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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ARCS)

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RADIATION PROTECTION & NUCLEAR MATERIALS

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FRIDAY

OCTOBER 22, 2010

ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 1:00 p.m., Michael T. Ryan, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

- MICHAEL T. RYAN, Chairman
- J. SAM ARMIJO, Member
- DENNIS C. BLEY, Member (via telephone)
- JOHN D. SIEBER, Member

DESIGNATED FEDERAL OFFICIAL:

CHRISTOPHER BROWN

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NRC STAFF:

CATHEY COLLEH

BOB EINZIGER

GEOFF HORNSETH

ATA ISTAR

DOUG WEAVER

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C-O-N-T-E-N-T-S

<u>ITEM</u>	<u>TOPIC</u>	<u>PAGE</u>
1.	OPENING REMARKS AND OBJECTIVES	
	DR. MICHAEL RYAN, ACRS	3
2.	STAFF OPENING REMARKS	
	DOUG WEAVER, SFST	5
3.	BACKGROUND/REGULATORY BASIS	
	GEOFF HORNSETH, SFST	7
4.	LICENSE RENEWAL PROCESS	
	ATA ISTAR, SFST	51
6.	PUBLIC COMMENTS	-
7.	COMMITTEE DISCUSSION	59
	DR. MICHAEL RYAN, ACRS	

14
15
16
17
18
19
20
21
22
23
24
25

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

(1:02 p.m.)

CHAIRMAN RYAN: The meeting will now come to order.

This is a meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Radiation Protection of Nuclear Materials.

I'm Michael Ryan, Chairman of the Subcommittee. The Subcommittee Members in attendance include Dr. Sam Armijo, Dr. Dennis Bley who is on the phone line.

Dennis.

MEMBER BLEY: I am here.

CHAIRMAN RYAN: Very good. Jack Sieber, and I believe that will be it. Mr. Chris Brown is the Designated Federal Official for this meeting.

The purpose of this meeting is to receive a briefing from the staff in NMSS Division, Spent Fuel Storage and Transportation on the newly-developed Standard Review plan for Dry Storage Systems License Renewal, NUREG-1927.

The Subcommittee will hear presentations by and hold discussions with representatives of the staff.

The Subcommittee will gather information,

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1 analyze relevant issues and facts and formulate
2 proposed positions and actions as appropriate for
3 deliberation by the Full Committee.

4 The Rules for participation in today's
5 meeting have been announced as part of the notice of
6 this meeting previously published in the Federal
7 Register on September 24th. A transcript of the
8 meeting is being kept and will be made available as
9 stated in the Federal Register Notice.

10 It is requested that speakers first
11 identify themselves and speak with sufficient clarity
12 and volume that they can be readily heard. We ask at
13 this time that you silence your cell phone or
14 Blackberry or put them in a silent operating mode.

15 We have not received any requests from
16 members of the public to make oral statements or
17 written comments. Let's see.

18 The Full Committee Briefing on this topic
19 will be held on November 4th at 8:35 a.m. in this
20 room. We will now proceed to the meeting and I call
21 upon Mr. Doug Weaver, Deputy Director in NMSS Division
22 of Spent Fuel Storage and Transportation to begin.

23 MR. WEAVER: Thank you, Dr. Ryan,
24 Committee Members, thank you for having us here today.

25 I would just like to make a few introductory remarks

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1 before I turn it over to the presenters.

2 A couple of key points. This is a
3 process-oriented standard review plan. I don't want
4 you to be surprised when you get into it and you're
5 looking for the technical detail. This is a process
6 document. It's not new, and it works, and let me just
7 tell you why I think those things.

8 It's not new. This, the methodology was
9 adopted, really, from the Standard Review Plan for
10 Renewal that's modeled on the Reactor License Renewal
11 Process from NRR, so we borrowed heavily from that
12 process.

13 And we've been using it. It's not new.
14 We've used this process to approve three renewals
15 already; Robinson, Oconee, and Surry. We have a
16 fourth renewal in-house now that's pretty far along in
17 the process for Fort St. Vrain. And for the Fort St.
18 Vrain renewal, we've used a draft of this standard
19 review plan for the review with good results.

20 The SRP incorporates public comments that
21 we receive during our comment period that closed last
22 winter, and our purpose here today, of course, is to
23 seek your endorsement on the document and any
24 recommendations you have that would help us improve it
25 as we -- as we move forward.

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1 So, thank you very much. With that, I'll
2 turn it over to Geoff Hornseth who will --

3 CHAIRMAN RYAN: Just one question, Doug,
4 as you begin.

5 MR. WEAVER: Yes.

6 CHAIRMAN RYAN: That was a great
7 introduction and we just finished this morning with a
8 review of the standard review plan for license
9 renewal.

10 MR. WEAVER: Oh. Perfect. Perfect.

11 CHAIRMAN RYAN: So, we heard the NRR side
12 of that story. So -- and I want to ask you to do
13 something that perhaps would be helpful for the
14 Subcommittee to hear and ultimately the Full
15 Committee, if you could point out to us how you've
16 incorporated lessons learned from your reviews where
17 you've applied it.

18 And I'm guessing you've found things that
19 you wanted to improve. That's very helpful for us to
20 learn what insights you gain and how the document has
21 evolved because of those insights.

22 So, if you've got that in your slides,
23 great. And if not, you just could point them out as
24 you go along. That would be great.

25 MR. WEAVER: Well, we had a discussion on

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1 that very topic this morning --

2 CHAIRMAN RYAN: Right.

3 MR. WEAVER: -- as we were getting ready
4 to come over here, and I think Geoff will speak to
5 that.

6 CHAIRMAN RYAN: Right. Terrific.

7 MR. WEAVER: And thank you, Dr. Ryan.

8 CHAIRMAN RYAN: Thank you.

9 MR. HORNSETH: All right. I am Geoff
10 Hornseth. I'm a materials reviewer in the Spent Fuel
11 Office. I'm going to be talking about this kind of an
12 orientation to Dry Cast Storage Systems, or ISFSI, the
13 Independent Spent Fuel Storage Installations.

14 CHAIRMAN RYAN: I am going to ask, Geoff,
15 if you don't mind, it's probably better because the
16 recorder, if you wander a bit, he might not catch all
17 of your words. So, you can see exactly what's on the
18 screen right there.

19 MR. HORNSETH: Okay.

20 CHAIRMAN RYAN: Is that -- I'm sorry.
21 That's a little bit different than probably what we're
22 used to --

23 MR. HORNSETH: A little contrary to my
24 style of talking. All right. I'll try and -- okay.

25 I'll go over a little bit of like timeline

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1 and license renewal background, just a short history.

2 And then, about the only technical stuff you're going
3 to hear today is the technical basis things, and then
4 a little bit about what's going on that technical
5 reviewers look at.

6 Then, Ata is going to go over the last
7 three bullets on there, license renewal process, or
8 ongoing activities and the summary.

9 The next slide, we've given you some
10 abbreviations, so if you're looking over the stuff
11 later you don't get completely lost. CHAIRMAN

12 RYAN: I was looking for DSS and now it's DCSS.
13 What's that about?

14 MR. HORNSETH: Right. It's just that the
15 terminology is not really fixed in the industry. Some
16 vendors use one phrase. The others use a different
17 phrase, and so it's not really uniform. It's not
18 saying -- but, everybody that works in this segment of
19 the industry understands the two different
20 abbreviations.

21 I'm sorry. It may be confusing for you.

22 CHAIRMAN RYAN: It's a small point, but
23 there's probably a couple other examples of
24 terminology we might offer you to say, you know, "also
25 known as", you know, or something like that that we,

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1 you know, keep people from wondering where things are.

2 So, we'll just give you those little nits as we go
3 along.

4 MR. HORNSETH: Yes, that's a good point.

5 CHAIRMAN RYAN: Okay.

6 MR. HORNSETH: Okay. The next slide is a
7 map of the U.S. with existing and proposed ISFSI
8 sites, but the staff uses the vernacular ISFSI, rather
9 than saying Independent Spent Fuel Storage --

10 CHAIRMAN RYAN: ISFSI is okay. Got that.

11 MR. HORNSETH: Okay. We see this as --
12 you know, we've licensed a lot of these things so we
13 had a lot of experience with licensing these things,
14 doing the design reviews and stuff. You see, there's
15 a lot of them out there.

16 And then, from the renewal standpoint we
17 see this as a growth industry because, you know, the
18 ongoing debate with the Yucca Mountain stuff.

19 Okay. How many people here or on the
20 Committee have been to an ISFSI site? Anybody? Okay.
21 One. All right.

22 CHAIRMAN RYAN: Jack has.

23 MR. HORNSETH: Two. You've been -- oh,
24 that's pretty good.

25 All right. Well, I'm going to go over a

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1 little bit for the benefit of people that haven't seen
2 one, and that's --

3 MEMBER BLEY: And actually one more. I
4 couldn't unmute my myself.

5 MR. HORNSETH: Oh, okay. Well, that's
6 pretty good, so you got a pretty good idea of what
7 these things look like, but I put some slides in.

8 The first one is -- this is a new homes t-
9 end design. It's a horizontal storage module under
10 construction. You see the rebar for the concrete
11 shield walls and stuff. They are about three feet
12 thick, so these things -- I think the current industry
13 vernacular is they're robust, which I think is an
14 interesting term.

15 The next one is a completed one, just
16 showing all the -- what I refer to, you know, the
17 pigeon holes for the individual canisters get slid in
18 there, then the radiation shield cover goes on and
19 everything stays buttoned up.

20 The next slide shows an interesting
21 antique. This is the Surry Site. This was the first
22 one that we relicensed. This uses a number of
23 canister designs which are now considered obsolete.
24 They are bolted lid designs which not many people are
25 using. They've -- certainly no new ones are being

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1 produced.

2 It also is a museum of a number of
3 different competing early designs, but this was the
4 first one it was through the loop.

5 The next slide is a not-very-good
6 schematic of the other type of design, which is the --
7 what I call a vertical chimney type. You have the
8 carbon steel or these days entirely austenitic
9 stainless steel spent fuel canister loaded with the
10 fuel goes inside what's called an over pack.

11 The slide here is erroneous, saying
12 "Storage Cask." It really is -- it's a concrete over
13 pack. It's just a natural draft type of chimney. The
14 walls of the chimney are two to three feet thick to
15 provide your gamma shielding and some -- and neutron
16 shielding.

17 There's air vents at the bottom, and
18 there's air vents at the top. In both types of
19 designs the vertical ventilated chimney here and then
20 the horizontal storage module that we looked at first,
21 the canister inside is fully-shielded from direct
22 impingement of any precipitation. So it sees dry air
23 at all times.

24 Okay. So, it's not really fully exposed
25 to the weather. The concrete's exposed to the weather

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1 naturally, but the canister itself is shielded from
2 the weather. So it's more of an indoor environment
3 like you'd have in your garage or attic or something -
4 -

5 CHAIRMAN RYAN: Stays dry at all times, is
6 it --

7 MR. HORNSETH: Stays dry at all times, to
8 the best of our knowledge.

9 CHAIRMAN RYAN: Right. I mean, is it
10 ambient relative humidity?

11 MR. HORNSETH: Yes.

12 CHAIRMAN RYAN: That's what it really is?

13 MR. HORNSETH: Yes. It's going to see the
14 relative humidity, but realizing now -- I'll get into
15 the environment on this in a little bit --

16 CHAIRMAN RYAN: All right.

17 MR. HORNSETH: -- but that's a good
18 question.

19 CHAIRMAN RYAN: Yes.

20 MR. HORNSETH: Because the canister itself
21 has decay heat, it's going to tend to want to be self-
22 drying --

23 CHAIRMAN RYAN: Right.

24 MR. HORNSETH: -- or stay dry and it's
25 going to lower the relative humidity right next to the

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1 canister wall, yes.

2 CHAIRMAN RYAN: Exactly. Yes. Go ahead.

3 MR. HORNSETH: Now your --

4 CHAIRMAN RYAN: Dennis has a question.

5 MEMBER BLEY: A quick question. Two
6 things. One is, as you go through it, once in a while
7 you mention the slide number. It would help.

8 But, on this one, what kind of time frame
9 are we looking at if either the lower or the upper
10 vent somehow gets blocked or plugged?

11 MR. HORNSETH: Oh, there's a daily
12 surveillance that the plant has to perform to ensure
13 that the screens that cover the openings, you know, to
14 keep out the birds and squirrel nests and stuff don't
15 get blocked. So, that's daily.

16 That's a daily surveillance to make sure
17 that all the vent openings are not blocked.

18 MEMBER BLEY: Okay. But if somehow it
19 gets blocked or couldn't get unblocked right away, I
20 imagine it would many days before you'd have any
21 trouble, wouldn't it?

22 MR. HORNSETH: Oh, yes. That's part of
23 the design basis, is -- the assumption is that a
24 certain number -- I don't have that off the top of my
25 head. Probably the majority of them would be blocked,

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1 and then you enter a tech spec requirement to unblock
2 it within a certain number of hours, which is on an
3 order of days.

4 MEMBER BLEY: Okay. Thanks.

5 MR. HORNSETH: Before you get into any
6 kind of an --

7 CHAIRMAN RYAN: A heat-up problem.

8 MR. HORNSETH: -- overtemperature
9 condition. Off-normal condition, is what it would
10 really be.

11 MEMBER ARMIJO: Quick question on your --

12 MR. HORNSETH: Okay.

13 MEMBER ARMIJO: -- canister materials.
14 You mentioned they are both carbon steel and stainless
15 steel --

16 MR. HORNSETH: Yes.

17 MEMBER ARMIJO: -- can be used. Do you
18 have any problems with the use of carbon steel?

19 MR. HORNSETH: Carbon steel has passed our
20 of use. Some early cast designs, by two vendors that
21 are now out of business, employed carbon steel for
22 heat transfer purposes. They were coated carbon
23 steel, but they only exist at a small number of sites,
24 and no new ones are being built.

25 They have not proven to be problematic in

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1 any form as far as, you know, being in service goes.
2 There has not been any reported problems.

3 MEMBER ARMIJO: Oh, I was -- for this
4 application, you know, dry environment, warm, carbon
5 steel is just fine.

6 MR. HORNSETH: Yes.

7 MEMBER ARMIJO: And it's not subject to
8 things like stress, corrosion, cracking --

9 MR. HORNSETH: That's right.

10 MEMBER ARMIJO: -- and all that other
11 stuff.

12 MR. HORNSETH: That's right. Yes.

13 So, let's see. We can move over to slide
14 number nine. This is a short history lesson. 2001 I
15 wrote the initial guidance, it was draft guidance for
16 the Surry plant, because we knew they were coming in
17 with a license renewal application and they wanted to
18 know what to submit.

19 So I used, as we -- as the boss indicated
20 earlier, I literally borrowed from the NRR plant --
21 power plant license renewal experience, plus my own
22 professional background going back 18 years doing
23 exactly this kind of thing in the industry.

24 And I drafted the initial technical
25 guidance in -- well, I call it part-technical and

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1 part-process guidance. Okay. Today is really more
2 process. That went out to -- to Surry -- the Surry
3 staff for their own review. It came back. It
4 basically had one comment. We incorporated that, and
5 then we went forward.

6 They made their application and we
7 processed the application using the guidance. Did not
8 require any change to the guidance. We got it right
9 the first time out of the box. I guess that just says
10 experience counts.

11 The one -- the one curve they threw at us
12 was a regulatory one, which was -- you notice under
13 the 2002 line there, they asked for a 40-year
14 extension, which is an exemption to the regulation.

15 And we held that aside from the technical
16 review and held that aside to consider that after all
17 the technical review considerations were done.

18 When we completed our technical review we
19 then re-reviewed our findings with respect to the
20 context of 20 years versus 40 years, and we found that
21 there was no reason to deny the 40-year request.

22 The material degradation mechanisms are
23 very slow or nonexistent, and so we had very good
24 confidence that we could go 40 years.

25 The only thing that you might say is

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1 changed was, we then made a license condition which
2 was after 20 years you have to do a lead task
3 inspection. And I'll get into what a lead task is in
4 a little bit.

5 So then, it became more of a regulatory-
6 type of things. There was a SECY paper options for
7 the renewal exemption request. Now we're getting into
8 all kinds of regulatory things.

9 And then there was an SRM came on down
10 from on high to us about, you know, the 40-year
11 renewal. Then the Commission said, you know, we don't
12 like to regulate by exemption. If you're going to
13 keep doing this, we're going to have to do rulemaking.

14 So we got involved with that and the SRM
15 to go ahead and start rulemaking. Also carried the
16 caveat that, staff, you have to also have a standing
17 review plan ready to go pretty much concurrent with
18 the new rules, so when the new rules published, we can
19 then subsequently in a fairly short order, publish a
20 standard review plan for license renewal.

21 So that's what this effort has been. It's
22 been taking the initial draft guidance that worked for
23 Surry and then Robinson, and then Oconee, and turn it
24 into a formal standard review plan which is what we're
25 briefing you on today.

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1 CHAIRMAN RYAN: Just so I'm getting my
2 recollection right, was there something about the pad,
3 the actual -- you know, the pad itself that was a 40-
4 year issue as well?

5 MR. HORNSETH: No. The pad was -- in the
6 first few cases, the pad was screened out as being
7 important to safety.

8 CHAIRMAN RYAN: Oh, okay.

9 MR. HORNSETH: And that's going to be a
10 plant-specific determination. If you're out in a
11 high-seismic zone like, say, the West Coast, and you
12 have hold-down brackets, then the pad would be
13 screened-in to some extent.

14 You know, but for the first few ones, the
15 pad was screened out.

16 CHAIRMAN RYAN: So seismic is the thing
17 that probably would bring it in and --

18 MR. HORNSETH: Right.

19 CHAIRMAN RYAN: -- and weather would not
20 bring it in?

21 MR. HORNSETH: Yes.

22 CHAIRMAN RYAN: Okay. All right. Just to
23 make sure.

24 MR. HORNSETH: That's right.

25 CHAIRMAN RYAN: All right. So, did the --

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1 excuse me.

2 MR. HORNSETH: Okay.

3 CHAIRMAN RYAN: The 40 years would add to
4 the initial license, which was or --

5 MR. HORNSETH: The initial license period
6 for all the ISFSI's at this point is 20 years.

7 CHAIRMAN RYAN: Right. Okay. So a total
8 of 60 if you --

9 MR. HORNSETH: For the ones that we have
10 approved.

11 CHAIRMAN RYAN: Right.

12 MR. HORNSETH: I should clarify. The new
13 Part 72 Rule says the initial license period can now
14 be upped to 40 years, and then the renewal period can
15 also be up to 40 years, changing from 20 and 20, which
16 was the old language.

17 CHAIRMAN RYAN: Okay. Okay.

18 MR. WEAVER: Just for -- I should have
19 mentioned this up front, but the status of the
20 rulemaking with the 40-year limit is that the
21 Commission's approved it. They've given -- and we
22 would hope that it would go into effect late winter,
23 early spring.

24 So, we are on track, we hope, to have the
25 guidance in place right around the time that the rule

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1 is effective.

2 MR. HORNSETH: So, meanwhile, business is
3 still going on. We've done a Oconee. That one's been
4 renewed. Fort St. Vrain is currently in review right
5 now. One of our reviewers has it.

6 We've issue the draft SRP for public
7 comment. As we've indicated, we've incorporated
8 public comments, and the Commission has approved the
9 final rule so far.

10 All right. Going to page 10, the
11 technical basis, you know, the preliminary guidance
12 depended heavily on previous power plant license
13 renewal experience, and plant life extensions, upgrade
14 experience and things like that.

15 Just borrowed extremely heavily on that.
16 Stole every idea that was useful and made use of it
17 for the preliminary guidance. Then my opinion is
18 always one data point is always worth a thousand
19 expert opinions.

20 So, we -- we had INEL, which has an ISFSI
21 site for the Three-Mile Island debris. We opened a
22 canister there that had been in storage for 15 years
23 and took a look at the interior of the canister, which
24 was a carbon steel, and also the fuel payload,
25 extracted a fuel rod and looked at the fuel rod

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1 properties, and the bottom line of all of that, which
2 is covered in a couple of NUREG CRs that we've been
3 referenced, if you want to --

4 MEMBER ARMIJO: I'd be very interested in
5 getting the references for those CRs.

6 MR. HORNSETH: Yes.

7 MEMBER ARMIJO: Everything was pristine,
8 zero degradation 15 years in storage, so that proved
9 all the engineering assumptions that went into it
10 about the drying processes working, the inerting with
11 the helium back-fuel works.

12 No external degradation to the canister
13 due to weathering or anything like that. And so that
14 was a very good sanity check on all the engineering
15 assumptions that goes into up-front to the design of
16 these things.

17 Okay. The next slide 11 -- oh, a
18 question.

19 MEMBER SIEBER: One thing the TMI 2 heat
20 load would be less than you would have with ordinary
21 spent fuel.

22 MR. HORNSETH: Yes, that's true. And the
23 temperature --

24 MEMBER SIEBER: 40 percent, 50 percent?

25 MR. HORNSETH: Well, the heat load on ones

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1 that are loaded actually can vary all over the map.

2 MEMBER SIEBER: Right.

3 MR. HORNSETH: The lowest one that I'm
4 aware of is Humboldt Bay which has a 50-watt --

5 MEMBER SIEBER: Yes. Come on.

6 MR. HORNSETH: Heat load which -- no, I
7 don't need --

8 MEMBER SIEBER: I'm not worried about
9 that.

10 MR. HORNSETH: Not worried about it. Yes.

11 And the hottest one that we've licensed that I have
12 personally worked on and I am aware of is a Holtec
13 vertical chimney-type design, stainless canister.

14 They asked for 42 kilowatts and we had to
15 negotiate that down to about 38 because of some
16 question about 3-D finite element heat transfer
17 calculation modeling thing. So, we negotiated that
18 one down to 38 kilowatts.

19 Yes, it's -- it's a lot, and because of
20 that variation is my reason for demanding a lead
21 canister inspection at some point in the history of
22 your operation before you do your renewal application.

23 MEMBER ARMIJO: Geoff, to make sure I
24 understand it, does that canister inspection go to the
25 extent of actually opening up the canister?

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1 MR. HORNSETH: No, we do not.

2 MEMBER ARMIJO: External.

3 MR. HORNSETH: It's an external because,
4 based on the results of the INEL -- well, actually
5 Argonne did the fuel work, but I'll call it the INEL
6 examination, we concluded that the canister internal
7 part, internal environment was so benign it was
8 nothing worth worrying about, for the time periods
9 that we are talking about.

10 Okay. Oh, yes. Let me anticipate one
11 question. There's a lot of rumors flying around in
12 the open literature and newspapers about dry cask
13 storage canisters being good for hundreds of years of
14 operation. Okay.

15 Realize that those are political
16 statements. The NRC technical staff has never made a
17 finding that these storage canisters can operate for
18 time periods of hundreds of years. Okay.

19 So, statements like that, like I say, are
20 political statements. You need to take them with a
21 trainload of salt. All right. So that's not us
22 speaking.

23 You know, we're going on 20-, 40-year
24 increments here, and it's -- and of course, we're
25 always going to be -- it's a feedback loop, you know.

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1 We're going to be paying attention to what's going on
2 as we get more experienced.

3 CHAIRMAN RYAN: Just to follow up on Dr.
4 Armijo's question, is there any plan that you see
5 somewhere down the line of opening the cask just to
6 look at the inner container and the contents?

7 MR. HORNSETH: Not for license renewal.

8 CHAIRMAN RYAN: I'm thinking more in terms
9 of just, you know, sort of the research or science
10 value of getting -- getting your eyes on it again.

11 MR. HORNSETH: Yes. If a situation arises
12 that there's a compelling argument for doing that,
13 then we are certainly going to consider that.

14 It's getting a little off-topic, but that
15 may be something that would come in as part of the --
16 you know, this real long-term study thing, but we're
17 not here to discuss that today.

18 CHAIRMAN RYAN: Fair enough.

19 MR. WEAVER: Yes, if I could just make two
20 -- two statements with -- you know, the Commission has
21 just issued, you know, always confidence will -- and I
22 think, although you can't -- you know, we license now
23 and it will soon to be up to 40-year increments.

24 Let's say there is a degradation mechanism
25 out there that we're unaware of today and that 80

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1 years or 150 it becomes evident. What do you do? You
2 repackage.

3 MR. HORNSETH: Right.

4 MR. WEAVER: You take it out, you move it
5 into a new can. So, I just want to make that -- make
6 that point. You know, that's sort of the worst-case
7 scenario, is a repackaging.

8 Bob, do you have anything to add on the
9 EPRI efforts in terms of cast demonstration? I don't
10 know where we are in --

11 MR. WEAVER: This gets to your question
12 about the -- any plans of opening the --

13 MR. EINZIGER: The demonstration where
14 they opened the cask in Idaho was used low-burn-up
15 fuel. It had fuel down around 33 gigawatt days per
16 metric ton, but fortunately it did see a high
17 temperature. It saw temperatures as high as 420
18 degrees C. So, it was a good demonstration.

19 We don't have that information with
20 respect to high-burn-up fuel, and we don't know how
21 high-burn-up fuel is going to behave after long
22 periods of time because there are some characteristics
23 of the high-burn-up fuel that are different than the
24 low-burn-up fuel.

25 In that light, in the program to look at

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1 very long-term storage, one of the suggestions that
2 has been made and has been taken to heart by the
3 industry is that some sort of a demonstration should
4 be done to look at the fuel, the internal components
5 of the canister and the gas to determine if -- or
6 rather, just to make sure we're as smart as we think
7 we are, and that nothing's happening that we hadn't
8 anticipated.

9 The industry has taken that to heart and
10 they're currently looking into what they would like to
11 do in that realm. Suggestions have flown around,
12 anywhere from a full-fledged demonstration using
13 multiple casks with multiple fuel sites, all the bells
14 and whistles you want, down to, can we find the cask
15 that's got some high-burn-out fuel in it out there,
16 and just open it up somewhere, take a look and see
17 what -- if there's anything going wrong inside.

18 MEMBER ARMIJO: The problem with that,
19 Bob, is unless you have a way to accelerate the --
20 you've got a time problem. You know --

21 MR. EINZIGER: Well, the idea being -- the
22 idea is being ahead of the game. You know, you're
23 right. We're not looking in to see in year 15, is
24 there something that we can tell that's going to
25 happen in year 500 or something, but it's more to look

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1 that is there something that's been out there for 15
2 years, and we'll look at it again in 30 years and
3 again, maybe in 50 years or -- just so that we're
4 always one step ahead of the game.

5 Take it to be very similar to what a lead
6 test assembly in a reactor --

7 MEMBER ARMIJO: Yes. But, again, you've
8 really got to -- because I've run a lot of fuel stuff,
9 and to get to a point where things are interesting,
10 you really have to do really aggressive testing,
11 either thermally or power or something to make up for
12 the fact you just don't have time.

13 MR. EINZIGER: I agree with you whole-
14 heartedly, Sam, and the -- but you have to remember
15 what we're looking for is not to find anything very
16 interesting.

17 MEMBER ARMIJO: No, and I hate those kinds
18 of experiments. I want to push them till they break.

19 MR. EINZIGER: Unfortunately, if we see
20 anything interesting, then we've got some big work to
21 do.

22 MEMBER ARMIJO: I understand that.

23 MR. EINZIGER: The idea is to look at it
24 and say, okay, we've been this far and we haven't seen
25 anything interesting. You know, we can look at how

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1 long it's been and what's going on and say, okay, and
2 if we take another small step and then look at it
3 again we're okay.

4 MEMBER ARMIJO: Got it.

5 MR. EINZIGER: A little off-track, but we
6 want to be giving you --

7 MEMBER ARMIJO: Well, some of us have
8 worked on things related to Yucca Mountain, containers
9 and canisters and a bunch of other stuff, and so we
10 probably have a different perspective than -- than 40
11 years.

12 CHAIRMAN RYAN: So, I guess the answer is
13 you've got some ideas floating around, but there's no
14 formal plan at this point to begin that kind of
15 testing, it's just in early conversation stages or --

16 MR. EINZIGER: Yes. People are taking it
17 to heart in the sense that it's not just, hey, here's
18 -- we're going to throw out a few brainstorming
19 sessions.

20 People are looking at it. There have been
21 committees of NRC, DOE, industry people that have been
22 actively looking into this, and there's been
23 international participation solicited in looking at
24 it.

25 In fact, IAEA is looking at establishing a

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1 cooperative research program to put a demonstration
2 together so that we're ahead of the game.

3 CHAIRMAN RYAN: So it sounds like this is
4 inside of ten years for sure, and maybe in the five to
5 ten range?

6 MR. EINZIGER: I think that the numbers
7 have been floating around is that the people would
8 like to have a demonstration started within the next
9 five years.

10 CHAIRMAN RYAN: Oh, okay.

11 MR. EINZIGER: Unfortunately, it just --
12 the logistics of getting any demonstrations started
13 takes a reasonable amount of time.

14 CHAIRMAN RYAN: Sure. Oh, yes. No, I
15 understand that. So -- but there is -- I mean, so it
16 sounds like there are serious plans for this kind of
17 activity already, it's not just, you know, like you
18 say, chit-chat around the coffee pot.

19 MR. EINZIGER: No, I think people are
20 serious about it because we're forcing them to be
21 serious about it.

22 CHAIRMAN RYAN: Very good.

23 MR. HORNSETH: Okay. To slide 11, for now
24 the canister interior is pretty much not being
25 actively considered in the renewal process because of

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1 the experience to date and the condition to date.

2 So, under the key renewal issues on slide
3 11, you know, it's predominantly an assessment for
4 material degradation, and we're concentrating on the
5 outside of the canister.

6 You know, of course, not opening up a
7 canister is driven hugely by ALARA also. You know,
8 it's a big --

9 MEMBER ARMIJO: Yes. Why would you do it
10 unless there is a really --

11 MR. HORNSETH: That's right. Unless there
12 is really compelling evidence. Incidentally, as part
13 of the Surry renewal, we did get a lot more data on
14 opening canisters, because those Surry canisters are
15 bolted-lid designs.

16 They had some seal failures because of a
17 design issue and water leaking in and the seals
18 failed. There was no radiological escape. It was
19 just the outer seal failed.

20 And there's instrumentation on those
21 canisters to measure that. So, they had to drag two,
22 three or four back in the reloading pool, unload them,
23 replace the seal and then reload them.

24 Well, that was great because then we got a
25 peek at the inside of these things and, once again,

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1 everything was pristine. So, we had -- and that's
2 another data -- another few data points on that.

3 Okay. So, for the canister -- question
4 over here.

5 MEMBER SIEBER: Those were carbon steel?

6 MR. HORNSETH: Those were -- I believe
7 those were -- it might have been a mixture. I know
8 there was some stainless steel ones involved in that.

9 MEMBER ARMIJO: Just roughly, what -- how
10 many bolted, sealed containers are there out there
11 compared to the welded? I'm a big proponent of --

12 MR. HORNSETH: It's probably a few hundred
13 bolted versus thousands of welded.

14 MEMBER ARMIJO: Okay.

15 MR. HORNSETH: And the bolted number is
16 now static.

17 MEMBER ARMIJO: Yes.

18 MR. HORNSETH: Will not grow.

19 MEMBER ARMIJO: Okay.

20 MR. HORNSETH: Okay. So, for the canister
21 which is the confinement mounting, you know, we're
22 concerned with corrosion, number one, you know, you
23 think of, and then there's some thermal fatigue that's
24 been analyzed.

25 It turns out it's a "no, never mind," but

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1 it's always analyzed, and the thermal fatigue comes
2 just from the diurnal temperature change.

3 And then for the concrete and -- your
4 concrete shielding, it's the usual issues with
5 concrete, cracking and spalling due to shrinkage and
6 what not, and there can be some thermal fatigue which,
7 of course, results in cracking and spalling.

8 The thing that makes license renewal for
9 ISFSI's easy, is the dry-cast storage system. It's
10 passive, it's static, there's no moving parts, we
11 don't have flow- assisted erosion corrosion and all
12 that -- all those sorts of issues.

13 Going to slide 12, as a materials
14 engineer, I look at the cask exterior environment as
15 being not very demanding. It's almost benign,
16 certainly not what I would call an aggressive
17 environment.

18 It's surrounded by air. It's exposed to
19 the decay heat. Now, the decay heat can raise the
20 canister shell up to, oh, probably 350 C, okay, in a
21 real extreme case for -- I mean, this is red-hot, you
22 know, fuel with a, you know, high burn up, packed in
23 there and five years out of the pool type of thing,
24 and you've got 40 kilowatts of decay heat.

25 All right. Now you're going to be bumping

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1 up against 350 degrees C for the canister shell. Of
2 course, you have the diurnal and annual temperature
3 changes, and in you're in a radiation field, of
4 course.

5 Radiation field turns out to be a "No,
6 never mind," because we're about six orders of
7 magnitude over a 100-year lifetime for one of these
8 canisters.

9 You're about six orders of magnitude below
10 what you would see in an operating reactor. So, for
11 the neutrons --

12 CHAIRMAN RYAN: So just a rough number
13 from my reference point.

14 MR. HORNSETH: For neutron -- for the
15 neutron dose, you'll be about five-by-ten to the 14th
16 neutrons per square centimeter, whereas reactors are
17 up around ten to the twenty to ten to the twenty-
18 third, especially ten to the twenty-third when you get
19 into DWR core shrouds, and the core shroud cracking
20 issue which you've probably been briefed on.

21 So, you know, we're six orders of
22 magnitude down. So, yes, the radiation field's there,
23 but it's not enough to adversely affect the materials.

24 CHAIRMAN RYAN: Just so I don't have to
25 get my calculator out, what are you measuring in

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1 millirem per hour on the outside of a --

2 MR. HORNSETH: In gamma's I have a slide
3 on that.

4 CHAIRMAN RYAN: Okay. Well, we'll get to
5 it. That's fine.

6 MR. HORNSETH: We'll get to it, yes.

7 MR. WEAVER: You're on the outside of the -
8 - where the people are or are you just on the outside
9 of the canister, or both?

10 MR. HORNSETH: Okay. I have it for one
11 meter from the fuel. I'm shielded, so you'll have to
12 kind of back out.

13 All right. And then the shield
14 environment, which is the concrete, that one's exposed
15 to the weather, which is going to be more aggressive
16 in a relative sense than the air that the canister
17 metal sees.

18 Of course, it sees a decay heat, but to a
19 much lower amount. And, by design, the temperature of
20 the concrete shell stays below what the American
21 Concrete Institute maximums are for continuous
22 exposure for concrete. It sees the temperature
23 changes and, of course, it sees the dose.

24 Switching over to page 13, okay, kind of
25 summing up what the preliminary guidance in the SRP is

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1 all about. Okay. We reviewed -- you know, it -- the
2 cornerstone of it is a review of the operational and
3 maintenance history.

4 And when the applicant comes in, they have
5 to provide an assessment, a synopsis of the
6 operational maintenance history for their ISFSI site
7 to cover any one-off type situations, any lessons
8 learned, that kind of thing.

9 Okay. They assess -- actually, they
10 reassess the environment and potential degradation
11 mechanisms because, you know, when you're initially
12 licensed, you have to do that, and then they assess it
13 to verify that conditions are, in most cases,
14 unchanged, and that's part of the third bullet.

15 You review the original licensing basis,
16 are all the assumptions still valid. Okay. They
17 review the time-dependent issues, which is the only
18 one we've identified at this point, is thermal
19 fatigue.

20 And then there's one that I put in. This
21 is your data point that you get. You get the 20-year
22 interval visual examination -- it's going to be
23 probably remote visual -- of the inaccessible areas of
24 some kind of a lead canister.

25 It's up to them to give me the engineered

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1 justification for why they want to pick one or two out
2 of their whole fleet of canisters for more detailed
3 visual examination by remote means, obviously.

4 They'll slip a flexible fiber optic camera
5 or something like that inside the concrete shield wall
6 and take a look around. This has been done, and it's,
7 you know, your sanity check on all your assumptions,
8 your verification, if there are no unanticipated
9 degradation mechanisms in operation.

10 CHAIRMAN RYAN: So that, I mean the lead
11 canister identification has to be submitted for NRC
12 approval?

13 MR. HORNSETH: Yes. And we look at that.

14 Yes.

15 And naturally, that one's going to be
16 based on things like which one is the hottest or which
17 one is the longest in service or some combination.

18 MEMBER ARMIJO: Or hottest and longest.

19 MR. HORNSETH: Yes. Or hottest and
20 longest, yes. And so we -- yes. We look at that one
21 pretty close.

22 Then, as we've said, no, we don't open any
23 because of the past experience and there's been no
24 degradation. And -- oh, there's the two new regs.
25 Yes, down at the bottom of the page.

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1 So we can move on to 14. 14 and 15,
2 there's some technical stuff.

3 MEMBER ARMIJO: So, I just want to go back
4 to, in the case of the canister, you don't really have
5 to do anything, other than just for completeness you
6 might want to do it, for corrosion or oxidation
7 assessment.

8 MR. HORNSETH: Yes.

9 MEMBER ARMIJO: Because those temperatures
10 are so low --

11 MR. HORNSETH: Yes.

12 MEMBER ARMIJO: And the -- you know, just
13 nothing's happening, but you could actually come up
14 with a number that's not unlikely to --

15 MR. HORNSETH: Oh, you mean like a
16 corrosion rate or something?

17 MEMBER ARMIJO: It's a trivial thing.

18 MR. HORNSETH: Oh, yes.

19 MEMBER ARMIJO: So, but you -- you just
20 said it's so small it's not even worth wasting your
21 time?

22 MR. HORNSETH: That's right. Yes.

23 MEMBER ARMIJO: And I agree with that.

24 MR. HORNSETH: Yes.

25 MEMBER ARMIJO: I just wondered --

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1 MR. HORNSETH: And experience to date has
2 completely supported that.

3 MEMBER ARMIJO: Yes.

4 MR. HORNSETH: Incidentally, I keep track
5 of some other things as kind of like sanity checks on
6 all this. As a materials corrosion guy, I look around
7 the country at structures, metallic structures that
8 are out there, and one of my favorite test coupons for
9 austenitic stainless steels is called the Chrysler
10 Building in Manhattan.

11 Okay. Everybody, you're familiar with
12 that big art deco top of the building, that austenitic
13 stainless steel. It's been there since 1920-
14 something, and they refurbished that building some
15 years back and they didn't touch that.

16 MEMBER ARMIJO: You want to check the
17 carbon steel, look at the U.S. Steel Building in
18 Pittsburgh.

19 MR. HORNSETH: Pittsburgh, yes. That's
20 right. That's right. That's my Core-Ten.

21 MEMBER ARMIJO: It's your Core-Ten --

22 MR. HORNSETH: Right.

23 MEMBER ARMIJO: Right.

24 MR. HORNSETH: Yes. But it's structurally
25 -- my unalloyed copper sample is called the Statue of

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1 Liberty.

2 MEMBER SIEBER: That turned green.

3 MR. HORNSETH: Yes. So, I look for that,
4 because, you know, I also looked at -- you know, when
5 this stuff started coming down off Capitol Hill and
6 the White House about, "Yes, these canisters can go
7 for hundreds of years," you know, I started thinking
8 about, well, wait a minute.

9 Stainless steel has only been around in
10 commercial quantities for about a hundred years. I
11 could take you down the road and show you a cast iron
12 object that's been laying on the ground for 150 years
13 and it's pretty pristine.

14 MEMBER ARMIJO: George, I can show you
15 Roman nails buried in Scotland for 2000 years,.

16 MR. HORNSETH: That's right.

17 MEMBER ARMIJO: And they're still sharp,
18 pointed and functional.

19 MR. HORNSETH: Yes.

20 MEMBER ARMIJO: So you could make a better
21 case for carbon steel than stainless steel.

22 MR. HORNSETH: Yes. Yes.

23 MEMBER SIEBER: There are still Iron Age
24 objects that --

25 MR. HORNSETH: Oh, yes.

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1 MEMBER SIEBER: -- that they've dug up, so
2 that's --

3 MR. HORNSETH: And I'm well-aware of that,
4 yes.

5 MEMBER SIEBER: -- four, five thousand
6 years old.

7 MR. HORNSETH: Yes. And I used to have a
8 native copper nugget that got away from me that's
9 probably two billion years old. In the right
10 environment. You know, the environment is key. Okay.
11 So, we were paying attention to that.

12 Okay. We can go over to slide 14. I put
13 these in in case people had questions about, you know,
14 what are the temperatures of the stuff.

15 The reason this draft is -- this is out of
16 a report that we are in the process of producing, so -
17 - but it gives you just, you know, the time lapse, I
18 think. And what this is saying, both of these graphs
19 are saying, is we have every milder conditions that
20 the materials were depending on, or being exposed to.

21 So, it gets more relaxed as time goes on.
22 It's not getting worse. So, it's getting -- it's
23 getting less severe on the material, so we've very
24 comfortable with our assessments that -- you know, we
25 feel another 20 to 40 years on one of these.

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1 Okay. Go to slide 16.

2 CHAIRMAN RYAN: Just a quick question on
3 the -- if I may, on the --

4 MR. HORNSETH: Oh.

5 CHAIRMAN RYAN: -- your key up there. It
6 says minus 40 degrees ambient?

7 MR. HORNSETH: Yes. That is a regulation
8 required lowest service temperature.

9 CHAIRMAN RYAN: I got you. Yes.

10 MR. HORNSETH: That's right in the 472.

11 MEMBER ARMIJO: And then your height
12 service is the 117?

13 MR. HORNSETH: And that's -- that one was
14 -- these curves were done for a site-specific type of
15 thing. And 117 was the highest ambient temperature.
16 You know, from Weather Service --

17 MEMBER ARMIJO: Well, these are kind of
18 like worse-case calculations of loading of the cask
19 and --

20 MR. HORNSETH: Yes.

21 MEMBER ARMIJO: -- burn-up and --

22 MR. HORNSETH: Yes, various loadings and -
23 - yes. And for the -- for the two extremes of
24 temperature that you can have and the other one with
25 the dose is for different kilowatt loadings.

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1 MEMBER ARMIJO: Yes.

2 MR. HORNSETH: Oh, different burn-up's,
3 excuse me.

4 MEMBER ARMIJO: Yes.

5 MR. HORNSETH: Okay. Going to slide 16,
6 and here's our experience to date. No degradation.
7 It's been pretty boring. The thermal compete
8 calculations have been -- there's nothing limiting
9 there for going out to, you know, a hundred years.

10 The underlying assumptions that we made in
11 the guidance and the underlying assumptions for the
12 design and the operating conditions have all been
13 upheld, with no changes necessary there, and not --
14 nothing, no surprises.

15 And then, of course, we naturally
16 concluded that the 40-year term was supportable and
17 justified by our technical experience with the first
18 several renewals. And another thing I put on
19 there, because Dr. Ryan asked it. What about
20 feedback, lessons learned and things like that. We
21 haven't had to make any changes to the preliminary
22 guidance, and we've just -- nothing really
23 significant.

24 We fine-tune for editorial clarity and
25 things like that, but we have not had to make any big

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1 changes. Nothing substantive.

2 MEMBER ARMIJO: Geoff, I'll ask this
3 question. I asked it of Bob when we were doing the, I
4 think, the cask -- one of these -- earlier reviews.
5 And is -- and I know these are welded, and there's
6 double welds and everything else --

7 MR. HORNSETH: Yes.

8 MEMBER ARMIJO: But is there any way that
9 you can independently find out that the helium that
10 you put in there is still there? Because, helium can
11 leak out of the teeniest little holes so slowly you
12 might not -- never be able to tell.

13 MR. HORNSETH: That's a great question,
14 and we have imposed a helium leakage rate test as --
15 it's a license condition, and they have to test using
16 the ANSI N-14.5 method which is the standard method
17 for helium leakage rate testing.

18 Okay. And the acceptance criteria is ten
19 to the minus seven standard cc's per minute. If you
20 grind through the calculation at that leakage rate,
21 you lose minor amounts of helium in a hundred years.

22 So, we're covered there for well beyond
23 initial license and even a renewal period of 40 years
24 each, that leakage rate is so low.

25 MEMBER ARMIJO: Well, would you be able to

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1 tell just -- let's assume that that was good, but in
2 the course of time for something, a little bit of slag
3 was in the weld that had sort of started leaking out.

4 It had passed your test, your fabrication
5 test --

6 MR. HORNSETH: Yes.

7 MEMBER ARMIJO: -- and it started leaking
8 out. Is there any way from a thermal, you know,
9 whether it's thermal imaging or some other thing that
10 says, "Hey, this thing is hotter than it should be?"

11 MR. HORNSETH: That's a good question,
12 too. And we are currently discussing amongst
13 ourselves a requirement for periodic thermal testing
14 of canisters.

15 MEMBER ARMIJO: Yes. And I'm just, you
16 know, just sort of --

17 MR. HORNSETH: Yes. --

18 MEMBER ARMIJO: --nondestructive

19 MR. HORNSETH: Yes. But that is something
20 that we're -- it's now under active consideration --

21 MEMBER ARMIJO: Yes.

22 MR. HORNSETH: -- to kind of head off that
23 question. From the thermal fatigue standpoint and so
24 forth, and most of these being austenitic, it's going
25 to be real hard to drive a preexisting flaw through

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1 one of these canister walls by --

2 MEMBER ARMIJO: I'm just --

3 MR. HORNSETH: By -- yes.

4 MEMBER ARMIJO: I'm not even worried about
5 thermal --

6 MR. HORNSETH: I know.

7 MEMBER ARMIJO: Just some way to put an
8 end to any speculation that these things are running
9 hotter than they should be, that the helium's still
10 there, using night vision goggles or something that
11 says --

12 MR. HORNSETH: No. That's under active
13 consideration right now.

14 CHAIRMAN RYAN: Would that be part of the
15 renewal area --

16 MR. HORNSETH: We would make that --

17 CHAIRMAN RYAN: -- review or --

18 MR. HORNSETH: -- probably part of the
19 renewal, yes.

20 CHAIRMAN RYAN: As opposed to some, you
21 know, 20 years has gone by, it's halfway through your
22 license period, do it then, or are you having a range
23 of thoughts on that at this point?

24 MR. HORNSETH: We -- no definite thoughts
25 on it yet.

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1 CHAIRMAN RYAN: Okay. All right. Fair
2 enough.

3 MR. HORNSETH: Actually, we're thinking
4 about maybe putting it in a -- as an initial license
5 condition when you're brand new, and just get it from
6 day one, so that we have assurance from day one that
7 we haven't lost things. Like I say, it's still under
8 discussion.

9 MEMBER ARMIJO: Yes.

10 MEMBER SIEBER: What is the initial helium
11 backflow pressure?

12 MR. HORNSETH: It varies from vendor-to-
13 vendor. Some of them are just almost zero psi gauge.
14 So, in other words, it's just one atmosphere --

15 MEMBER SIEBER: I was thinking like zero
16 to five --

17 MR. HORNSETH: Yes.

18 MEMBER SIEBER: -- gauge.

19 MR. HORNSETH: Some of them go up as high
20 as 60 psi.

21 MEMBER SIEBER: Oh, really?

22 MR. HORNSETH: And the reason for 60 psi
23 is these are the real hot canisters with the high
24 loads and they need more helium for the heat transfer
25 medium.

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1 MR. WEAVER: Obviously, as time goes on,
2 your heat load is dropping --

3 MR. HORNSETH: Sure.

4 MR. WEAVER: -- for some period of time --

5 MR. HORNSETH: No problem.

6 MEMBER SIEBER: Yes, but the difference in
7 heat transfer capability from zero to five psi helium
8 is not very much.

9 MR. HORNSETH: Yes.

10 MEMBER SIEBER: So unless you -- I think
11 60 psig would make a difference, but at those low
12 pressures, I don't think it's relevant. I mean, it's
13 not going to go below zero.

14 MR. HORNSETH: Right. Some of the fellow
15 reviewers have -- have done some "what if's," you
16 know, "What if we lose it over a period of time and
17 see what happens," and the results were pretty boring.
18 There was nothing dramatic for the cases that they
19 ran.

20 MEMBER ARMIJO: You have to lose it early
21 to make any difference.

22 MR. HORNSETH: Yes. And these curves that
23 I gave you, the sample curves are why it -- it becomes
24 less important as time goes on.

25 MEMBER SIEBER: Yes, but the leak rate

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1 almost certainly would be higher than the decay rate
2 that you show in your --

3 MR. HORNSETH: Possibly. Yes. Okay. So,
4 that's all I have to say in the way of prepared
5 remarks. At this point I'm ready to turn it over to
6 Ata, and he can go through what the process is.

7 MR. ISTAR: My part is going to the
8 process. Thank you, Geoff. You laid down the ground
9 rules and you make my life easy, I guess.

10 I am going to go through the -- what the
11 NUREG 1927 covers, and I tried to make it as easy as
12 possible, providing the flow charts, you know, the
13 color-coded flow charts.

14 And actually, I couldn't put everything on
15 one page because it would be very cluttered. And
16 again, the NUREG 1927 is based on the preliminary NRC
17 staff guidance that was prepared in 2001, and the
18 objective in August was to provide to the staff a
19 guide as well as to make the review in a timely
20 fashion, and also, what is the expectation of the NRC
21 from the applicant.

22 And we literally discussed 101, the
23 utilities that -- who went through the license
24 renewals and took their advice and implemented and in
25 our -- you know, incorporated in our -- in our NUREG

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1 1927, and I think it works well.

2 And the last review which was for forward
3 centering. We took one of our junior engineers,
4 material engineers, asked him to go through this to
5 whether they-- he could performance base on that.
6 With little assistance he was able to perform it.

7 So, we are happy with the result. And,
8 again, this is a living document. It can be revised
9 as we learn more about the research, ongoing research
10 and other information that we could gather from the
11 industry and research as well as from the EPRI
12 conferences that we are part of it.

13 And basically the NUREG SRP has three
14 sections, and I'll go through with the scoping
15 evaluation on page 18, and those two questions are
16 commonly asked throughout our -- by the regulatory and
17 others, to identify the SCCs limiting the scopes.

18 So, the first grants, is the SCC
19 important to safety, if it's important to safety
20 you put that into a scope.

21 The second questions, of course, if
22 it's not in scope, if it's not important to
23 safety impact the safety function. If it impacts
24 the safety function, that goes into the scope as
25 well.

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1 The next step is the aging management
2 review on page 19 -- supposed to be 19. For some
3 reason I couldn't make that 19 show up in our
4 slides --

5 MEMBER BLEY: Excuse me.

6 MR. ISTAR: Yes, sir.

7 MEMBER BLEY: Could I slip in a
8 question now and just to address it, please, as
9 you go through your slides. Don't -- don't try
10 to answer it now for me.

11 But, as I read through the NUREG, and
12 looking at the TLAA section and at the AMP
13 section, it's -- it looks as if you don't have
14 any particular recommendations for what those
15 should be, but you have tables of issues that
16 need to be addressed.

17 MR. ISTAR: Correct.

18 MEMBER BLEY: Is that right?

19 MR. ISTAR: Correct.

20 MEMBER BLEY: Okay. Then, just go
21 ahead and I'll -- I'll interrupt as you go.

22 MR. ISTAR: Correct. And on page 19,
23 which doesn't show "page 19," the asterisk --
24 whatever, the SCCs are in scope, the applicant
25 should also look into subcomponents of those

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1 SCCs, whether it's, let's say, concrete, the
2 subcomponent will be reinforcement. So that kind
3 of situation.

4 And the intended function, and
5 identify the material and the environment. I
6 have an upcoming table that shows this process
7 and describes in a better format. And this is
8 hard to imagine from this slide.

9 Even though the SRP has numerous flow
10 charts within the -- within the document that it
11 will make it easier for the staff to follow the
12 logic.

13 And it's -- and page 19 is the SCC
14 subject to an aging effect. If it's "yes," then
15 we have to go to -- into a bucket of aging
16 management activities, which aging management
17 activity that it's going to be in.

18 And we separated those aging
19 management activities which is -- either it's
20 going to be in TLAA or aging management program.

21 And as we -- it was discussed before and very
22 few components within the ISFSI's are -- drops
23 into TLAA. Most of them are in the aging
24 management program part of it.

25 And then, you know, following the

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1 flow chart, is the SCC subject to a TLAA review,
2 I'll follow one path, I think it will make it
3 easier if someone can go back and try different
4 paths.

5 And if it's "No," it will fall into
6 aging management program and if -- is the SCC
7 within the existing aging management program that
8 was approved in the original license. If it's
9 "Yes," it goes down to -- the next question is
10 "Identify aging effect managed by the existing
11 aging management program for the period of
12 renewal."

13 If it's "Yes," it's covered, and it's
14 identified in the SAR, and the case is closed.
15 If it's "No," we'll see the "No" block in the
16 next page and -- let me go to the next slide on
17 page 22.

18 And if it goes to "No," from both
19 sides, from an aging management program as well
20 as TLAA, modification to existing aging
21 management may be required, or into the
22 introduction of a new aging management activity,
23 or -- and this should be documented in SAR and
24 also NRC has to review their aging management
25 activity, whatever that could be.

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1 And I tried to make it as simple as
2 possible with -- with color coding, but I think
3 if you have any questions I could, you know, go
4 back and, you know, go back and forth on this.

5 But I would like to jump on page 23,
6 which shows we -- most of the applicants provide
7 a table like this and which shows on the left
8 side SCCs in scope, list all the components and
9 intended functions, material and environment that
10 covers the aging management review part of it.

11 And after that, aging effects require
12 management, you know, what are those, and also
13 aging management activities. Either it's going
14 to be TLAA or aging management program.

15 So, they identify, you know, an
16 extensive table similar to this. This is just a
17 small table, part of a table, and it's an
18 example. There's no conclusion here that I
19 present.

20 And also, on the next page in 24, and
21 I provided the aging management programs that
22 applicants -- and we will -- we generally look
23 for it, which are prevention, mitigation,
24 condition monitoring or performance monitoring,
25 and those are the programs that can assure that

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1 the components are, you know, looked at -- looked
2 after like in a prevention.

3 We have -- we provided ISG0-11
4 temperature limits, and stress limits, and I have
5 a chart. If you are interested, I can give it to
6 you. These are for normal condition, for low-
7 burn-out fuel and high-burn-out fuel. What are
8 the limits are provided in ISG-11.

9 And it -- of course, concrete has
10 some limits, temperature limits. ACI code
11 provides those. And mitigation could be coding
12 and could be done by a corrective action.

13 And condition monitoring will be
14 inspections and -- which is going to be one of
15 those 20-year lead canister inspection program.
16 That's one of our actions.

17 And performance monitoring,
18 surveillance, is our -- another issue which
19 radiation monitoring is constantly being done,
20 and we are trying to get the applicants to do the
21 temperature measurements at inlets and outlets to
22 justify the curves that you've seen earlier for
23 the temperature, to determine the temperature
24 levels.

25 Going to the next slide, and this --

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1 Fort St. Vrain has currently been performed, and
2 I would like to give one RAI that was asked
3 during the review process which is -- which is
4 about the concrete inspections at higher
5 elevations.

6 This is a different structure than
7 you have seen earlier, and it's like 80, 90 feet
8 high, the concrete and, you know, the question
9 was: How do you inspect the concrete in a higher
10 elevation?

11 So they responded properly and we
12 accepted their aging management program that they
13 have for higher elevation inspections.

14 So, this is the -- this is one of the examples
15 that --

16 MEMBER ARMIJO: But this -- does this
17 use canisters or not?

18 MR. ISTAR: No.

19 MEMBER ARMIJO: This is a gas reactor
20 fuel, right, where they --

21 MR. HORNSETH: It uses canisters but
22 it's very different. They're small diameter
23 compared to the five-foot ones that we've been
24 talking about today. I forgot the -- yes, these
25 canisters were normally found, but are five feet

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1 in diameter, about.

2 The Fort St. Vrain's are more like
3 two feet. One, 18 inches, two feet --

4 MEMBER ARMIJO: About the size of the
5 graphite --

6 MR. HORNSETH: Yes. Just bigger than
7 the graphite blocks, yes.

8 MEMBER ARMIJO: Well, this is unique.
9 This is very unique.

10 MR. HORNSETH: It is.

11 MEMBER ARMIJO: It's the only one in
12 the state. Yes, this is a unique design. This
13 could be probably the most complex compared to
14 the --

15 MR. HORNSETH: Correct. It was.

16 MEMBER ARMIJO: -- for renewal.

17 MR. HORNSETH: Yes. They had a
18 larger number of components to consider.

19 MEMBER ARMIJO: Yes.

20 MEMBER BLEY: Was this part of the
21 old reactor building? It looks like it's got the
22 equipment that you have --

23 MR. HORNSETH: No, it isn't. It was
24 a new building. It was erected next door on the
25 adjacent property, so it's completely separate

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1 from the old reactor site.

2 MEMBER BLEY: Okay. So they just
3 have some way to move the fuel across from the
4 reactor site over to here and put it into
5 permanent storage, or this -- this restorage?

6 MR. HORNSETH: That's right.

7 MR. ISTAR: Okay. And the next slide
8 is -- I'd like to, you know, talk about a little
9 bit about the ongoing activities supporting the
10 aging management, staff-sponsored research,
11 coastal marine atmospheric effects.

12 I think Geoff can talk to -- he's the
13 lead engineer on that.

14 MR. HORNSETH: Let me take that one.

15 MR. ISTAR: Sure. Please.

16 MR. HORNSETH: Let me take that one
17 for a second. Back to earlier questions about,
18 you know, you engage with the industry and so
19 forth and looking at research and stuff. This is
20 one that I initiated because a question arose
21 about, well, what is the effect on a stainless
22 canister that's in an ISFSI that's at the beach,
23 on the ocean.

24 And we did a lot of debate and
25 argument and a lot of literature research and

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1 found, yes, there's a -- you could fill this
2 building with all the studies about SCC and
3 corrosion of austenitic stainless steels exposed
4 to a marine atmosphere at ambient temperature.

5 But, we're not. We're at elevated
6 temperature. So, we wrote a research contract
7 and had a study done. It's research advise --
8 our research division advises me today that the
9 NUREG with the results of our study is to be
10 published at any minute, so it will be out.

11 But I can give you -- I believe the
12 results was, we exposed U-bend samples of three
13 different kinds of austenitic stainless steel,
14 304 and 316, and one of them was the L-grade, and
15 these are what's commonly used today.

16 We coated them with salt, using a fog
17 mechanism because we did not want droplet water
18 getting on the samples because that gave us a
19 false positive. We discovered that by way of a
20 couple of other studies.

21 And then we exposed these things in a
22 fog chamber to very high humidity levels at three
23 different temperatures, 43 degrees C, 76 degrees
24 C and 100 and -- what was it -- oh, about 120
25 degrees C.

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1 All the 43 degree C samples -- now
2 realize, this was an accelerated test, so we were
3 running humidity levels that are twice what has
4 ever been reported anywhere in the world from
5 natural weather conditions.

6 All of 43 degree C samples eventually
7 pitted and initiated stress corrosion cracks.
8 None of the 70-odd degree C and over 100 degree C
9 samples exhibited any degradation whatsoever.

10 The next scope of this is, we're
11 going to turn it over to NEI and EPRI for
12 industry to propose what the next step is going
13 to be because, at this point you have a plethora
14 of possible answers going from, you know, write
15 another research contract to stick a fire hose in
16 the top of the chimney once a year and just wash
17 it down.

18 What we did, of course, in order to
19 accelerate the test was, we cheated. We made
20 sure that our samples had a beautiful white
21 coating. It looked like it had been titanium
22 oxide painted on it before we exposed them to the
23 fog chamber.

24 At this time we don't have any
25 evidence that the salt drift actually sticks to

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1 the side of one of these canisters as it flows
2 through there. We will be finding that out and,
3 you know, when the industry gets, you know,
4 responds with what their proposed reaction is
5 going to be to this study.

6 MEMBER ARMIJO: Is there any proven
7 transport mechanism to get salt in solution,
8 either in the fog or something, since you can't
9 pour on it --

10 MR. HORNSETH: Right.

11 MEMBER ARMIJO: It has to transport
12 through some sort of a fog mechanism --

13 MR. HORNSETH: Oh, yes.

14 MEMBER ARMIJO: -- into the --

15 MR. HORNSETH: Yes.

16 MEMBER ARMIJO: -- into the canister
17 surface.

18 MR. HORNSETH: Very definitely. You
19 can have salt aerosols, okay, transported in air.
20 It's very common, and the best illustration is,
21 if you go to the beach, you notice the corrosion
22 there is just phenomenal compared to what it is
23 away from the beach.

24 And that is largely due to salt drift
25 as an aerosol, not gross, you know, blowing of

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1 the wave tops onto the -- onto your beach cottage
2 type of thing.

3 There is a classic paper that was
4 conducted by Kennedy Space Flight Center. It's
5 on the web --

6 MEMBER ARMIJO: Okay.

7 MR. HORNSETH: -- where they did a
8 study of deposition rates of this salt drift at
9 distances from basically high tide to about 100
10 miles inland, wherever -- however far away
11 Orlando, Florida is from the Cape, okay, and they
12 can quantify -- it's a classic curve that shows
13 you what the annual deposition rate is of this
14 salt drift.

15 It also drops dramatically when you
16 have a sheltered environment. Our canisters are
17 very sheltered, much more so than the ones that
18 were in the Kennedy Space Flight Center study.

19 So, we anticipate that the salt
20 deposition rates will be very low --

21 MEMBER ARMIJO: Yes.

22 MR. HORNSETH: -- but that was one of
23 the follow-on things like, well, okay, what is
24 the salt deposition rate.

25 And, like I say, this is one of these

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1 things -- we decided that, rather than trying to
2 anticipate how the industry is going to react to
3 this information that there may be an issue,
4 we'll let them decide.

5 You know, if they want to get EPRI to
6 do some more, you know, computational fluid
7 dynamics, modeling stuff, which we didn't want to
8 go there, fine. If they want to just stick a
9 fire hose in the top of --

10 CHAIRMAN RYAN: Go back to one
11 measurement idea, you know.

12 MR. HORNSETH: Yes. But we're going
13 to get a measurement pretty soon from Calvert
14 Cliffs, because their license renewal application
15 landed on my desk last week. And they are not on
16 the ocean, but they are on the Chesapeake Bay, so
17 I'm looking at that one with great interest to
18 see if we have any accumulation.

19 So, that's one thing that we're doing
20 to keep ahead of --

21 MEMBER ARMIJO: That will be
22 interesting, to see what --

23 MR. HORNSETH: Yes.

24 MEMBER ARMIJO: -- what happens
25 there.

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1 MR. HORNSETH: I will give it back to
2 Ata.

3 MR. ISTAR: Thank you, Geoff. And
4 also, ISG-11 is, as I told you earlier,
5 temperature levels, and some hoop cladding, hoop
6 stresses are listed.

7 Bob, you may want to say something
8 about this ISG-11 because he's in charge of that,
9 putting these temperature limits for low-burn-up
10 or high-burn-up, and for normal conditions,
11 normal handling conditions, off- normal and
12 accident conditions.

13 MR. EINZIGER: A big concern that
14 we're having is that, with high-burn-up fuel
15 during the time it's in the reactor and the
16 cladding is corroding, a certain percentage of
17 the hydrogen that's generated diffuses into the
18 cladding.

19 And when it's in storage, there is a
20 -- may be a propensity of the hydroids that form
21 in the cladding that are normally in a
22 circumferential direction, revert to a radial
23 direction and that during a side-drop accident
24 could cause an impinging mode fracture of the
25 cladding, and that if we allow the cladding to go

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1 up to the 400 degree C during storage, which is
2 the current recommended temperature, that there
3 would be enough of this reorientation to occur to
4 cause a problem later down the line when we go to
5 transport the fuel.

6 This is a subject that's under
7 investigation worldwide. The Japanese had taken
8 some steps and they've just unilaterally decided
9 they're not going to fight it anymore, and
10 they've dropped their maximum storage
11 temperatures down to 275 degrees versus a 400.
12 That's a pretty big drop --

13 MEMBER ARMIJO: That's a huge drop,
14 yes.

15 MR. EINZIGER: And if we tried to do
16 that, we would probably get a lot of backlash
17 from our -- our vendors.

18 In any case, we are doing a study at
19 Argonne to determine whether there's a problem,
20 and preliminary results from that tests with some
21 radiated ZIRLO indicate that you do get a
22 reorientation of the hydrides and then there is
23 the possibility that if you go to very long-term
24 storage, which is another topic in itself, that
25 the fuel cladding temperature could drop low

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1 enough where the -- there's enough hydride
2 reoriented to make a brittle cladding.

3 So, we're waiting for those tests to
4 come in, and once those tests come in, we'll look
5 at ISG-11 again and determine whether there's
6 some additional guidance that we have to generate
7 either in the form of modifying ISG-11 or
8 potentially giving guidance for the -- if we're
9 going to look at the behavior in longer-term
10 storage.

11 MEMBER ARMIJO: Well, there's a lot
12 of things that can happen there, as you know.
13 You know, you've got to have -- for that hydrogen
14 to redissolve and redistribute it will move
15 toward the coldest regions and it will move to
16 the regions where there's a highest tensile
17 stresses, so it may -- you know, if you've got to
18 look at the whole fuel rod before somebody comes
19 up with a --

20 MR. EINZIGER: Well, actually, you're
21 right, Sam. But we are at high-enough
22 temperatures --

23 MEMBER ARMIJO: Oh, I know you're at
24 high enough temperatures.

25 MR. EINZIGER: -- where we dissolve

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1 the hydrogen we get into solution, and the
2 stresses that are needed to reorient it.

3 We are seeing reorientation. What
4 surprised us is when we tested the fuel at 150
5 degrees C afterwards, we would be ductile, and if
6 we went down to room temperature and tested it
7 again, we were brittle --

8 MEMBER ARMIJO: Keep it warm.

9 MR. EINZIGER: Well, that is a
10 possibility. See, there's going to be certain --
11 there's going to be a profile in the cladding
12 where you're going to be hot enough during
13 storage to get the reorientation to occur in cold
14 enough during transportation to have a fracture
15 occur.

16 So, it's a -- at this point, it's
17 premature to say the extent that there's a
18 problem. The only indications at this point so
19 far either is an issue that we are going to have
20 to have the vendors address, and the kind of
21 guidance we do in terms of ISG-11 reissuing is
22 still debatable.

23 MEMBER ARMIJO: Yes. Well, it's got
24 to be a whole assembly analysis, because you
25 could just as likely to break of the plenum, the

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1 upper plenum regions, the end plugs, as well as
2 the fuel --

3 MR. EINZIGER: Well, it's more than a
4 whole assembly. It's a whole cask analysis.

5 MEMBER ARMIJO: Yes.

6 MR. EINZIGER: And to look at the
7 temperature profiles and to -- you have to have
8 two conditions. You have to have it get hot
9 enough, and then you have to get cold enough
10 later down the line.

11 MEMBER ARMIJO: And you've got to
12 have enough hydrogen.

13 MR. EINZIGER: Well, actually that
14 was the thought before it was the fact that the
15 high-burn-up fuel was in the reactor longer, you
16 had more oxidation, you had more hydrogen and, in
17 effect, that's probably not the reason.

18 What we're finding out is that even
19 in lower-burn-up fuel there's plenty of hydrogen
20 to do the job. Where the high-burn-up fuel
21 becomes a problem is the fact that during the
22 radiation, not only do you generate more hydrogen
23 in the cladding, you also generate more fission
24 gas release from the fuel to the plenum which
25 increases the stress and it's the stress that's

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1 causing you the problem.

2 MEMBER ARMIJO: Sure.

3 MR. EINZIGER: But this is a subject,
4 you know, we could sit down and discuss at your
5 convenience and -- but we're far from the answer
6 if it yet.

7 MEMBER ARMIJO: Yes, I'd be
8 interested in that. I'll follow that as much as
9 I can.

10 MR. ISTAR: Thank you, Bob.

11 MR. WEAVER: And from the perspective
12 of this presentation, it really becomes a problem
13 in the transportation -- subsequent
14 transportation. We're just strictly storing --

15 MEMBER ARMIJO: You are going to just
16 put it there and it's going to sit there.

17 CHAIRMAN RYAN: That was a question I
18 was going to ask. We're really on two different
19 pages and --

20 MEMBER ARMIJO: Yes.

21 CHAIRMAN RYAN: -- I want to just --
22 you know, okay.

23 MR. ISTAR: And the third bullet
24 here, "The applicant may provide new data
25 demonstrating the DCSS performance."

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1 We are kind of -- contact the --
2 quite a bit of applicants and utilities to
3 provide -- I'll give you an example -- to inlet
4 and outlet temperature measurements, continuously
5 made.

6 We want them to do that so we'll get
7 the information from them. And, you know, some
8 of them are -- we're trying to get their consent
9 and they -- of course, they talk about the
10 expense and everything. Once they, I think,
11 remotely install their equipment it's going to be
12 a very easy process just getting there.

13 But, during the -- and the next
14 bullet in staff, every task force for surge
15 issues in every -- and utility and NRC kind of
16 reform this group that we are trying to convince
17 the utilities to go and make the temperature
18 measurements.

19 I think they are going to finally
20 going to agree upon that. But, again, that's --
21 we can't enforce that. They have to do it
22 themselves and volunteer that, for that.

23 And, as the last slide, and I have --
24 I'll go through the summary, and again, the
25 preliminary guidance 2001 successfully applied to

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1 four ISFSI renewals, and which was captured in
2 the SRP.

3 And the preliminary guidance is the
4 basis, again, for the SRP, and SRP provides
5 stability and structure for the technical review
6 process, identifies core technical aging issues,
7 incorporated public comments and concurring with
8 the 10 CFR proximity final rule.

9 And, of course, as you can see, the
10 staff involvements in research and industry is
11 the critical part of it and it's a living
12 document that -- and it's going to be revised as
13 we learn more about the process to help the
14 industry.

15 And that's all I have to say. Thank
16 you very much.

17 CHAIRMAN RYAN: Thank you, Ata. That
18 was a very good presentation, from all three of
19 you. Thank you.

20 Any questions? Jack?

21 MEMBER SIEBER: No questions. You
22 say the coastal atmosphere study is on the
23 internet?

24 MR. HORNSETH: Not yet. It's --

25 MEMBER SIEBER: That's something I

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1 would like to read.

2 MR. HORNSETH: It's to be published
3 at any minute. It's been submitted for
4 publication. That's the news as of this morning.

5 I don't have a NUREG CR number yet. It's still
6 X-X-X.

7 MEMBER SIEBER: Okay. But if you can
8 work with Chris and just give Chris a copy when
9 it's ready, then --

10 MR. HORNSETH: Yes.

11 MEMBER SIEBER: Your verbal
12 explanation is fine, but I -- I have an academic
13 interest in it, so I'd like to read it. So, if I
14 can get it --

15 MR. HORNSETH: We'll get copies for
16 the whole committee.

17 CHAIRMAN RYAN: I'd like that, too.
18 Dr. Armijo.

19 MEMBER ARMIJO: Just a couple of
20 questions. One of them is -- and I don't -- I
21 forget where I read this. I think it was in the
22 reviewing for this -- this meeting.

23 There was an issue of retrievability
24 and we talked about that, Bob, when we kind of
25 tried to explain in the, I guess, ISG, approved

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1 ISG --

2 MR. HORNSETH: On ISG-2.

3 MEMBER ARMIJO: -- ISG 2, yes. Now,
4 that related to the fuel retrievability.

5 MR. HORNSETH: Yes.

6 MEMBER ARMIJO: And is it -- my
7 question was: If somebody's already set up a
8 facility, the cask was designed and the issue of
9 retrievability wasn't a requirement at that time,
10 would that be a problem in -- in relicensing?

11 MR. HORNSETH: The retrievability has
12 always been required.

13 MEMBER ARMIJO: Okay. That answers
14 my question. It's always been required whether
15 it was --

16 MR. HORNSETH: It is required.

17 MEMBER ARMIJO: -- actually doable.
18 It's always doable. It's just how much money do
19 you want to spend.

20 MR. HORNSETH: What that -- what that
21 initially covered was, we didn't want licensees
22 putting the fuel in some kind of container and
23 then burying it out in the back yard someplace in
24 concrete underground and forgetting where it was.

25 MEMBER ARMIJO: Okay.

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1 MR. HORNSETH: That was the initial
2 one.

3 MEMBER ARMIJO: Okay.

4 MR. HORNSETH: And that has not
5 happened. All the canisters are serial numbered.
6 They are kept track of because you're reporting
7 on them --

8 MEMBER ARMIJO: The contents are --

9 MR. HORNSETH: -- and there are
10 surveillances, so there's a lot of things to
11 prevent that from ever happening.

12 MEMBER ARMIJO: And my other question
13 has -- it's way off. Maybe you don't even want
14 to hear it, but I'm going to say it anyway.

15 We -- you know, we've been going
16 through this certification of new reactors and
17 one of the things that's been imposed on the new
18 reactors, and to a certain extent on the
19 operating plants is aircraft impact, malevolent
20 aircraft impact.

21 And, in the case of the ISFSI
22 facilities, is -- on the same site, okay -- you
23 know, so you have a little logic problem. Here
24 comes an aircraft, but it can only hit the
25 buildings or -- but it can't hit the -- where all

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1 these canisters are lined up.

2 Is there an issue, have you folks
3 been thinking about that?

4 MR. HORNSETH: That's been considered
5 -- that's been considered at length. It's
6 outside of the initial licensing process, it's
7 outside of license renewal. It's not a -- it's
8 not a Part 72 design requirement.

9 However, it has been assessed and
10 with the concrete structures around these
11 canisters, it's not an issue.

12 MEMBER ARMIJO: It will knock a hole
13 --

14 MR. HORNSETH: It will not -- it will
15 displace them, but you will never breach a
16 canister.

17 MEMBER ARMIJO: That's good to know.
18 I'm happy to hear that.

19 MR. EINZIGER: There is a classified
20 study that deals with the aircraft impact that
21 was produced by Sandia --

22 MEMBER ARMIJO: Okay.

23 MR. EINZIGER: -- that, if you're
24 interested in you should be able to get a hold of
25 --

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1 MEMBER ARMIJO: Yes. If I need --

2 MR. EINZIGER: You can --

3 MEMBER ARMIJO: You answered -- you
4 know, you answered my question. You know, it
5 just seemed that we have a big logic problem when
6 here we are publicly saying we're assessing this
7 on --

8 MR. HORNSETH: It's been assessed,
9 yes.

10 MEMBER ARMIJO: But we're kind of
11 like silent on the -- the ISFSI facility on the
12 same site, and it's a -- you know, how do you
13 explain that to the public?

14 MR. HORNSETH: That's a tricky one
15 because it's a safeguards thing --

16 MEMBER ARMIJO: I know.

17 MR. HORNSETH: -- and so I don't want
18 to reveal --

19 MEMBER SIEBER: Yes, you can't
20 explain it.

21 MR. HORNSETH: Yes.

22 MEMBER ARMIJO: Well, I'm not going
23 to explain it to them. I'm just going to say
24 it's been considered.

25 MR. HORNSETH: Yes.

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1 MEMBER ARMIJO: That's all I want to
2 say.

3 MR. HORNSETH: It's happily been
4 considered.

5 MEMBER ARMIJO: Been assessed.

6 MR. HORNSETH: For various different
7 designs also.

8 MEMBER ARMIJO: Right. A horizontal,
9 the verticals and all that?

10 MR. HORNSETH: Yes. Yes.

11 MEMBER SIEBER: Just say "Don't worry
12 about it."

13 MEMBER ARMIJO: They always listen to
14 me, right. That's all I have.

15 CHAIRMAN RYAN: Thank you, Sam.
16 Dennis.

17 MEMBER BLEY: Well, nothing new. Sam
18 raised some real good points that I was thinking
19 about and I appreciate the discussion.

20 I guess the -- the only thing, it's
21 kind of like the other areas on the materials
22 side when we look. It's a little less structured
23 than we see for the reactors, but then it's a
24 simpler problem and it seems real expertise
25 available to do the review, so I think that all

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1 works out fine.

2 I appreciate the briefing and it
3 looks pretty good to me. Thanks.

4 CHAIRMAN RYAN: Thank you.

5 MR. HORNSETH: Thank you. I'd like
6 to comment on your comment. As a technical
7 reviewer, a personal opinion, I wanted to see a
8 lot more engineering nuts and bolts type of stuff
9 go into the document, but we have constraints.

10 I did slide a few things in there
11 and, much to my surprise, we got a lot of push-
12 back from the industry about being too
13 prescriptive.

14 MEMBER BLEY: Okay. With this one,
15 because --

16 MEMBER ARMIJO: I thought that. They
17 must be a hard bunch, I'll tell you.

18 MR. HORNSETH: Oh, I'll tell you. I
19 think they'd boo a cure for cancer. I was real
20 surprised, and one of the -- one of the comments
21 that they were really trying to beat me up on
22 that we finally said, no, we're not going to
23 accept that comment was the horizontal design
24 entails a metallic tract structure that's inside
25 the concrete.

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1 MEMBER BLEY: Yes.

2 MR. HORNSETH: And normally they're
3 built out of carbon steel, and I had this
4 stainless steel coastal marine atmosphere study
5 cooking at the same time and I knew about it.

6 CHAIRMAN RYAN: Yes.

7 MR. HORNSETH: And I said, now,
8 they're going to have to address this and I want
9 to put a reminder in there for the reviewers and
10 also by way of remote control industry, because
11 they read all this stuff --

12 CHAIRMAN RYAN: Yes.

13 MR. HORNSETH: -- that they're going
14 to have to do something about that structure in
15 there and, boy, did I get adverse comments about
16 micromanaging and picking on certain designs and
17 all this kind of -- and I said, no, we're leaving
18 it in there because we -- we don't want that to
19 be missed.

20 But they really didn't like the --
21 the detailed technical guidance. So, some of it
22 -- some of it came out.

23 CHAIRMAN RYAN: Interesting. Very
24 good.

25 MEMBER BLEY: It is interesting,

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1 frankly. I'm a little curious but -- okay.
2 Thanks.

3 CHAIRMAN RYAN: Okay. Dennis, thank
4 you.

5 Like I said, we had a couple of
6 things that we found that where the terminology
7 was different from the previous NUREG, and we'll
8 -- we'll give those to you off-line from this
9 meeting, because they are minor and editorial
10 more than anything else, but just -- just so that
11 everything lines up if somebody's referring to
12 the previous NUREG versus this one, they won't be
13 "Huh?" scratching their heads.

14 So -- but those are minor things we -
15 -

16 MR. WEAVER: If you will give those
17 to us in the near term --

18 CHAIRMAN RYAN: Yes. I think Chris
19 will organize them and send them to you. Yes.
20 Yes, we'll do that very quickly. We'll do that
21 probably early next week, or later. So -- again,
22 we had to scratch our heads a bit, and that will
23 save somebody else from doing the same.

24 MR. WEAVER: Thank you.

25 CHAIRMAN RYAN: I think my summary is

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1 this has been a fabulous briefing. It's --
2 you've done a lot of work and you've explained it
3 well to us today and we -- I don't think we had
4 any significant comments on the draft document at
5 all, but just some minor editorial items.

6 We'll wrap those up and I think we'll
7 be able to recommend to the Full Committee that
8 we support the issuance of the NUREG and we'll
9 have a draft letter for their review read at the
10 Full Committee meeting.

11 MR. HORNSETH: Well, thank you, Dr.
12 Ryan, and the members appreciate it.

13 CHAIRMAN RYAN: Thank you. And take
14 the rest of the week off. We are way ahead of
15 schedule and it's fine.

16 MR. HORNSETH: We thought you'd
17 appreciate that.

18 CHAIRMAN RYAN: Yes. Absolutely.
19 No, I think it's just -- we're right on top of
20 it.

21 MEMBER SIEBER: Just wait a couple
22 more hours.

23 MR. WEAVER: Yes.

24 MR. BROWN: Mike, do you want them to
25 use the same presentation for the Full Committee

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1 --

2 CHAIRMAN RYAN: Yes. I think the
3 presentation is probably just about right. Maybe
4 a little bit less detail on some of the -- you
5 know, the --

6 MR. HORNSETH: Oh, yes.

7 MR. WEAVER: You don't need the
8 background or the --

9 CHAIRMAN RYAN: Well, no. I think
10 the background, right on up through -- you know,
11 maybe not so much on the flow chart in the
12 process part.

13 MR. WEAVER: Yes, I just --

14 CHAIRMAN RYAN: And that was good for
15 us because we needed to hear the detail, but I'm
16 not sure the Full Committee needs to hear all
17 that. Sam, do you --

18 MEMBER BLEY: I think if you just
19 kept the slide 17, with the overview --

20 CHAIRMAN RYAN: Yes. That's enough.

21 (Simultaneous speaking.)

22 MR. HORNSETH: Do you want to keep
23 the same level of technical stuff that I dragged
24 you guys through?

25 CHAIRMAN RYAN: Yes. Perfect.

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1 Perfect.

2 MR. HORNSETH: Okay.

3 CHAIRMAN RYAN: A couple of drafts
4 never hurt.

5 MEMBER SIEBER: Slide 16 in all the
6 way to 29.

7 MR. ISTAR: Pardon, sir?

8 CHAIRMAN RYAN: 18 through --

9 MEMBER SIEBER: 16 to 22.

10 CHAIRMAN RYAN: Well, I think we'll
11 keep that one 17, because that at least is that
12 overview.

13 MEMBER SIEBER: 16 through 22.

14 CHAIRMAN RYAN: Go out.

15 MEMBER SIEBER: Stay in.

16 CHAIRMAN RYAN: Oh, stay in.

17 MR. HORNSETH: Oh, 16 through 22 stay
18 in.

19 CHAIRMAN RYAN: Well, we're kind of
20 saying get rid of 18 and 19 and --

21 MEMBER SIEBER: Okay.

22 CHAIRMAN RYAN: I would hold those as
23 sort of backup slides. Just have them in a
24 backup set.

25 MR. HORNSETH: The one flow chart

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1 page, and we'll keep the others in our hip
2 pocket.

3 CHAIRMAN RYAN: Yes. Just move them
4 to -- what we normally do is have a page that
5 says, "Backup slides," --

6 MR. HORNSETH: Okay.

7 CHAIRMAN RYAN: -- and just stick
8 them back there and reorder it. That way they're
9 there if you need it.

10 MR. HORNSETH: Okay.

11 CHAIRMAN RYAN: With that, again,
12 thank you very much, and I think we're done.

13 Motion to adjourn?

14 PARTICIPANT: So moved.

15 CHAIRMAN RYAN: You have total
16 authority. We're done. Thank you very much.
17 We'll close the record here.

18 (Whereupon, the meeting was concluded
19 at 2:28 p.m.)

20

21

22

23

24

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NUREG-1927
Standard Review Plan for
Renewal of Spent Fuel Dry Cask Storage
System Licenses and
Certificates of Compliance

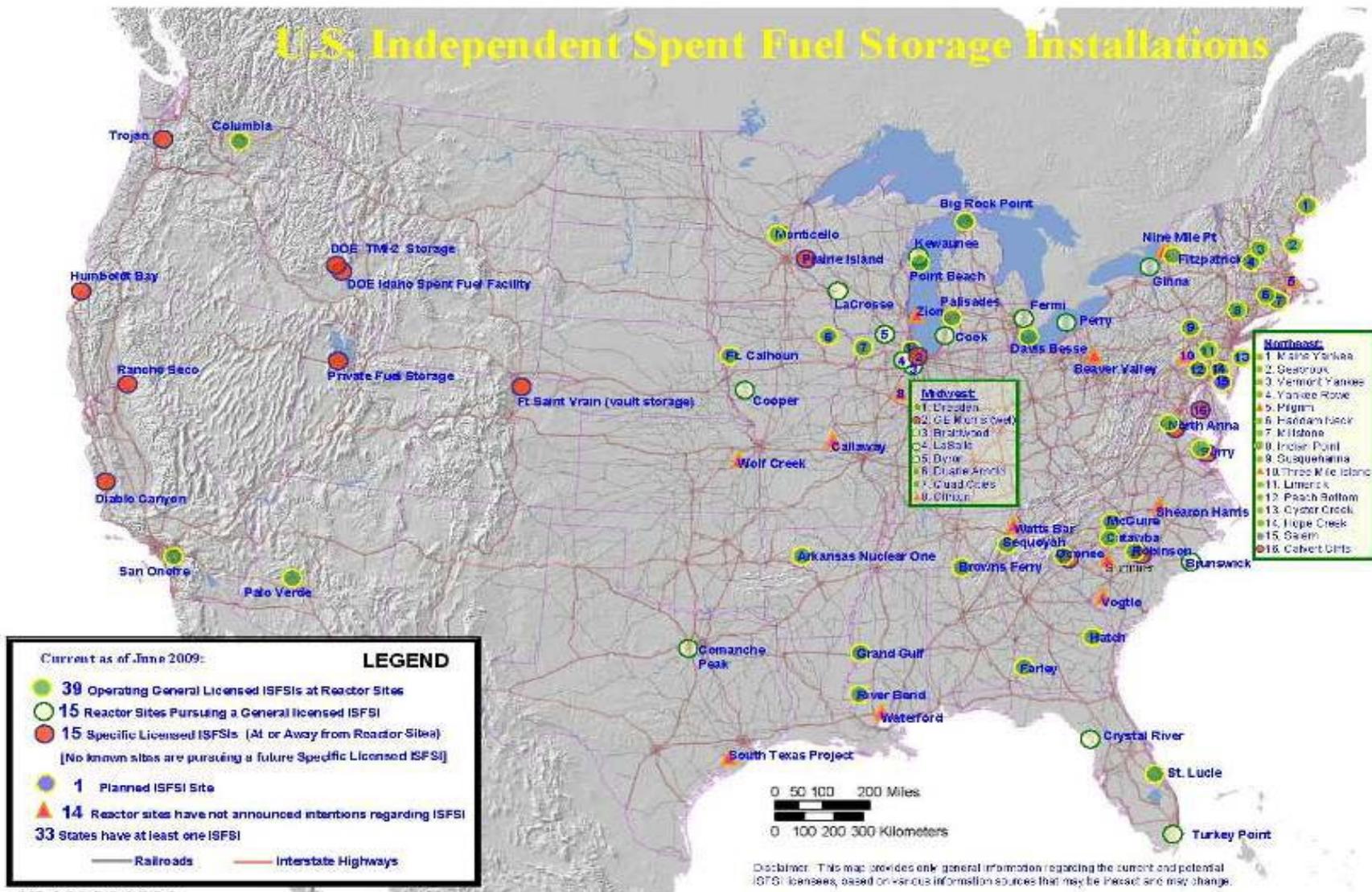
Ata Istar and Geoffrey Hornseth
U.S. Nuclear Regulatory Commission
October 22, 2010

- Introduction to DCSS
- License Renewal Background
- Technical Basis
- License Renewal Process
- Ongoing Activities Supporting Aging Management
- Summary

Abbreviations:

- **AMA** Aging management activity
- **AMP** Aging management program
- **AMR** Aging management review
- **CC** Criticality control
- **DCSS** Dry cask storage system
- **HT** Heat transfer
- **ISFSI** Independent spent fuel storage installations
- **PB** Pressure boundary
- **RS** Radiation shielding
- **RAI** Request for additional information
- **SAR** Safety analysis report
- **SRM** Staff requirements memoranda
- **SRP** Standard review plan
- **SS** Structural support
- **SSCs** Structures, systems and components
- **TLAA** Time-limited aging analysis

U.S. Independent Spent Fuel Storage Installations



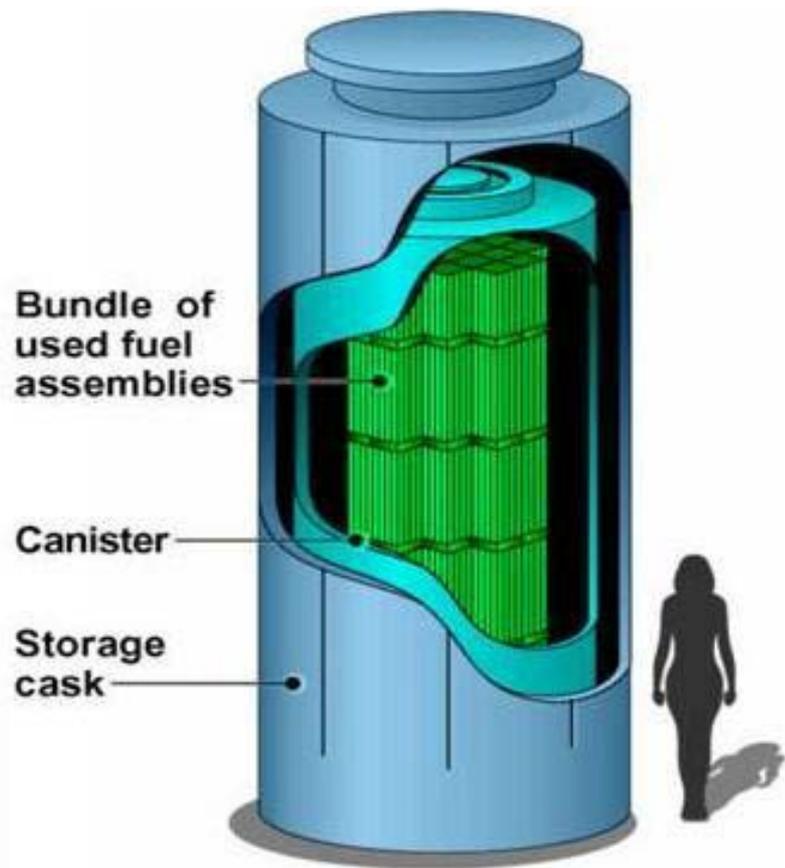
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Introduction to DCSS









License Renewal Background:

- 2001** Letter to VEPCO (Dominion Power) “Preliminary NRC Staff Guidance for 10 CFR Part 72 License Renewal.”
- 2002** Surry ISFSI, VEPCO (Dominion Power), application with 40 year exemption request.
- 2004** SECY-04-0175 “Options for the Surry ISFSI license renewal exemption request.”
- 2004** Staff Requirements Memoranda (SRM) approves 40-year renewal for Surry and H.B. Robinson.
- 2006** Commission directed staff to proceed with Part 72 rulemaking, 40 year terms.
- 2009-2010** Oconee, Fort St. Vrain renewal reviews.
- 2009-2010** Draft SRP based on preliminary guidance.
- 2010** Commission approved 10 CFR Part 72 final rule.

Technical Basis:

Preliminary guidance developed

- experience with power plant license renewal,
- cask opening & examination.

Key renewal issues:

Predominately assessment for material degradation

- Canister:
 - Corrosion
 - Thermal fatigue
- Concrete shielding:
 - Cracking/spalling
 - Thermal fatigue

DCSS is passive, static.

Canister exterior environment:

- Air
- Decay heat
- Temperature changes
- Dose

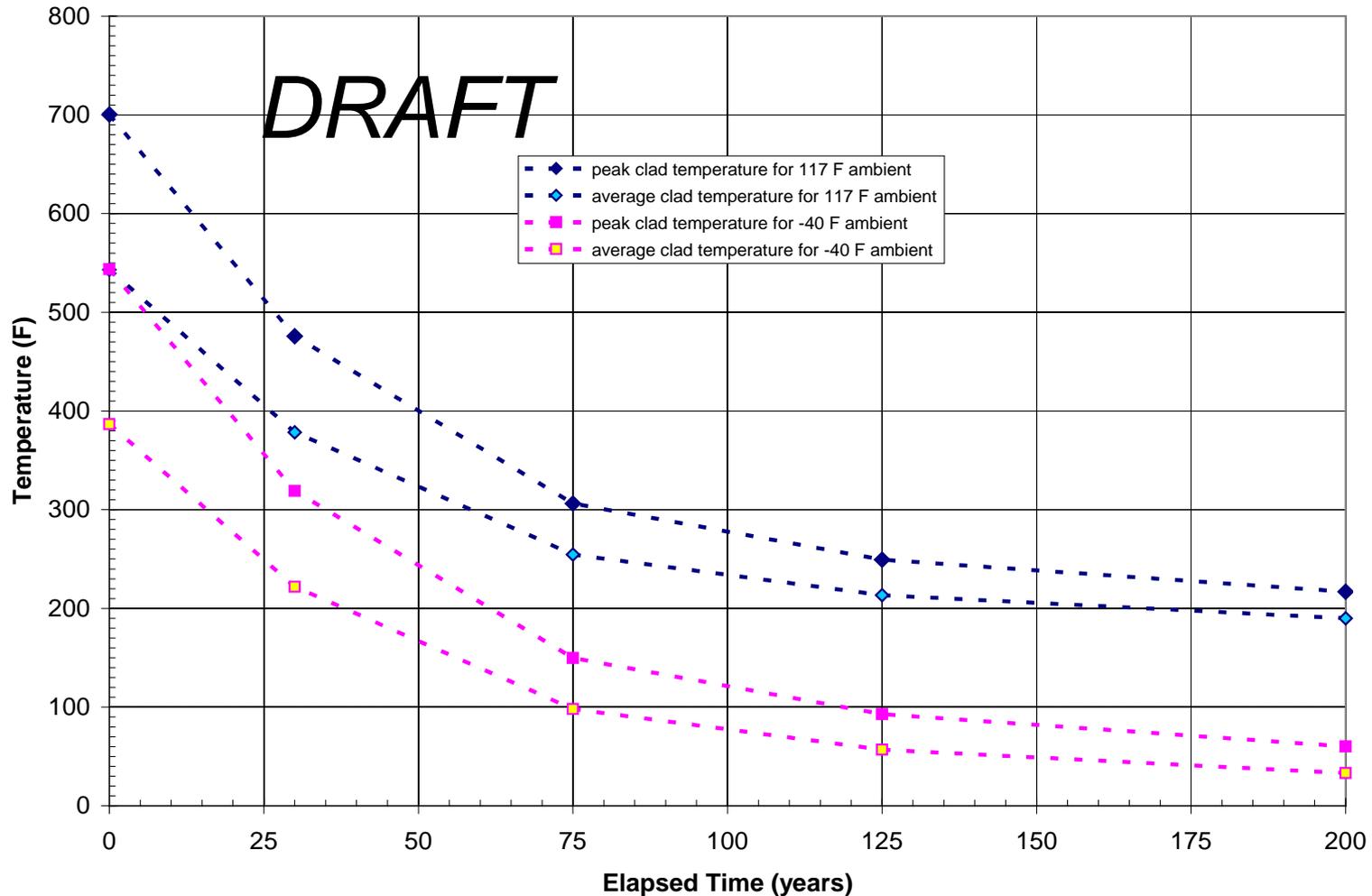
Shield Environment

- Weather
- Decay heat
- Temperature changes
- Dose

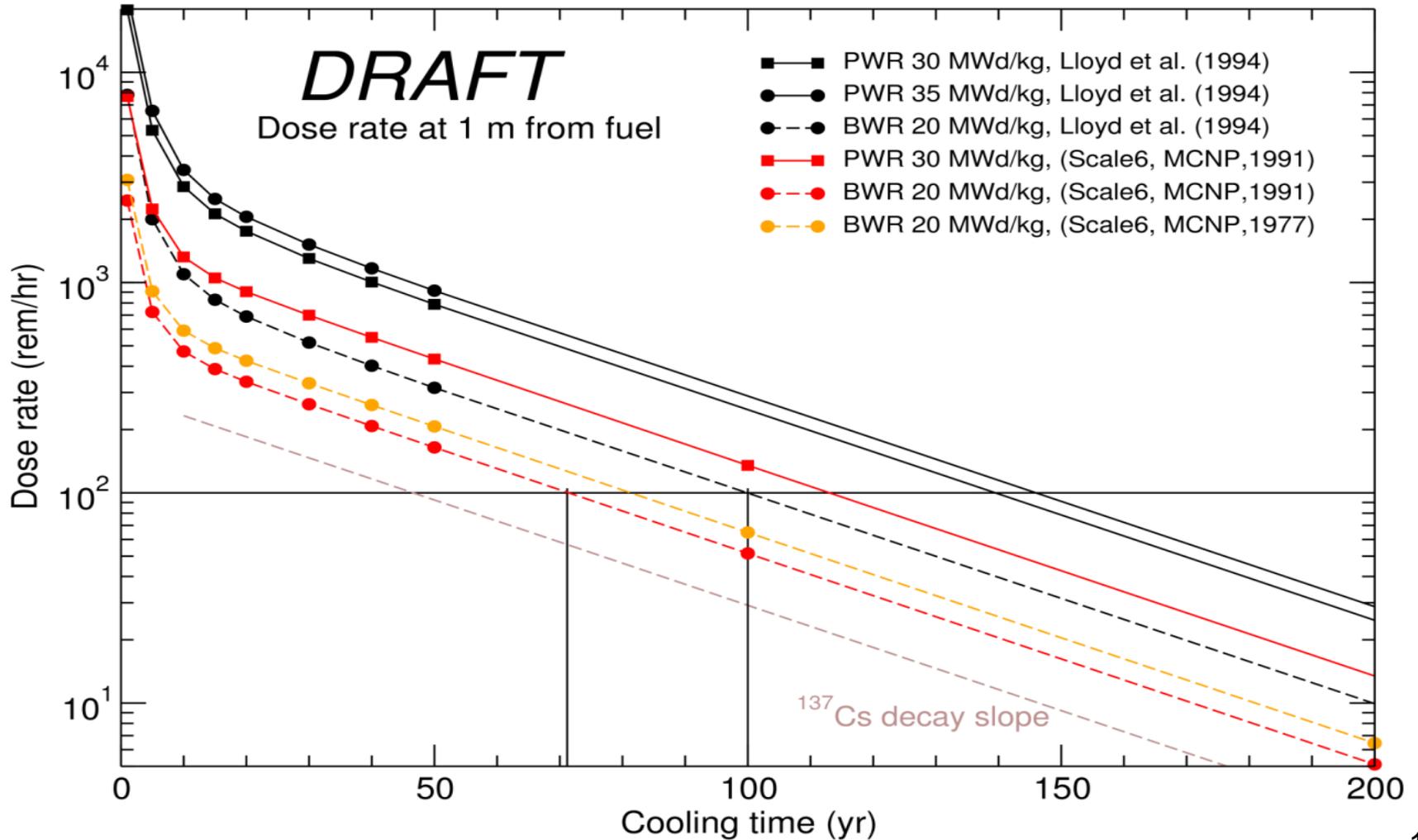
Preliminary Guidance and SRP Relies on:

- Review of operational and maintenance history.
- Assess environment and potential degradation mechanisms.
- Review of original licensing basis.
- Review time-dependent issues (thermal fatigue).
- 20-year interval visual examination of inaccessible areas of “lead canister” for unanticipated aging effects.
- No degradation of DCSS interior and low burn-up fuel cladding after 15 years of storage:
 - NUREG/CR-6745, “Dry Cask Storage Characterization Project - Phase 1; CASTOR V/21 Cask Opening and Examination,” Sept. 2001.
 - NUREG/CR-6831, “Examination of Spent PWR fuel Rods after 15 years in dry Storage,” Sept. 2003.

Representative Cladding Unshielded Temperature



Representative Dose Rate



Renewal Experience (to date):

- No degradation observed.
- Thermal fatigue not limiting.
- Underlying assumptions/operating-conditions upheld.
- 40 year term justified by technical findings from the first two renewals.

License Renewal Process

1.0 Review of Regulatory Requirements

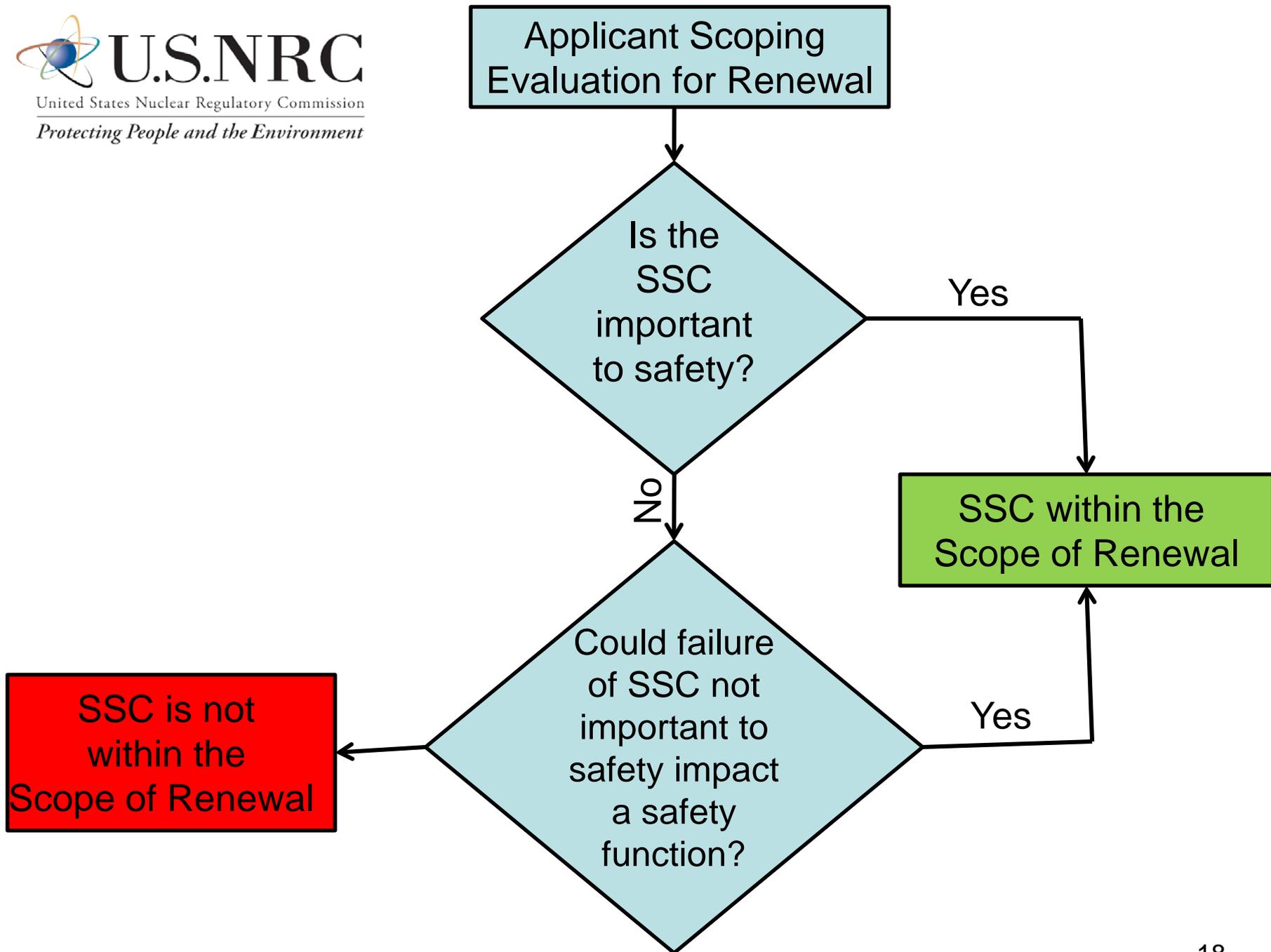
2.0 Scoping Evaluation

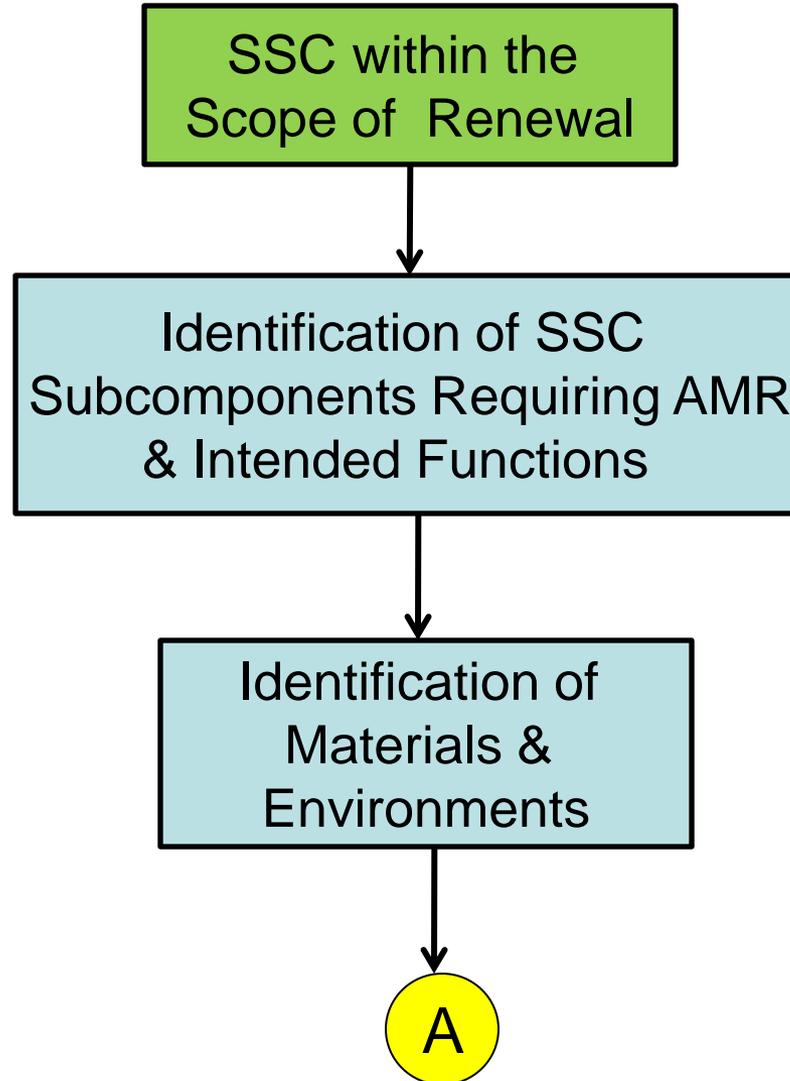
3.0 Aging Management Review

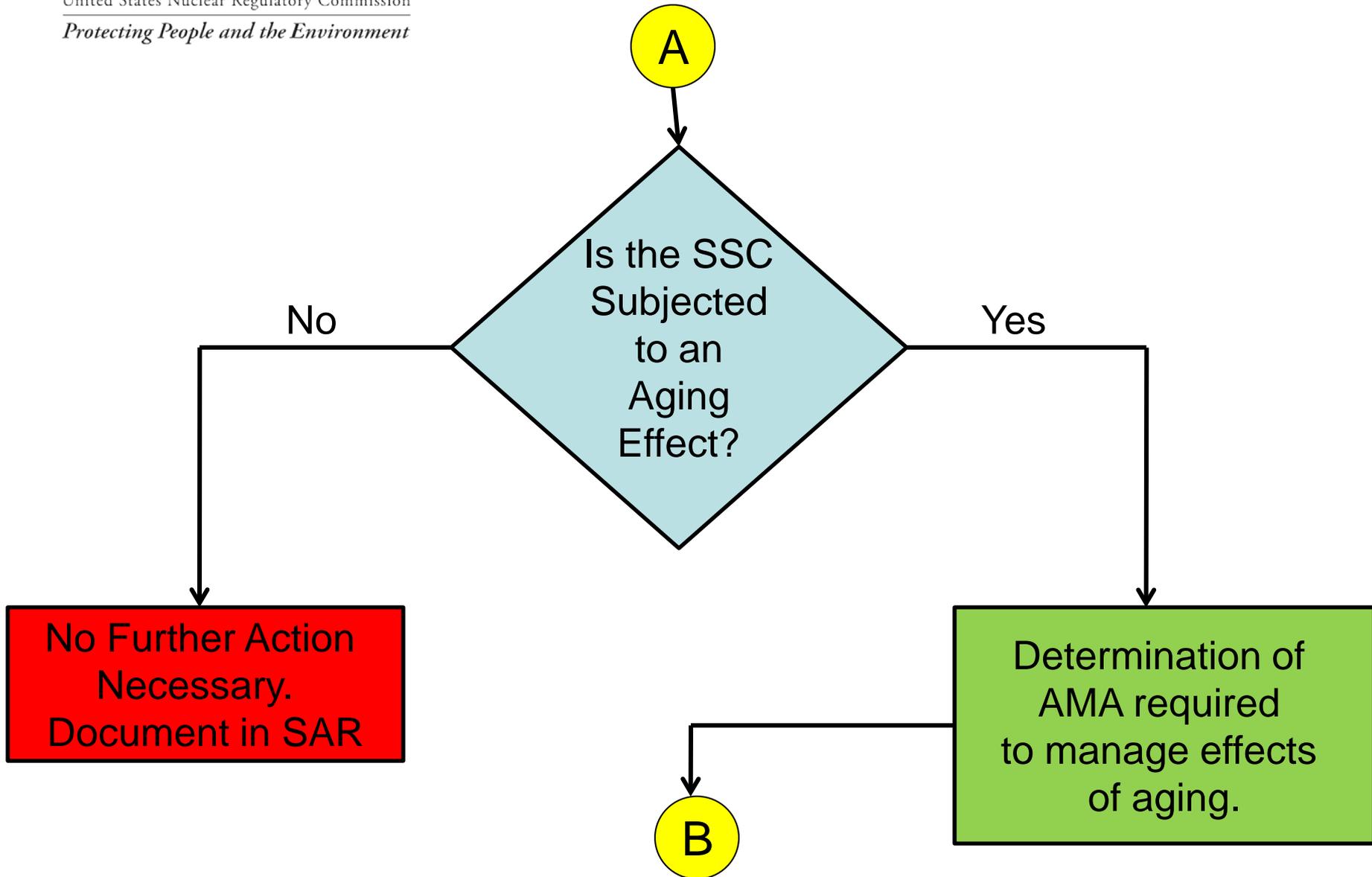
3.5 Time-Limited Aging Analysis

3.6 Aging Management Programs

3.7 Retrievability







B

Determination of
 AMA required
 to manage effects
 of aging.

Is the SSC
 subjected
 to TLAA
 review?

Yes

No

Is the SSC
 within an
 existing
 AMP?

No

TLAA ↔ **AMP**

Yes

C

Is TLAA
 demonstrated
 adequately
 for the period
 of renewal?

Yes

Is identified
 aging effect
 managed by
 existing AMP
 for the period
 of renewal?

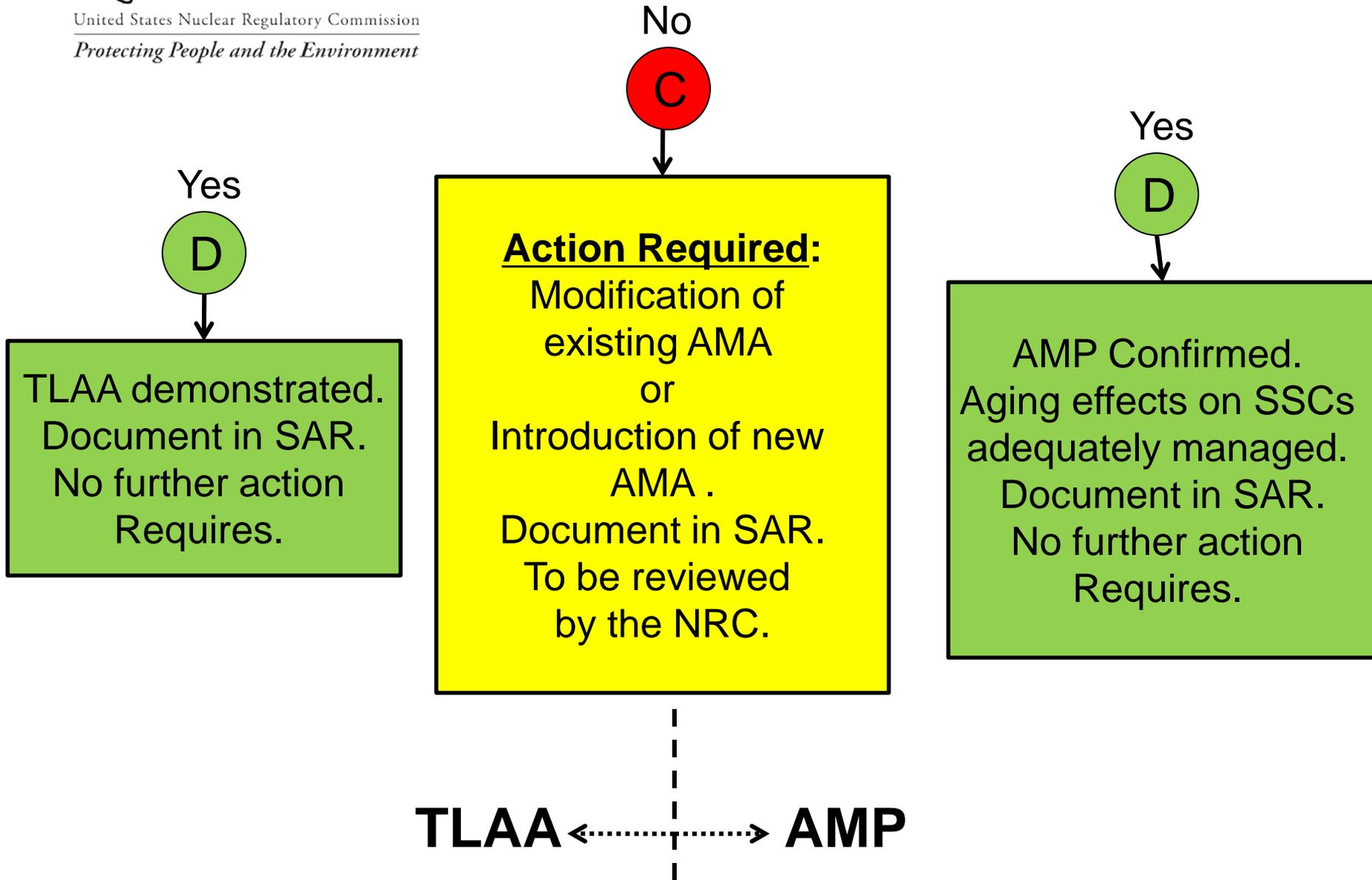
Yes

No

No

C

D

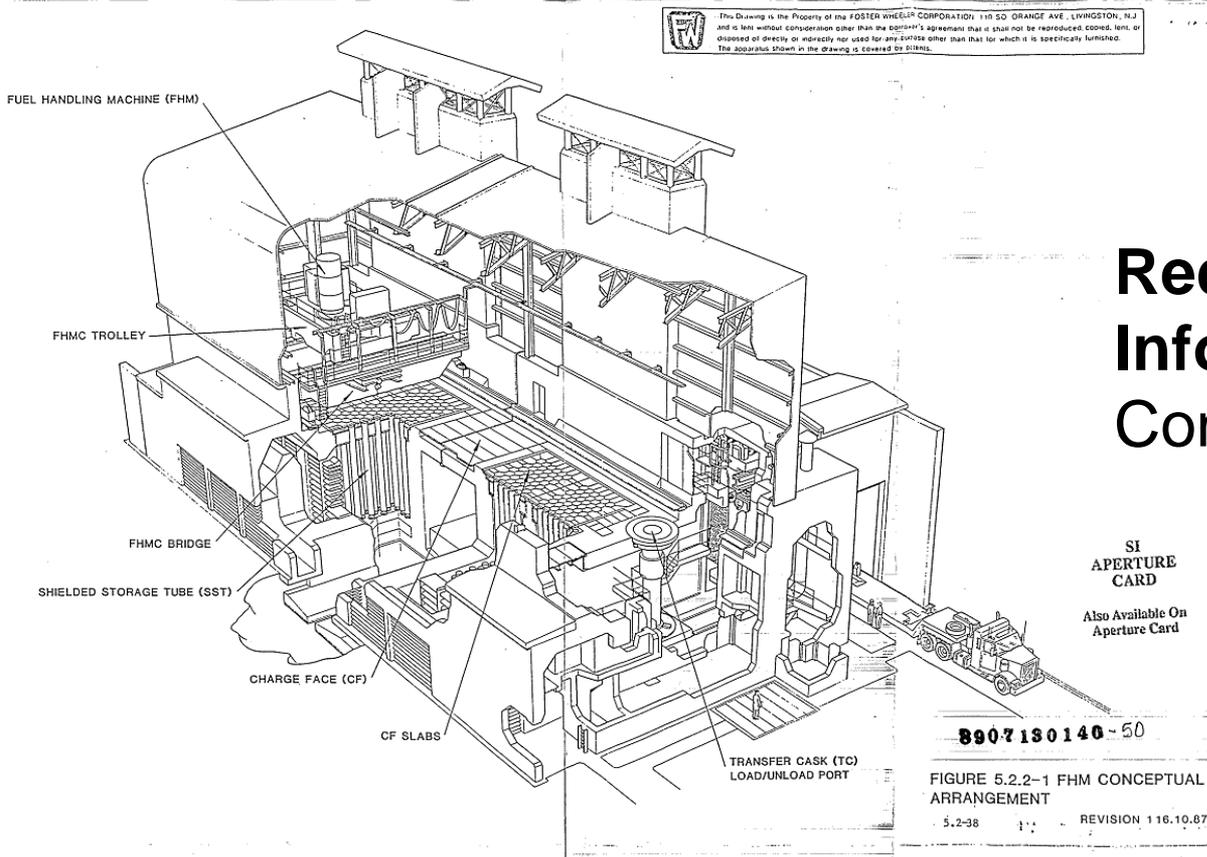


Sample Table for Aging Management Review (AMR)

SSCs in-Scope	Intended Function	Material	Environment	Aging Effects Requiring Management	Aging Management Activity
Concrete (Above Grade)	HT, RS, SS	Concrete	Weather	Spalling, Cracking, Change in Material Properties	Site-Specific AMP
DCS Support Assembly	SS	Carbon Steel	Indoor	Loss of Material	Site Specific AMP
		Stainless Steel	Indoor	None Identified	None Required
Seismic Restraints	SS	Carbon Steel	Indoor	Loss of Material	Site-Specific AMP
Canister	Confine.	Stainless Steel	Indoor	Corrosion	Lead DCS Inspection

Aging Management Programs (AMP):

- **Prevention** – concrete & cladding temperature limits.
- **Mitigation** - coatings/corrective actions.
- **Condition Monitoring** - inspections.
- **Performance Monitoring** – surveillances.



Request for Additional Information (RAI): Concrete Inspection, AMP

Fort St. Vrain ISFSI

Ongoing Activities Supporting Aging Management:

- Staff sponsored research – costal marine atmosphere effects.
- Staff updates Interim Staff Guidance (ISG) 11, “Cladding Considerations for the Transportation and Storage of Spent Fuel,” Rev. 3 as needed – limits temperature and stresses in cladding.
- The applicant may provide new data demonstrating DCSS performance.
- Staff/EPRI task-force for storage issues.

Summary:

- Preliminary guidance (2001) successfully applied to four ISFSI renewals.
- Preliminary guidance basis for SRP.
- SRP
 - provides stability and structure to the technical review process,
 - identifies core technical aging issues,
 - incorporated public comments,
 - concurrent with 10 CFR Part 72 final rule.
- Staff involvement with research/industry.