

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 1-246

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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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METALLURGY & REACTOR FUELS SUBCOMMITTEE

+ + + + +

WEDNESDAY

APRIL 8, 2015

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ROCKVILLE, MARYLAND

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

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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

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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

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P R O C E E D I N G S

(8:29 a.m.)

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

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

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

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

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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

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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

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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

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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.

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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

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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 TLAAAs and AMPs need to be submitted as

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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

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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

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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

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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,

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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

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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

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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

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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

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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

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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

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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

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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

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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.

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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

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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

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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?

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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

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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.

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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

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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

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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.

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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.

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1 MS. BANOVA: 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

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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

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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

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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

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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.

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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

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

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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

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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.

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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

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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 Particularly 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

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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,

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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,

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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.

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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.

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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.

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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.

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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

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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 Al 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

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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

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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.

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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.

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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.

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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.

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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

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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

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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.

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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

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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

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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

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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

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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

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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

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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.

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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

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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

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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.

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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

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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

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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

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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.

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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

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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 --

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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 10⁸R.

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

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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.

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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.

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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.

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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

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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

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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

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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.

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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.

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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 --

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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.

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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

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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

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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.

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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.

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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

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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

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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.

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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.

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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

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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

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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

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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.)

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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

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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

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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

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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.

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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.

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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 --

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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.

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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.

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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

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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.

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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

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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

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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

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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.

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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

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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

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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

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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.

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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

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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

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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

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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

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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

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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.

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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.

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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.

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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.

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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.

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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

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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

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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.

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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

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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.

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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

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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,

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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,

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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?

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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.

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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.

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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.

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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

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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.

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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 TLAA's 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

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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 specifics 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

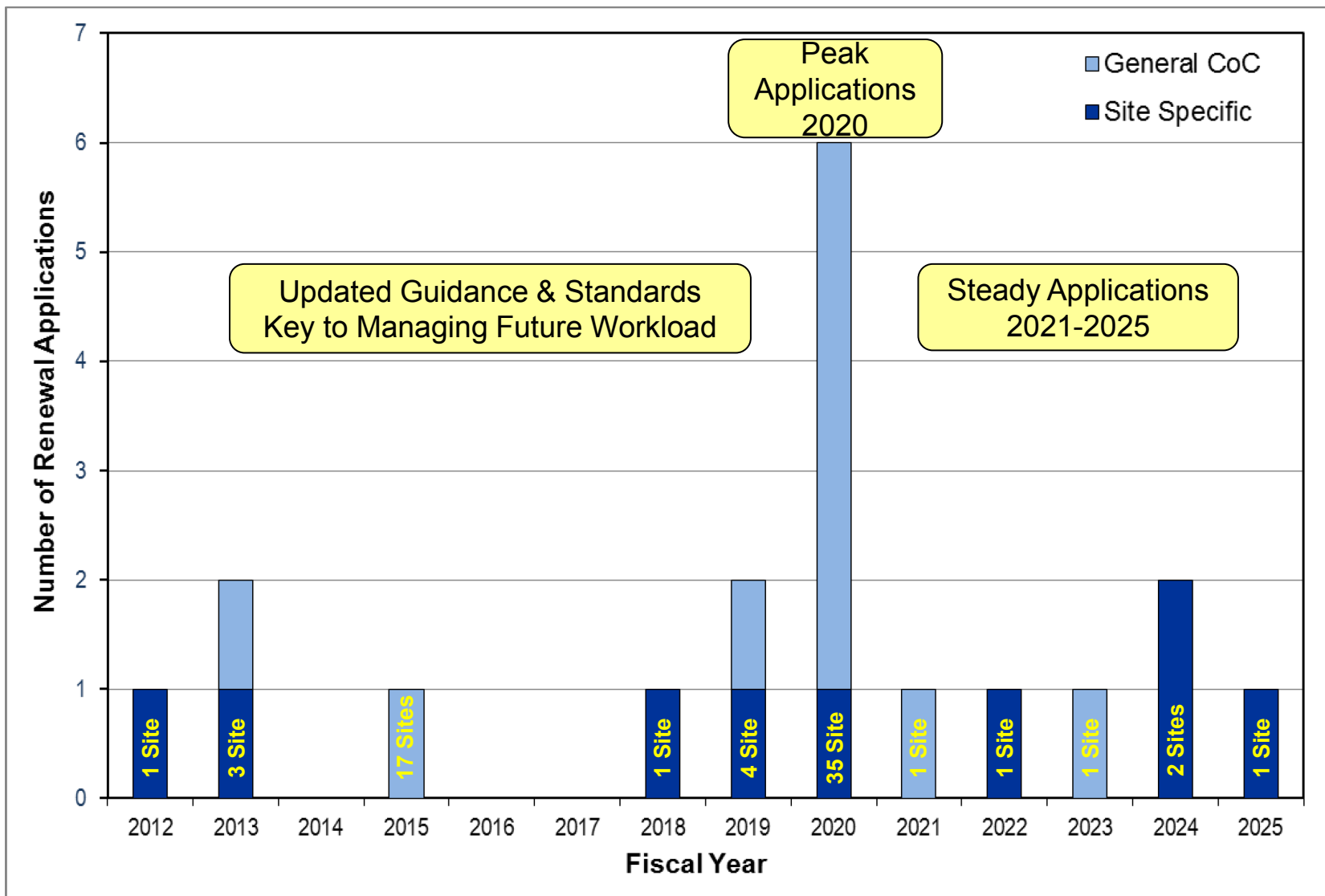
Presentation to:
Advisory Committee on Reactor Safeguards
Meeting of the Subcommittee on Metallurgy & Reactor Fuels

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



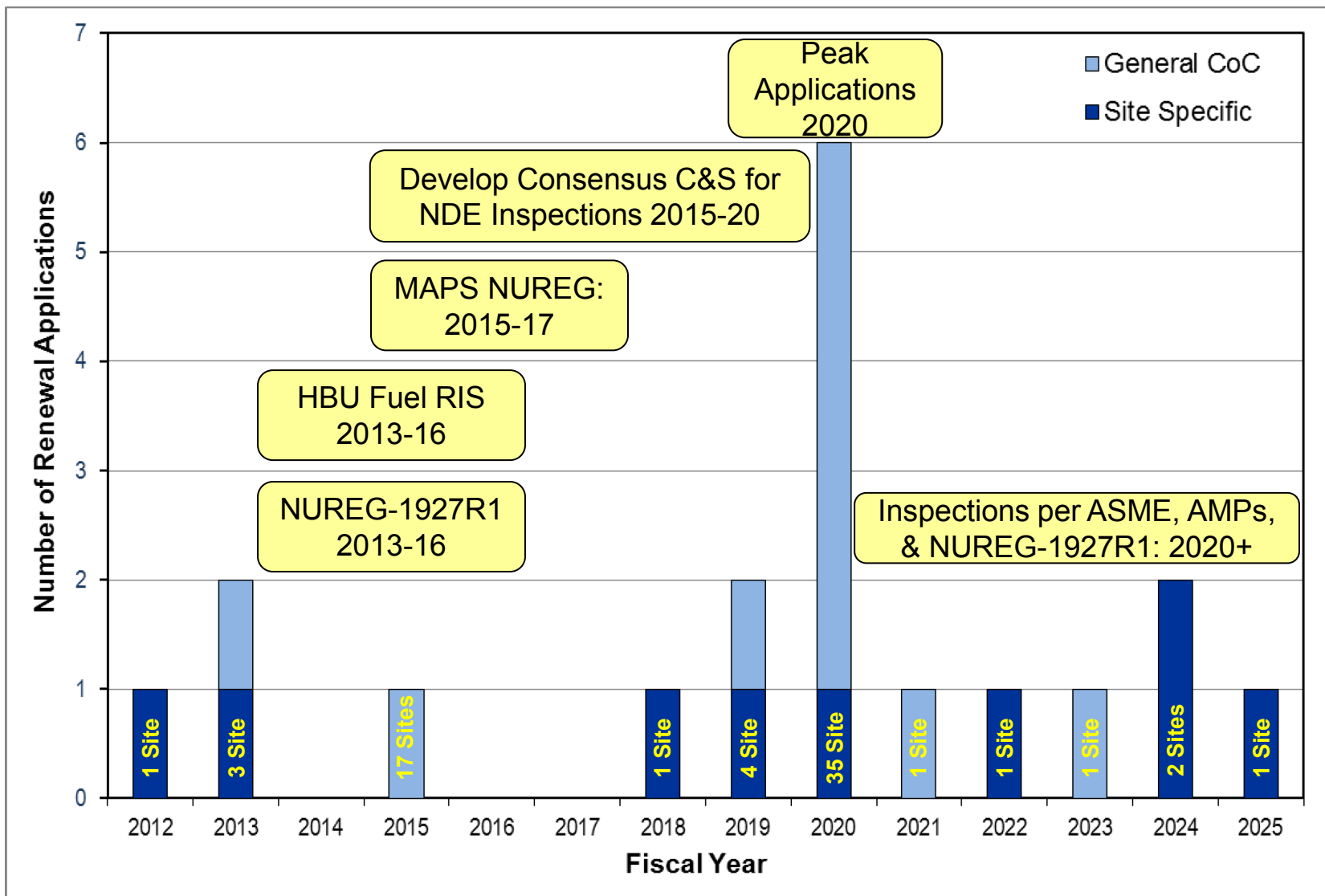
Developing Supporting Information for Guidance Infrastructure

- 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^+ 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

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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 8th, 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 $1.8\text{E-}12$ and $3.2\text{E-}14$ *
- Opportunities to further verify performance being pursued

* Compares to $2\text{E-}6$ LCF/yr. public & $1\text{E-}5$ 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

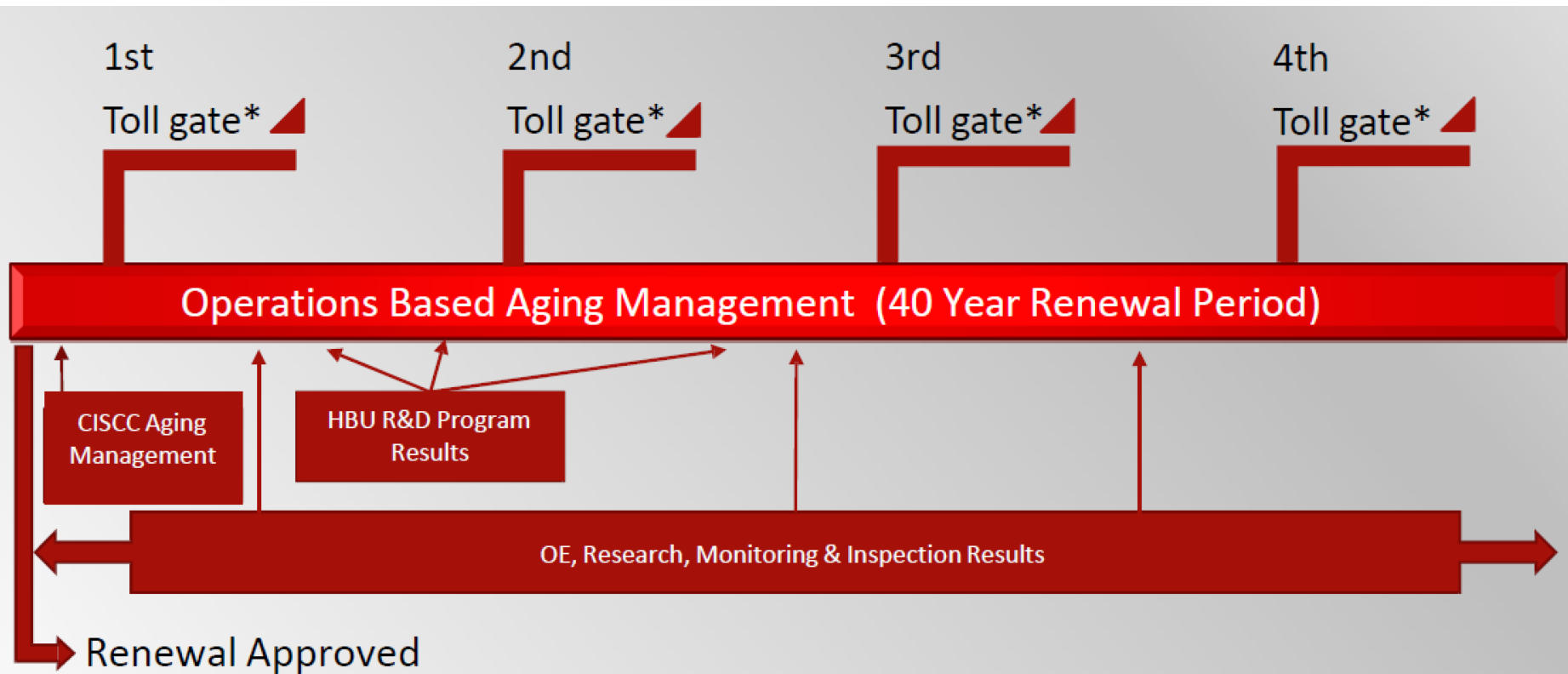
NEI 14-03 Content

- 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