then our AMPs that  
12 we're developing are going to be system specific, okay.

13 And as a result of that we're going to be  
14 incorporating them in a logical manner that ties into,  
15 can you go to the slide before? One more, for this  
16 chart. Those that are coming in for renewal first,  
17 okay, after the 2018 time frame, those will be the first  
18 ones that we develop the AMPs for so that we can  
19 promulgate that information as soon as possible, okay.

20 And we do that in a logical step wise  
21 manner. We go to the various systems that are coming  
22 in for renewal first so that they get our guidance out  
23 there ahead of time. This is where, the next one is the  
24 inspection for licensee's aging management activities.  
25 On the reactor side there are AMP inspection audits or

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 AMP audits, okay, AMP effectiveness audits.

2 We over here are looking into how are we  
3 going to implement and we need to get clear acceptance  
4 criteria, clear guidance to our inspectors out in the  
5 regions, okay, as well as possible other inspectors to  
6 go and observe and see how the licensees are doing their  
7 aging management activities. And so that's something  
8 that we're just in the infancy of developing.

9 That would be out there as soon as we can.  
10 While we're also doing this there is just so many  
11 different little pieces that we're trying to pull  
12 together and this one is a huge one. ASME boiler and  
13 pressure vessel, Section XI for in-service inspection  
14 of dry cask storage canisters.

15 The last part, the last ASME Code meeting  
16 they agreed, Section XI agreed to change their charter  
17 and take this on, okay. So it was a really important  
18 step that and we're going to have our first task group  
19 meeting on the 27th I believe, right.

20 MALE PARTICIPANT: Yes, that's correct.

21 DR. CSONTOS: Of April. And so that's a,  
22 the ASME Code meeting is out in Colorado Springs. So  
23 that will, that's a big area for us. We have one of our  
24 staff that's attending the ACI Code to make sure that  
25 our interests are being met because ultimately we would

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 love to see us use the codes and standards as a way for  
2 getting a consensus on our inspection programs.

3 And then again, the review of the Rev. 1 we  
4 hope for 14-03. And then lastly, this is the schematic  
5 of where we're trying to get all this done so that we  
6 can get the guidance out to the licensees as soon as  
7 possible. And I know that the code and standards goes  
8 up into 2020. It's not my process.

9 But as long as there is maybe a code case  
10 so people can reference as head of that, that would be  
11 ideal. And after 2020 we gave the licensee, for Calvert  
12 we gave them five years to develop an inspection  
13 technique.

14 They have told us they are going to try to  
15 get it done in three. When I have been at the ASME Code  
16 meeting they don't feel this is a bridge too far in terms  
17 of inspection techniques.

18 They really believe they can get something  
19 out there fairly soon because they can just leverage off  
20 of what's being done on the reactor side. And that's  
21 it.

22 CHAIRMAN BALLINGER: Questions from the  
23 Committee? I believe, what about comments from the  
24 audience? Hearing none the bridge line is opened. Is  
25 anybody out there? You'll have to identify yourself by

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 saying something.

2 MR. LEWIS: Marvin Lewis, member of the  
3 public.

4 CHAIRMAN BALLINGER: Hi, Marvin.

5 MR. LEWIS: Yes. Thank you for having  
6 this presentation. It's very, it helps put it all  
7 together especially for somebody who can't put  
8 full-time into it.

9 Really I don't know if it's a comment or a  
10 question. But, you know, when you're talking about  
11 wall cracks, cracking through-walls and all that and I  
12 was wondering, okay, so we're worried about the gases  
13 leaking out which of course includes the krypton and  
14 xenon and whatever along with the hydrogen.

15 Now gases mix pretty good. They don't have  
16 to be shaken or stirred. They mix pretty good. And I  
17 just was wondering when the helium comes out, you know,  
18 the helium has been pressurized of course is  
19 non-radioactive, when the helium does leak out it  
20 probably leaks out with some radioactive therein.

21 And I just was wondering and I'm hoping to  
22 comment that you're going to look at the possibility of  
23 looking for these leaks using a) a hearing leak detector  
24 and b) some kind of a field meter, maybe on a pole or  
25 a stick to keep the observer away from any high

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 radioactivity if there is any.

2 And I was wondering, you know, you were  
3 talking about how long it takes to leak out and that the  
4 helium would leak out first. And I can't understand  
5 that because it would be easy mixing as first of all  
6 these great species would be -- which would leave a  
7 mixing.

8 So I'm just making, you can consider that  
9 a question or a comment or a request for further work.  
10 I don't know. Okay, thank you for allowing me to speak.

11 CHAIRMAN BALLINGER: And thank you very  
12 much. Is there any, I thought I heard somebody else out  
13 there as well, is anybody else out there?

14 MR. HOFFMAN: Ace Hoffman.

15 CHAIRMAN BALLINGER: Yes, Mr. Sussman.

16 MR. HOFFMAN: Hoffman.

17 CHAIRMAN BALLINGER: Hoffman, excuse me,  
18 yes, Mr. Hoffman.

19 MR. HOFFMAN: Thank you. I have a  
20 question about the moisture inside of the dry casks that  
21 might be there.

22 It sounded to me like I heard that it's  
23 possible that moisture could get into the fuel rods  
24 themselves through microscopic cracks I would assume.  
25 And if it does get in there it's virtually impossible

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 to spin it up to 3 torr for a half hour it is not going  
2 to be, there's no way you can remove that quickly.

3 Did I hear correctly that there could be  
4 fuel inside or water inside the fuel rods themselves or  
5 is it only on the outsides of all the rods and in the  
6 assemblies and so forth?

7 CHAIRMAN BALLINGER: We're not, we can't  
8 answer questions.

9 MR. HOFFMAN: All right. I'm sorry.  
10 That's my question.

11 CHAIRMAN BALLINGER: Excuse me. But you  
12 can send in a note to Chris Brown at here and he can  
13 respond to your question.

14 MR. HOFFMAN: Okay, thank you.

15 CHAIRMAN BALLINGER: Okay. Is there  
16 anybody else out there?

17 MALE PARTICIPANT: I thought I heard Ruth.

18 MS. GILMORE: Donna Gilmore.

19 CHAIRMAN BALLINGER: Yes.

20 MS. GILMORE: Okay. Can you hear me okay?

21 CHAIRMAN BALLINGER: Yes.

22 MS. GILMORE: Okay, great. You know,  
23 somebody brought up the issue of the transportation and  
24 it would seem to me that your NUREG-1927 even though you  
25 don't deal with the transportation you should be

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 informed by it.

2 So for example if you're going to allow,  
3 could whoever is not muted please mute because they're  
4 making it difficult to hear the conversations.

5 CHAIRMAN BALLINGER: We can hear you quite  
6 well.

7 MS. GILMORE: Okay. I'm hearing a lot of  
8 background noise. So anyway, at least be informed by  
9 it. For example, if you're going to allow a certain  
10 amount of cracking in a canister and then you have a  
11 transportation requirement that the canisters need to  
12 be perfectly intact before you can transport them, you  
13 know, you're kind of setting things up to fail.

14 So I don't see how you can ignore, you know,  
15 all the transport requirements in trying to set your  
16 standards. It doesn't make any sense. Am I missing  
17 something?

18 CHAIRMAN BALLINGER: Again, if you, you  
19 can pose that question and send a note to Chris Brown  
20 here and we'll respond to that.

21 MS. GILMORE: Okay. So you're asking for  
22 comments and not questions. Is that what you're  
23 saying?

24 CHAIRMAN BALLINGER: Yes.

25 MS. GILMORE: I see, okay. So, okay,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 another comment would be I know you're planning to have  
2 the industry come up with some method to inspect maybe  
3 three to five years. There should be requirements as  
4 to what you're going to require that the inspection must  
5 be able to do.

6 You know, I'm, so that would be one of my  
7 comments. I'm not sure if anybody has addressed  
8 exactly, you know, how thorough that inspection needs  
9 to be able to be to meet your aging management  
10 requirements. So that's one comment.

11 And then you have, currently you have  
12 temperature limits set and other requirements and it  
13 needs to be really clear and I would like to see included  
14 in the NUREG exactly more specifically what the  
15 acceptable options are for them to do, you know, if  
16 they don't meet these requirements. So anyway. I  
17 guess that's all for now.

18 CHAIRMAN BALLINGER: Thank you very much.  
19 Are there any other members of the public out there?  
20 Hearing none, thank you. We'll close the bridge line.

21 MR. LUTZ: Excuse me, excuse me. Can I,  
22 I'm sorry. This is a member of the public. Can you  
23 hear me?

24 CHAIRMAN BALLINGER: Yes, we can. Can you  
25 give us your name please?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. LUTZ: Yes, I'm sorry. We were trying  
2 to get it off mute. My name is Ray Lutz. I'm with  
3 Citizens' Oversight. And the thing that I see really  
4 missing from all of these discussions is there is kind  
5 of a gap between our local Public Utilities Commission  
6 which deals with costs and the NRC which deals with some  
7 of the safety issues.

8 Apparently the way you guys have defined  
9 these safety issues is that you do on an inspiration by  
10 inspiration or even a design by design basis. Your  
11 license is by perhaps a manufacturer of the ISFSI or the  
12 cask system and not, I'm not, the problem is that we're  
13 not exploring the issue of where are these installations  
14 are being sited because there's a decision first of all  
15 about which cask system or which dry ISFSI type system  
16 that's being used, the various ones that are being  
17 approved by the NRC the Public Utilities Commission says  
18 it's out of their hands in terms of which ones are being  
19 collected.

20 And also it appears that no one is even  
21 considering where these things are being placed. It's  
22 just a de facto conclusion that they're going to be  
23 placed at every single decommissioned plant right now.  
24 And everyone says that's what the DOE says. That's the  
25 DOE's problem.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   And then the NRC says that's not our problem  
2                   and the Public Utilities says it's not our problem  
3                   either so no one is talking about it. And we need to  
4                   get more discussion is, well I know you guys cannot  
5                   answer any questions which is a sad thing.

6                   But it seems like there needs to be some  
7                   directions for the states to pursue maybe a consolidated  
8                   ISFSI configuration where it would be in a location that  
9                   would be preferable for these extremely long periods of  
10                  time that we're talking about here and not just  
11                  defaulting to installing these at the plants.

12                  So that's a problem that I see is that  
13                  there's a big chunk of things here that are not being  
14                  discussed. The stuff that you're talking about seems  
15                  like you're doing a pretty good job and I appreciate a  
16                  lot of the good questions that were asked during the  
17                  conversation today.

18                  But there's a little bit larger questions  
19                  about not exactly whether we think they're going to  
20                  corrode but where are we putting them exactly? Are  
21                  there other options? These kind of questions and those  
22                  are not being addressed.

23                  Okay, so that's the end of my comment I  
24                  guess. Thank you.

25                  CHAIRMAN BALLINGER: Thank you.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. GILMORE: This is Donna Gilmore. I  
2 actually have a couple more comments. I'll be quick,  
3 all right. Number one I met with Doctor Singh, the  
4 president of Holtec. He said, he told us that even a  
5 microscopic crack could release millions of curies of  
6 radiation into the environment.

7 He also said he would not recommend  
8 repairing these canisters because even a repair will  
9 create a location for more corrosion to occur. So I  
10 just want to get that out there. And I have a video of  
11 him making these statements. I posted it on my website  
12 at sanonofresafety.org.

13 CHAIRMAN BALLINGER: Thank you.

14 MS. GILMORE: And one more comment is you  
15 could please make the slides available ahead of time to  
16 the people that have e-mailed you and said they want to  
17 participate in the conference because that would be very  
18 helpful to have the slides to review, you know, as you're  
19 having the meeting.

20 CHAIRMAN BALLINGER: Okay. Thank you  
21 very much.

22 MS. GILMORE: Thank you. And I really  
23 appreciate all the great questions that I heard today.  
24 I really liked the honest discussion.

25 CHAIRMAN BALLINGER: Thanks again.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Anybody --

2 MR. LUTZ: One more thing. Can I ask a  
3 question? This is Ray Lutz again. Is this session  
4 being recorded and can the recording be made available  
5 to the public?

6 MR. BROWN: We have a transcript that will  
7 be probably available in two weeks on the internet.

8 CHAIRMAN BALLINGER: Yes, there will be a  
9 transcript available on the internet within two weeks.

10 MR. LUTZ: Wonderful, okay. Thank you  
11 very much. We'll look forward to that. Thank you.  
12 Bye bye.

13 CHAIRMAN BALLINGER: Anybody else out  
14 there? Hearing none we close the, okay, can we go  
15 around the table for final comments.

16 MEMBER RICCARDELLA: I have no further  
17 comments.

18 CHAIRMAN BALLINGER: Dick?

19 MEMBER SKILLMAN: Reporting timeliness I  
20 think is a comment that I'm comfortable reinforcing.  
21 Thank you for the presentation, really solid, really  
22 good. Thank you.

23 CHAIRMAN BALLINGER: Dr. Powers?

24 MEMBER POWERS: I'm resonating a lot with  
25 an implied comment in Kris' slides that said we're

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 relatively new in this process and that we need to have  
2 the capability to be flexible maybe or active or in some  
3 way adjust as we learn things along the way here and not  
4 get too encumbered by the rigidity of a system so that  
5 we can respond to things that we learn as we go along.

6 I appreciated that comment a lot and I think  
7 we need to think carefully about just exactly that. The  
8 problem that we're going to run into is the time scales  
9 here are incommensurate with the time scales which  
10 people pay attention to this issue. So the people that  
11 are going to be responding to the learning are not  
12 necessarily the people that set up the system.

13 CHAIRMAN BALLINGER: Charles.

14 MEMBER BROWN: No, I appreciated the  
15 discussion and the meeting. It was very informative  
16 for an electrical guy to listen to this stuff, have to  
17 pay attention to blacksmith technology goes to the  
18 dynamic realm in which I exist.

19 But I have learned a lot in the past and I  
20 really wanted to reemphasize the point that I really  
21 think you have to have some type of Aging Management  
22 Programs, a framework, not every detail but some  
23 framework for those programs to be developed and defined  
24 as part of the license condition and the renewal  
25 condition.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           I just, I've sat in on dozens of the license  
2 renewals and the GALL, AMP, the aging management stuff  
3 and the time limited, the TLAAs and all the other stuff  
4 that goes into that are very, very good and I just think  
5 this is an area that's ripe. If you're going to get into  
6 you might as well do it and do it right.

7           So that's the only other, just reemphasize  
8 my comment for good or for bad.

9           CHAIRMAN BALLINGER: Anything else? Well  
10 this was a great presentation, at least from my  
11 standpoint, and I think everybody else appreciated it  
12 and we look forward to further interaction with picking  
13 up on some of the comments that we've made and things.

14           I think the issue is sort of, now speaking  
15 as one person, that the issue of risk I think you've  
16 heard that around the table. So I hope that you would  
17 at least consider that going forward. And with that if  
18 there's not anything else we are adjourned. Thank you.

19           (Whereupon, the above-entitled matter went  
20 off the record at 12:26 p.m.)

21

22

23

24

25

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1  
2  
3  
4  
5  
6  
7  
8

# **Introduction and Operations-Focused Approach to Aging Management for Spent Fuel Storage Renewal**

Kristina Banovac

NMSS/DSFM/RMB

Meeting with Advisory Committee on Reactor Safeguards  
Subcommittee on Metallurgy & Reactor Fuels

NUREG 1927, Rev. 1

April 8, 2015

# Outline

---

- Background
  - Regulatory framework for spent fuel storage
  - Requirements and guidance for spent fuel storage renewals
- Current challenges
- Path Forward
  - Guidance / Infrastructure needs
  - Operations-focused approach
  - Plan for NUREG-1927, Rev. 1
- Meeting agenda

# Background

## Regulatory Framework for Spent Fuel Storage



- Two part regulatory framework for spent fuel storage in 10 CFR Part 72
- Specific license for storage of spent fuel in an independent spent fuel storage installation (ISFSI)
- General license for storage of spent fuel in NRC-approved storage systems
  - General license authority provided to Part 50 and 52 license holders through 10 CFR Part 72, Subpart K
  - Storage system design requirements in 10 CFR Part 72, Subpart L
  - Approved designs are provided a Certificate of Compliance (CoC), listed in 10 CFR 72.214, and are available for use by general licensees
  - General license term is tied to the term of the CoC that is in use at the ISFSI; general licenses are not renewed

# Background

## Storage Renewal Requirements – Specific Licenses & CoCs



- Renewal of specific licenses and CoCs for storage of spent fuel, for a period not to exceed 40 years (10 CFR §72.42 and §72.240)
- Time-limited aging analyses
- Description of the Aging Management Program (AMP)
- Design bases information as documented in the most recently updated final safety analysis report
- Maintain intended functions in the period of extended operation

# Background

## Current Spent Fuel Storage Renewal Guidance



- Guidance located in NUREG-1927, Rev. 0, “Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificate of Compliances”
  - Provides NRC guidance for renewal of ISFSI licenses and CoCs for storage cask designs
  - Issued in March 2011 to accompany the 10 CFR Part 72 final rulemaking for “License and Certificate of Compliance Terms”

# Current Challenges

- Recent staff renewal review experience indicated need for expanded guidance
- Storage & reactor operating experience indicates potential degradation of structures, systems, and components
- Known vs. potential unknown aging/degradation mechanisms
- Difficult to define and assess all operable degradation modes for all potential chemistries for all locations and environments
- 7 specific license and 8 CoC renewal applications expected within next 10 years

# Path Forward

## Storage Renewal Team

---

- Intra-Agency team created in December 2013
- Staff members from NMSS, NRR/DLR, RES, and OGC
- Reflect on storage operating experience, staff's storage renewal review experience, and reactor renewal experience
- Extensive Stakeholder Engagement
  - Held over 20 NRC Public Meetings on renewal topics
  - Participated in numerous conferences, workshops, and meetings
  - Reviewed NEI 14-03, Rev. 0, Guidance for Operations-Based Aging Management for Dry Cask Storage
  - Incorporated feedback from stakeholders into revised guidance

# Path Forward

## Identified Needs

---

- Operations-focused approach to storage renewals
  - Learning, proactive and responsive
- Stable, predictable and efficient renewal regulatory framework with clear, transparent, & reliable expectations
  - Revision to NUREG-1927 (focus of meeting today)
  - Development of other guidance and infrastructure (last presentation in meeting)

# Path Forward

## Operations-Focused Approach

---

- Based on achievable operational methodologies:
  - Condition based monitoring and/or in-service inspections (ISIs)
- Assessment of monitoring and/or ISI findings and data
- Criteria for actions/decisions:
  - Prevention, repair, replacement, or mitigation measures
- Report, aggregate, & trend operational experience
- “Learning” AMPs that assess and respond to operating experience

# Path Forward

## Plan for NUREG-1927, Rev. 1

- Revise draft guidance per today's meeting
- Publish draft guidance for public comment (May/June 2015)
- Address public comments and finalize guidance
- Engage with ACRS on proposed final guidance (Spring 2016)
- Publish final guidance (Summer 2016)
- Continue stakeholder engagement
  - Public meetings
  - Continued engagement on NEI 14-03

# Agenda for this Meeting

---

- Overview of changes in NUREG-1927, Rev. 1
- AMP for reinforced concrete structures
- AMP for localized corrosion and stress corrosion cracking of welded stainless steel canisters
- High-burnup fuel monitoring program
- Industry presentation on operations-focused approach to aging management
- Development of infrastructure for operations-focused approach to aging management

# References

- 10 CFR Part 72  
<http://www.nrc.gov/reading-rm/doc-collections/cfr/part072/>
- “License and Certificate of Compliance Terms” Final Rule  
<http://www.gpo.gov/fdsys/pkg/FR-2011-02-16/pdf/2011-3493.pdf>
- NUREG-1927, Rev. 0  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1927/>
- DRAFT NUREG-1927, Rev. 1 (for coordination with ACRS subcommittee at this meeting), ADAMS Accession No. ML15068A303

# Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- ADAMS – Agencywide Documents Access and Management System
- AMP – Aging Management Program
- CFR – Code of Federal Regulations
- CoC – Certificate of Compliance
- ISFSI – Independent Spent Fuel Storage Installation
- ISI – In-Service Inspection
- NEI – Nuclear Energy Institute
- NMSS – Office of Nuclear Material Safety and Safeguards (NRC)
- NRR/DLR – Office of Nuclear Reactor Regulation, Division of License Renewal (NRC)
- OGC – Office of the General Counsel (NRC)
- RES – Office of Nuclear Regulatory Research (NRC)

# **Changes in NUREG-1927, Rev. 1**

## **Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel**

Ricardo Torres

NMSS/DSFM/RMB

Meeting with Advisory Committee on Reactor Safeguards

Subcommittee on Metallurgy & Reactor Fuels

NUREG 1927, Rev. 1

April 8, 2015

# Structure and Format

---

- Upfront material (Abbreviations, Definitions, Introduction)
  - I. General Information Review
  - II. Scoping Evaluation
  - III. Aging Management Review
    - Time-Limited Aging Analyses
    - Aging Management Programs
- Appendices

# Upfront and General Information

- Updated terminology and definitions:
  - Added/clarified existing definitions; made consistent with 10 CFR §72.3, NUREG-1536 and NUREG-1567
- Expanded guidance on application content, particularly for CoC renewals
- Added section on timely renewal
- Added reviewer guidance for:
  - Amendment applications submitted during renewal reviews and after the renewal is issued
  - Use of conditions for ensuring AMPs remain effective during the renewal period

# Scoping Evaluation

- Scoping evaluation identifies SSCs reviewed for aging mechanisms and effects
- Clarified sources of information that may be used to support the evaluation
- Expanded guidance for:
  - Review of SSC subcomponents
  - Scoping of fuel internals
  - Identifying SSCs within the scope of renewal
- Clarified reviewer guidance for ensuring exclusions from the scope of renewal are justified

# Aging Management Review

- AMR assesses proposed aging management activities for SSCs within the scope of renewal.
- Expanded guidance on environmental data and identification of aging effects and mechanisms:
  - Lead system inspection results
  - Use of maintenance records, operating experience specific to material/service environment (site-specific, industry-wide)
  - Use of consensus codes/standards
  - Other applicable NRC guidance or reports

# Aging Management Review

- Expanded discussion on aging management of fuel internals
- Revised TLAA section:
  - ensure consistency with 10 CFR §72.3
  - provide guidance for review of calculations/analyses not part of approved design bases
- Expanded discussion on each of ten AMP elements
- Provided new guidance on learning AMPs and use of operating experience

# Aging Management Review

---

- Included discussion of specific NEI 14-03 concepts:
  - Use of “tollgates” or periodic assessments of operating experience/confirmatory research
  - Aggregation and dissemination of operating experience
- Deleted Retrievability section

# Appendices

---

- Appendix A on Non-Quantifiable Terms – No changes
- Removed appendices that added minimal value to the review process
- Added new appendices:
  - Example AMPs
  - Lead system inspections
  - Use of a demonstration program as a surveillance tool for HBU fuel performance (per ISG-24)
  - Special considerations for CoC renewals
  - Storage terms (period that a DSS has been loaded)

# Appendix C: Lead System Inspection(s)

---

- Expanded guidance for Lead System Inspection(s)
  - Purpose of the Lead System Inspection
  - Selecting System(s) for Inspection:
    - Inspection of multiple systems may be necessary to capture variations in designs, environments, materials, loadings, and applicable aging effects
  - Guidelines for the Lead System Inspection
  - Use of Surrogate Inspections
  - Considerations for Lead System Inspections for CoC Renewals

# Appendix E:

## Special Considerations for CoC Renewals

---



- Development of TLAAs and AMPs
  - CoC holders
- Implementation of AMPs
  - General licensees to comply with the terms, conditions, and specifications of the CoC, including but not limited to, the requirements of any AMP (10 CFR §72.212(b)(11))
  - General licensees should update the evaluation required under 10 CFR 72.212(b)(5) to show how they will meet the new CoC terms, conditions, or specifications for aging management
- Corrective Actions
  - General licensees use their Corrective Action Program (CAP) (consistent with the criteria in 10 CFR Part 50, Appendix B) to capture and address aging effects.

# Appendix F:

## Storage Terms (CoC Renewals)

---



- Flow chart for calculating length of storage term of a dry storage system (DSS) loaded during either the initial storage period or renewal period(s) of a CoC

# References

- 10 CFR Part 72  
<http://www.nrc.gov/reading-rm/doc-collections/cfr/part072/>
- NUREG-1927, Rev. 1 Draft  
<http://pbadupws.nrc.gov/docs/ML1506/ML15068A331.pdf>
- NUREG-1927, Rev. 0  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1927/>
- NUREG-1536  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1536/>
- NUREG-1567  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1567/>
- DSFM ISG-24  
<http://pbadupws.nrc.gov/docs/ML1405/ML14058B166.pdf>

# Acronyms

- ACRS: Advisory Committee on Reactor Safeguards
- ADAMS: Agencywide Documents Access and Management System
- AMP: Aging Management Program
- AMR: Aging Management Review
- CA: Corrective Action
- CFR: Code of Federal Regulations
- CoC: Certificate of Compliance
- DLR: Division of License Renewal
- DSS: Dry Storage System
- HBU: High Burnup
- ISFSI: Independent Spent Fuel Storage Installation
- ISG: Interim Staff Guidance
- NEI: Nuclear Energy Institute
- NMSS: Office of Nuclear Material Safety and Safeguards
- NRR: Office of Nuclear Reactor Regulation
- OGC: Office of the General Counsel
- QA: Quality Control
- RES: Office of Nuclear Regulatory Research
- SSC: Structure, System or Component
- TLAA: Time-Limited Aging Analysis
- VSC: Ventilated Storage Cask

# Development of Infrastructure for Operations-Focused Approach to Aging Management

Aladar A. Csontos, Ph.D  
NMSS/DSFM/RMB

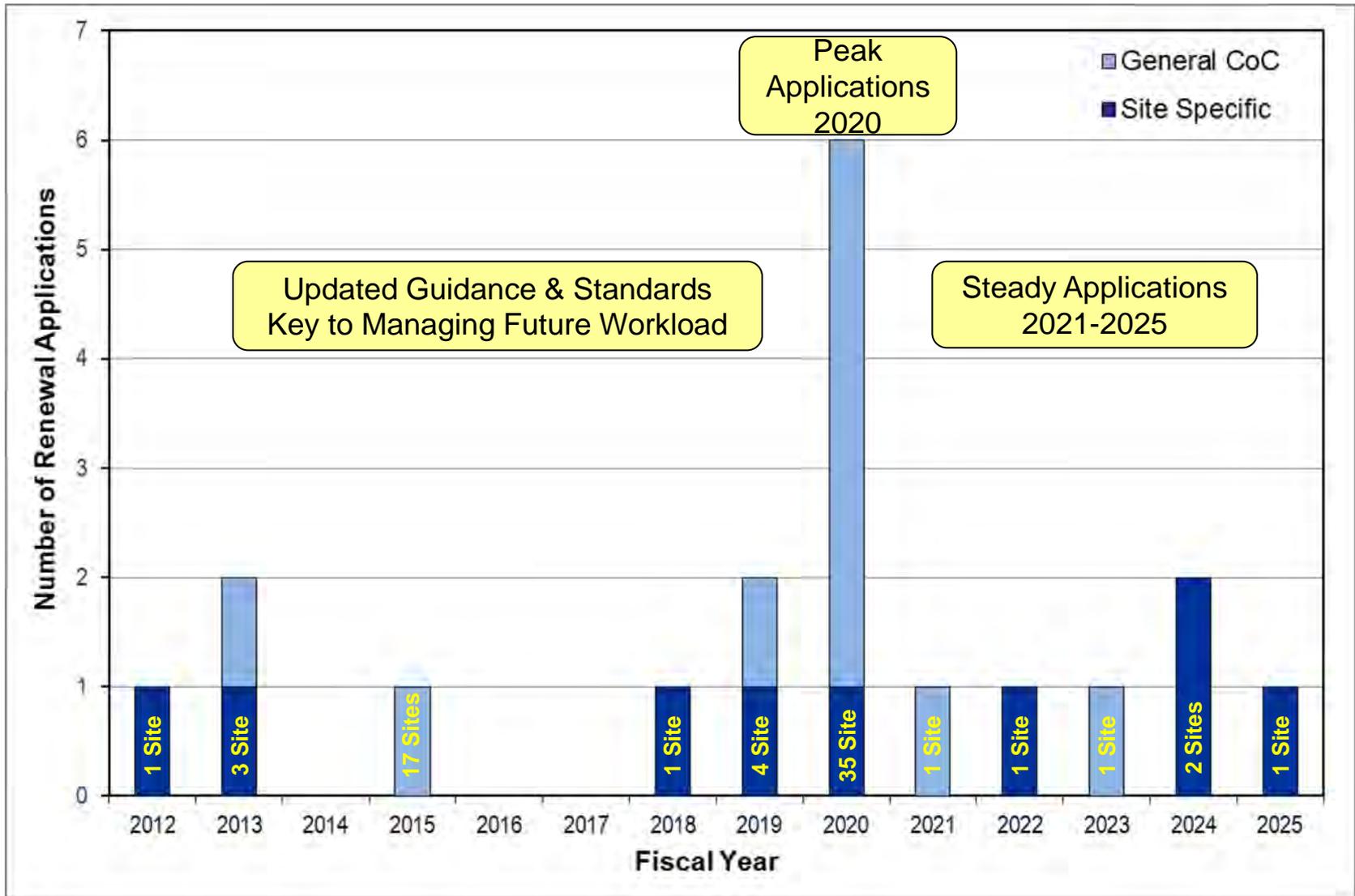
Presentation to:  
Advisory Committee on Reactor Safeguards  
Meeting of the Subcommittee on Metallurgy & Reactor Fuels

NUREG-1927 Revision 1  
April 8, 2015

# Spent Fuel Storage Renewal Experiences & Expectations

- Staff experience with storage renewal reviews
- Updated Storage Renewal Framework:
  - Operations-focused aging management
  - Learning, proactive, & responsive aging management
  - AMPs that consider & respond to OpE & confirmatory research
  - NUREG-1927, Rev. 1 with three example AMPs
- Upcoming wave of renewal applications in next 10 years:
  - 7 Specific license renewal applications
  - 8 CoC renewal applications
- Additional staff guidance and consensus codes/standards development will be key to managing the future workload

# Current & Future Spent Fuel Storage Renewal Projections



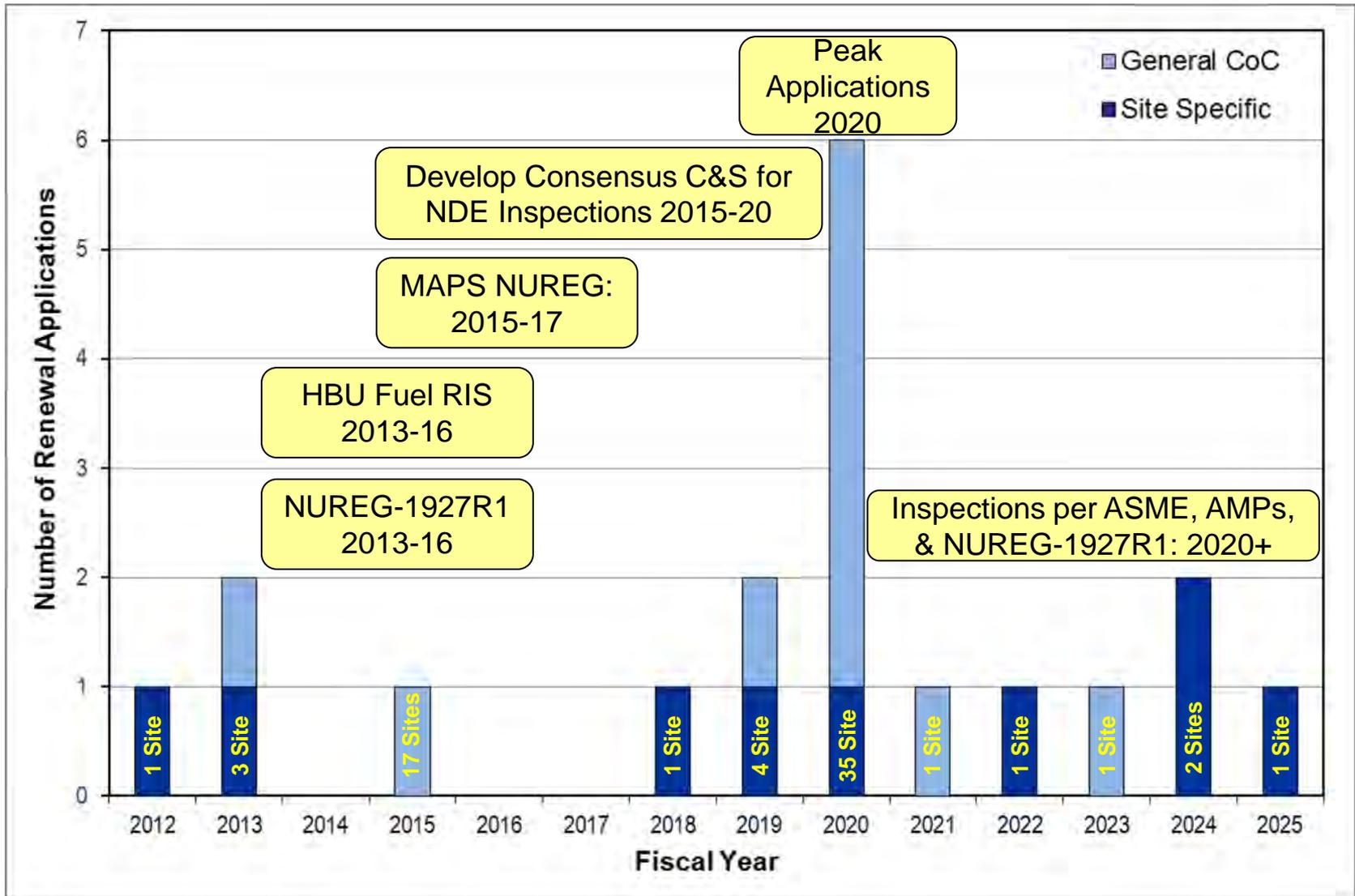
# Developing Supporting Information for Guidance Infrastructure

- NRC Technical Support Activities:
  - Report on the recent Expert Panel Workshop on Degradation of Concrete in Spent Nuclear Fuel in Dry Cask Storage Systems
  - Aging Management Tables (AMT) supporting additional AMPs
  - Aging Management for Extended Storage and Transportation
  - Non-destructive examination (NDE) inspection technology reviews
  - Chloride induced stress corrosion cracking (CISCC) modeling
  - Thermal analyses for horizontal ventilated & vertical multipurpose casks
  - Cladding integrity research fatigue testing and cladding stress modeling
- Stakeholder engagement:
  - DOE High Burnup Dry Storage Cask Research & Development Project
  - NEI CISCC Regulatory Issue Resolution Protocol
  - NEI 14-03 Guidance on Operations-Based Aging Management

# Guidance Infrastructure for Spent Fuel Storage Renewal Reviews

- NRC guidance infrastructure development underway:
  - Publish NUREG-1927R1 for public comment (2015)
  - Issued Draft Regulatory Issue Summary on High Burnup Fuel for Storage and/or Transportation for 45-day Public Comment (3/5/2015)
  - Managing Aging Processes for Storage (MAPS):
    - GALL-like NUREG analog
    - Additional AMPs for specific storage systems
  - Guidance for NRC inspections of licensees' aging management activities
- External stakeholder infrastructure development:
  - Consensus ASME Boiler and Pressure Vessel Code Section XI for inservice inspections (ISI) of dry cask storage canisters
  - Consensus ACI Code for ISI of dry cask storage concrete overpacks
  - Review of NEI 14-03 R1 "Dry Cask Storage License Renewal Industry Guidance for Operations-Based Aging Management"

# Current & Future Spent Fuel Storage Renewal Projections



# Example of a High Burnup (HBU) Fuel Monitoring Program

Aladar A. Csontos, Ph.D  
NMSS/DSFM/RMB

Presentation to:  
Advisory Committee on Reactor Safeguards  
Meeting of the Subcommittee on Metallurgy & Reactor Fuels

NUREG-1927 Revision 1  
April 8, 2015

# Purpose of HBU Fuel Monitoring Program

---

- Surrogate surveillance program to check condition of HBU fuel in dry storage to ISG-11 expectations:
  - Discharge burnup greater than 45 GWd/MTU
  - ISG-11 “Cladding Considerations for the Transportation and Storage of Spent Fuel” (NRC 2003)
- Confirmation that intended function(s) of fuel maintained, as expected, during the period of extended operation
- AMP expectation for HBU fuel demonstration program:
  - DOE & EPRI “HBU Dry Storage Cask R&D Project” (HDRP)
  - Or an alternative program meeting ISG-24 “Use of a Demonstration Program as Confirmation of Integrity for Continued Storage of HBU Fuel Beyond 20 Years (Appendix D, NUREG-1927, Rev. 1)

- Intact HBU fuel stored in AREVA TN-32 bolted lid cask at North Anna ISFSI (Dominion VA Power)
- Nominal burnups between 53-58 GWd/MTU
- Fuel assemblies include four cladding types:
  - Zircaloy-4, low-tin Zircaloy-4, Zirlo™, and M5™
- Surveillance cask to be licensed to the ISG-11 temperature limits and loaded such that the fuel cladding temperature is as close to the limit as practicable

# AMP Element 1: Scope of Program

---

- Assembly subcomponents/materials of construction:
  - Maximum burnup
  - Cladding types, maximum cladding temperature
  - Basket material/welds
  - Neutron absorbing materials
- Environment:
  - Dry helium
- Aging effects determined for material/environment combinations per ISG-24 Rev. 0 or the HDRP:
  - Fuel cladding breach
  - Assembly distortion
  - Residual moisture after drying
  - Changes in the hydride structure of the cladding

# AMP Element 2: Preventative Actions

---

- Condition monitoring program
- Casks/canisters dried per the accepted guidance in NUREG-1536/NUREG-1567
- Backfilled with helium cover gas
- Maximum cladding temperature is maintained below the recommended ISG-11 Rev 3 limits

# AMP Element 3: Parameters Monitored or Inspected

---

- Consistent with guidance in ISG-24:
  - Maximum cladding temperature
  - Inspection for the presence of fission gas in the cover gas
  - Inspection for presence of water vapor in the cover gas
  - Inspection for hydrogen to determine that any radiolysis of residual or bound water does not produce a flammable condition
  - Profilometry at the completion of the storage period to determine creep deformation
  - Gas puncturing at completion of storage to determine cladding stress for creep calculations
  - Cladding metallography at the completion of storage to determine condition of cladding hydrides

# AMP Element 4: Detection of Aging Effects

---

- Consistent with guidance in ISG-24:
  - Calibrated thermocouple lances to measure the radial and axial temperature profile
  - Fission gas analysis technique for the cover gas with sensitivity to detect release of 1% of the fission gas produced in 1% of the cask rods with the lowest burnup in the demonstration
  - Residual moisture detection technique with sensitivity to detect the vapor pressure at the bottom of the demonstration system
  - Hydrogen detection technique with sensitivity to detect 2% hydrogen in the cover gas of the demonstration

# AMP Element 5: Monitoring and Trending

---

- Evaluate information obtained from the HDRP loading and initial period of storage along with other available sources of information
  - Nondestructive examination (NDE) (i.e., cask gas sampling, temperature data)
  - Destructive examination
  - Confirmatory research – Separate Effects Surrogate Experiments
- Licensee to monitor, evaluate, and trend the information via the Corrective Action Program

# AMP Element 6: Acceptance Criteria

---

- Cladding Creep:
  - Total creep strain extrapolated to the total approved storage duration based on the best fit to the data <1%
  - ISG-11 temperature limits based on limiting creep to <1%
- Hydrogen:
  - Max H<sup>+</sup> content of cover gas over the approved storage period extrapolated from the gas measurements to be less than 5%
- Drying:
  - Moisture content in cask indicate no greater than one liter of residual water after the drying process is complete
- Fuel rod breach:
  - Fission gas analysis indicate <1% of fuel rod cladding breaches

# AMP Element 7: Corrective Actions

---

- Evaluations address lessons learned from aggregate feedback and corrective actions taken when warranted
- Corrective Actions in accordance with 10 CFR 72 Subpart G, or 10 CFR 50 Appendix B
  - Perform repairs or replacements
  - Modify the confirmatory program in a timely manner
  - Adjust age-related degradation monitoring and inspection programs (e.g., scope, frequency)
  - Actions to prevent reoccurrence
  - An evaluation of the dry storage system to ensure safety and retrievability functions are maintained
  - Evaluation of the effect of any corrective actions taken on other safety components

# AMP Element 8: Confirmation Process

---

- Consistent with 10 CFR Part 72, Subpart G, or 10 CFR Part 50, Appendix B
- QA Program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality
- The confirmation process describes or references procedures to:
  - Determine follow-up actions to verify effective implementation of corrective actions, and
  - Monitor for adverse trends due to recurring or repetitive findings.

# AMP Element 9: Administrative Controls

---

- Consistent with 10 CFR Part 72, Subpart G, or 10 CFR Part 50, Appendix B
- QA Program ensures that the administrative controls include provisions that define:
  - Instrument calibration and maintenance
  - Inspector requirements – consistent with ACI 349.3R
  - Record retention requirements
  - Document control
- The administrative controls describes or references:
  - Frequency/methods for reporting inspection results to the NRC
  - Frequency for updating the AMP based on industry-wide operational experience

# AMP Element 10: Operating Experience

---

- Evaluate applicable operating experience
  - DOE-EPRI Cask Demonstration Program or other surrogate surveillance demonstration programs
    - storage conditions and fuel types similar to those in the dry storage system
    - Satisfy the ISG-24, Rev. 0 acceptance criteria
  - Other domestic/international research confirmatory research for separate effects surrogate experiments
  - Internal and industry-wide Condition and Corrective Actions Reports
  - Vendor-issued safety bulletins
  - NRC Information Notices

# Acronyms

- ADAMS: Agencywide Documents Access and Management System
- AMP: Aging Management Program
- DOE: Department of Energy
- EPRI: Electric Power Research Institute
- R&D: Research and Development
- ISFSI: Independent Spent Fuel Storage Installation
- ITS: Important to Safety
- RAP: Repair Application Procedure
- SSC: Structure, System, or Component
- TLAA: Time-Limited Aging Analysis

# References

- Bare, W.C, L.D. Torgerson. 2001. “Dry Cask Storage Characterization Project-Phase 1: CASTOR V/21 Cask Opening and Examination,” NUREG/CR-6745, Idaho National Engineering and Environmental Lab, Idaho Falls, ID. ADAMS Accession No. ML013020363.
- M.C. Billone, T.A. Burtseva, and R.E. Einziger. 2013. “Ductile-to-Brittle Transition Temperature for High-Burnup Cladding Alloys Exposed to Simulated Drying-Storage Conditions,” *Journal of Nuclear Materials*, Volume 433, Issues 1–3, pages 431–448, February 2013.
- R.S. Daum, S. Majumdar, Y. Liu, and M.C. Billone. 2006. “Radial-hydride Embrittlement of High-burnup Zircaloy-4 Cladding”, *Journal of Nuclear Science and Technology*, Vol. 43, No. 9, p.1054, 2006.
- Einziger, R.E., H. Tsai, M.C. Billone, B.A. Hilton. 2003. “Examination of Spent PWR Fuel Rods after 15 Years in Dry Storage,” NUREG/CR-6831, Argonne National Laboratory, Argonne, IL. ADAMS Accession No. ML032731021.
- EPRI. 2014. “HBU Dry Storage Cask Research and Development Project Final Test Plan,” February 27, 2014, DOE Contract No.: DE-NE-0000593.
- K. Kamimura. 2010. “Integrity Criteria of Spent Fuel for Dry Storage in Japan” *Proc. International Seminar on Interim Storage of Spent Fuel*, ISSF 2010, Tokyo Nov 2010, page VI3-1.
- NRC. 2000. “Standard Review Plan for Spent Fuel Dry Storage Facilities,” NUREG-1567, Washington, DC. ADAMS Accession No. ML003686776.
- NRC. 2003. NRC Interim Staff Guidance 11, “Cladding Considerations for the Transportation and Storage of Spent Fuel,” Revision 3, November 17, 2003. ADAMS Accession No. ML033230335.
- NRC. 2010. “Standard Review Plan for Spent Fuel Dry Storage Systems at a General License Facility,” NUREG-1536, Revision 1, Washington, DC. ADAMS Accession No. ML091060180.
- NRC. 2014. NRC Interim Staff Guidance 24, “The Use of a Demonstration Program as a Surveillance Tool for Confirmation of Integrity for Continued Storage of HBU Fuel Beyond 20 Years,” Revision 0, July 11, 2014. ADAMS Accession No. ML14058B166.

# *Industry Guidance for Operations-Based Aging Management for Dry Cask Storage (NEI 14-03)*

**Kristopher Cummings**

Nuclear Energy Institute

ACRS Subcommittee on Metallurgy and Reactor Fuel

April 8<sup>th</sup>, 2015 • Rockville, MD

# Topics to Address

- Extended Storage Safety Basis
- Overview of NEI 14-03
- NRC Comments and Industry Response on NEI 14-03

# Extended Storage Safety Basis

- Dry Casks are robust systems with no moving parts
- Part 72.42 rulemaking increased license/renewal terms from 20 to 40 years
  - “This increase is consistent with the NRC staff’s findings regarding the safety of spent fuel storage as documented in the renewal exemptions issued to the Surry and H.B. Robinson ISFSIs” 76 Fed. Reg. 8874 2/16/2011
- Continued Storage rulemaking
  - “continued safe storage of spent fuel in dry casks for the timeframes considered in the GEIS is technically feasible” NUREG-2157, September 2014
- EPRI and NRC Dry Storage PRAs conducted in 2007
  - Annual cancer risk between 1.8E-12 and 3.2E-14 \*
- Opportunities to further verify performance being pursued

\* Compares to 2E-6 LCF/yr. public & 1E-5 LCF/yr. worker thresholds of negligible risk from NRC’s framework for “Risk-Informed Decision-making for Nuclear Material and Waste Applications”, Revision 1, February 2008

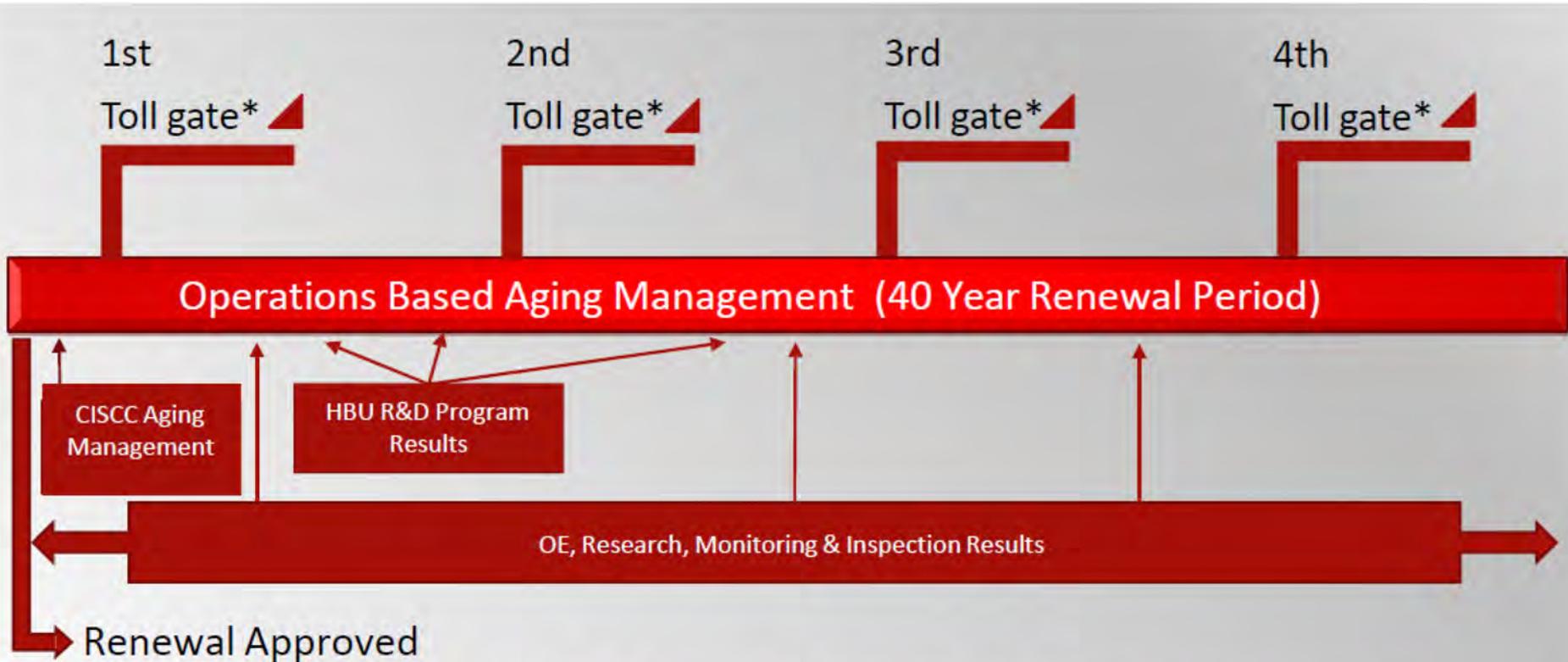
# NEI 14-03 Content

- Key administrative resource to ensure consistency in cask license renewal applications
- Process Focused:
  - Technical details of applications up to licensees and cask designers (CoC holders)
- Augments NUREG-1927 and specific aging management plan guidance being developed (e.g., MAPS Report)
- Two areas of focus
  - Forward looking approach to gathering dry cask storage operating data
  - Renewal application format and content

# Toll Gates

- Commitment to periodic, documented safety assessments
- Assessment timing specified after renewed operating period begins determined by the specific licensee or CoC holder
- Integrates OE, research, monitoring, and inspection results and assesses aggregate impact (e.g. applies CISCC susceptibility criteria & HBU R&D results)
  - If confirmatory, proceed to next toll gate (no action)
  - If not, pre-plan for possible outcomes – e.g., implement corrective actions, if needed, under licensee’s corrective action program
- Piloted in Calvert Cliffs and Prairie Island renewals tailored for specific issues – Canister corrosion, high burnup fuel

# Toll Gates for ISFSI License Renewal



\* To be determined by specific licensee/CoC Holder (with cask user input)

# Licensee Implementation

- Key concept:

*Effective licensee implementation of an operations-based DCS aging management program will require the ability to efficiently change AMAs based on feedback from operating experience, research, monitoring, and inspections*

# Operating Experience

- Identification, screening, and sharing of OE within and across DCS technologies is a key
- OE should be screened consistently and shared among affected entities in a timely manner
- Technology users groups play a key role

# NEI 14-03 Status

- NEI 14-03 completed in September 2014 and submitted to NRC for review and endorsement
- NRC Response received in January 2015 (ML15013A201)
  - Application Format and Content
  - **Sharing of Operating Experience**
  - Tollgates
  - **Change Control of Aging Management Information**
  - **Lead System Inspections**
  - AMPs and TLAAs
- Industry is working to address NRC Response and provide an updated revision for NRC final endorsement in NUREG-1927

# Sharing of Operating Experience

- Industry is working to develop options for an improved operating experience sharing program:
  - Enhancement of cask vendors existing program to capture and disseminate OE.
  - Utilize existing plant operating experience sharing infrastructure for dry cask storage

# Change Control/Tech Spec Content

- Placing aging management program in license conditions is inconsistent with PRM 72-7 and NRC risk informed framework initiative.
- Emphasis has been on ensuring licensee/CoC holder control of dry cask storage AMPs is consistent with plant license renewal.
- To remain a “learning aging management” program need to ensure that flexibility exists to modify or update the AMPs in a timely manner.
- Underlying QA program requires maintenance of the design basis (and restoration of the design basis, if needed).

# Change Control/Tech Spec Content

- CoC amendments require rulemaking and are not an efficient change mechanism
  - Later amendments are not applicable to casks loaded under the renewed original CoC or earlier amendments
- Level of detail in recent renewed site-specific ISFSI licenses may hinder ability to be responsive (CoC holders do not have the ability to quickly modify the program if in the CoC).

# Lead System Inspections

- Need to clearly distinguish scope and purpose of a lead canister inspection (before renewal application) versus the aging management program inspections.
- CoC holder has no legal authority to require general licensees to perform inspections prior to period of extended operation.
- Initial inspections (and TLAAs) will provide operating experience basis to inform need for additional inspections at each site.
- Forthcoming EPRI Susceptibility Report will provide criteria and ranking for use of surrogate inspections for SCC.

**Thank you**

Questions?

# Abbreviations

- AMA – Aging Management Activity
- AMP – Aging Management Program
- CAP – Corrective Action Program
- CISCC – Chloride-Induced Stress Corrosion Cracking
- CoC – Certificate of Compliance
- DCS – Dry Cask Storage
- HBU R&D – DOE/EPRI Demonstration Project
- OE – Operating Experience
- MAPS – Managing Aging Programs for Storage
- PRA – Probabilistic Risk Analysis
- TLAA – Time-Limited Aging Analysis