Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Radiation Protection & Nuclear Materials

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Friday, October 22, 2010

Work Order No.: NRC-506 Pages 1-84

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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

NRC STAFF:

CATHEY COLLEH

BOB EINZIGER

GEOFF HORNSETH

ATA ISTAR

DOUG WEAVER

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

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,

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

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

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

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

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

MR. WEAVER: Thank you, Dr. Ryan, Committee Members, thank you for having us here today. I would just like to make a few introductory remarks

before I turn it over to the presenters.

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

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

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

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

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

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

MR. WEAVER: Yes.

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

MR. WEAVER: Oh. Perfect. Perfect.

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

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

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

MR. WEAVER: Well, we had a discussion on

that very topic this morning --

CHAIRMAN RYAN: Right.

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

CHAIRMAN RYAN: Right. Terrific.

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

CHAIRMAN RYAN: Thank you.

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

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

MR. HORNSETH: Okay.

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

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

I'll go over a little bit of like timeline

and license renewal background, just a short history. And then, about the only technical stuff you're going to hear today is the technical basis things, and then a little bit about what's going on that technical reviewers look at.

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

The next slide, we've given you some abbreviations, so if you're looking over the stuff later you don't get completely lost. CHAIRMAN RYAN: I was looking for DSS and now it's DCSS. What's that about?

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

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

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

you know, keep people from wondering where things are. So, we'll just give you those little nits as we go along.

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

CHAIRMAN RYAN: Okay.

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

CHAIRMAN RYAN: ISFSI is okay. Got that.

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

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

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

CHAIRMAN RYAN: Jack has.

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

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

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

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

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

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

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

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

produced.

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

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

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

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

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

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

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

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

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

MR. HORNSETH: Yes.

CHAIRMAN RYAN: That's what it really is?

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

CHAIRMAN RYAN: All right.

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

CHAIRMAN RYAN: Yes.

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

CHAIRMAN RYAN: Right.

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

canister wall, yes.

CHAIRMAN RYAN: Exactly. Yes. Go ahead.

MR. HORNSETH: Now your --

CHAIRMAN RYAN: Dennis has a question.

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

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

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

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

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

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

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

MEMBER BLEY: Okay. Thanks.

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

CHAIRMAN RYAN: A heat-up problem.

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

MEMBER ARMIJO: Quick question on your --

MR. HORNSETH: Okay.

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

MR. HORNSETH: Yes.

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

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

They have not proven to be problematic in

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

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

MR. HORNSETH: Yes.

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

MR. HORNSETH: That's right.

MEMBER ARMIJO: -- and all that other stuff.

MR. HORNSETH: That's right. Yes.

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

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

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

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

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

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

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

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

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

The only thing that you might say is

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

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

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

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

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

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

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

CHAIRMAN RYAN: Oh, okay.

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

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

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

MR. HORNSETH: Right.

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

MR. HORNSETH: Yes.

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

MR. HORNSETH: That's right.

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

excuse me.

MR. HORNSETH: Okay.

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

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

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

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

CHAIRMAN RYAN: Right.

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

CHAIRMAN RYAN: Okay. Okay.

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

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

is effective.

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

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

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

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

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

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

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

MR. HORNSETH: Yes.

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

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

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

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

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

MEMBER SIEBER: 40 percent, 50 percent?

MR. HORNSETH: Well, the heat load on ones

that are loaded actually can vary all over the map.

MEMBER SIEBER: Right.

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

MEMBER SIEBER: Yes. Come on.

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

MEMBER SIEBER: I'm not worried about that.

MR. HORNSETH: Not worried about it. Yes. And the hottest one that we've licensed that I have personally worked on and I am aware of is a Holtec vertical chimney-type design, stainless canister.

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

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

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

MR. HORNSETH: No, we do not.

MEMBER ARMIJO: External.

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

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

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

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

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

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

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

MR. HORNSETH: Not for license renewal.

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

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

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

CHAIRMAN RYAN: Fair enough.

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

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

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

MR. HORNSETH: Right.

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

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

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

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

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

In that light, in the program to look at

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

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

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

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

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

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

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

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

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

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

MEMBER ARMIJO: I understand that.

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

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

MEMBER ARMIJO: Got it.

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

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

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

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

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

In fact, IAEA is looking at establishing a

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

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

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

CHAIRMAN RYAN: Oh, okay.

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

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

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

CHAIRMAN RYAN: Very good.

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

the experience to date and the condition to date.

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

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

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

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

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

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

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

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

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

MEMBER SIEBER: Those were carbon steel?

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

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

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

MEMBER ARMIJO: Okay.

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

MEMBER ARMIJO: Yes.

MR. HORNSETH: Will not grow.

MEMBER ARMIJO: Okay.

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

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

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

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

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

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

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

All right. Now you're going to be bumping

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

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

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

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

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

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

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

millirem per hour on the outside of a --

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

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

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

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

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

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

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

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

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

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

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

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

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

It's up to them to give me the engineered

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

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

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

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

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

MEMBER ARMIJO: Or hottest and longest.

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

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

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

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

MR. HORNSETH: Yes.

MEMBER ARMIJO: Because those temperatures are so low --

MR. HORNSETH: Yes.

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

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

MEMBER ARMIJO: It's a trivial thing.

MR. HORNSETH: Oh, yes.

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

MR. HORNSETH: That's right. Yes.

MEMBER ARMIJO: And I agree with that.

MR. HORNSETH: Yes.

MEMBER ARMIJO: I just wondered --

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

MEMBER ARMIJO: Yes.

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

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

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

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

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

MR. HORNSETH: Right.

MEMBER ARMIJO: Right.

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

Liberty.

MEMBER SIEBER: That turned green.

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

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

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

MR. HORNSETH: That's right.

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

MR. HORNSETH: Yes.

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

MR. HORNSETH: Yes. Yes.

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

MR. HORNSETH: Oh, yes.

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

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

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

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

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

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

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

Okay. Go to slide 16.

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

MR. HORNSETH: Oh.

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

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

CHAIRMAN RYAN: I got you. Yes.

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

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

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

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

MR. HORNSETH: Yes.

MEMBER ARMIJO: -- burn-up and --

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

MEMBER ARMIJO: Yes.

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

MEMBER ARMIJO: Yes.

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

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

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

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

changes. Nothing substantive.

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

MR. HORNSETH: Yes.

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

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

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

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

MEMBER ARMIJO: Well, would you be able to

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

It had passed your test, your fabrication test --

MR. HORNSETH: Yes.

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

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

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

MR. HORNSETH: Yes. --

MEMBER ARMIJO: --nondestructive

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

MEMBER ARMIJO: Yes.

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

one of these canister walls by --

MEMBER ARMIJO: I'm just --

MR. HORNSETH: By -- yes.

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

MR. HORNSETH: I know.

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

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

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

MR. HORNSETH: We would make that --

CHAIRMAN RYAN: -- review or --

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

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

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

CHAIRMAN RYAN: Okay. All right. Fair enough.

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

MEMBER ARMIJO: Yes.

MEMBER SIEBER: What is the initial helium backflow pressure?

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

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

MR. HORNSETH: Yes.

MEMBER SIEBER: -- gauge.

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

MEMBER SIEBER: Oh, really?

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

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

MR. HORNSETH: Sure.

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

MR. HORNSETH: No problem.

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

MR. HORNSETH: Yes.

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

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

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

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

MEMBER SIEBER: Yes, but the leak rate

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

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

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

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

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

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

1927, and I think it works well.

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

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

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

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

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

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

MEMBER BLEY: Excuse me.

MR. ISTAR: Yes, sir.

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

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

MR. ISTAR: Correct.

MEMBER BLEY: Is that right?

MR. ISTAR: Correct.

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

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

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

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

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

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

And we separated those aging management activities which is -- either it's going to be in TLAA or aging management program. And as we -- it was discussed before and very few components within the ISFSI's are -- drops into TLAA. Most of them are in the aging management program part of it.

And then, you know, following the

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Going to the next slide, and this --

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

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

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

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

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

MR. ISTAR: No.

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

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

in diameter, about.

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

MEMBER ARMIJO: About the size of the graphite --

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

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

MR. HORNSETH: It is.

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

MR. HORNSETH: Correct. It was.

MEMBER ARMIJO: -- for renewal.

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

MEMBER ARMIJO: Yes.

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

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

from the old reactor site.

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

MR. HORNSETH: That's right.

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

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

MR. HORNSETH: Let me take that one.

MR. ISTAR: Sure. Please.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. HORNSETH: Right.

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

MR. HORNSETH: Oh, yes.

MEMBER ARMIJO: -- into the --

MR. HORNSETH: Yes.

MEMBER ARMIJO: -- into the canister surface.

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

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

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

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

MEMBER ARMIJO: Okay.

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

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

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

MEMBER ARMIJO: Yes.

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

And, like I say, this is one of these

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

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

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

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

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

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

MR. HORNSETH: Yes.

MEMBER ARMIJO: -- what happens there.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. EINZIGER: -- where we dissolve

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

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

MEMBER ARMIJO: Keep it warm.

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

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

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

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

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

MEMBER ARMIJO: Yes.

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

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

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

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

causing you the problem.

MEMBER ARMIJO: Sure.

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

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

MR. ISTAR: Thank you, Bob.

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

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

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

MEMBER ARMIJO: Yes.

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

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

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

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

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

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

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

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

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

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

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

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

Any questions? Jack?

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

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

MEMBER SIEBER: That's something I

would like to read.

MR. HORNSETH: It's to be published at any minute. It's been submitted for publication. That's the news as of this morning. I don't have a NUREG CR number yet. It's still X-X-X.

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

MR. HORNSETH: Yes.

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

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

CHAIRMAN RYAN: I'd like that, too.

Dr. Armijo.

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

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

ISG --

MR. HORNSETH: On ISG-2.

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

MR. HORNSETH: Yes.

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

MR. HORNSETH: The retrievability has always been required.

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

MR. HORNSETH: It is required.

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

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

MEMBER ARMIJO: Okay.

MR. HORNSETH: That was the initial one.

MEMBER ARMIJO: Okay.

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

MEMBER ARMIJO: The contents are --

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

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

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

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

these canisters are lined up.

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

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

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

MEMBER ARMIJO: It will knock a hole --

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

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

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

MEMBER ARMIJO: Okay.

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

MEMBER ARMIJO: Yes. If I need --

MR. EINZIGER: You can --

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

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

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

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

MEMBER ARMIJO: I know.

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

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

MR. HORNSETH: Yes.

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

MR. HORNSETH: Yes.

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

MR. HORNSETH: It's happily been considered.

MEMBER ARMIJO: Been assessed.

MR. HORNSETH: For various different designs also.

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

MR. HORNSETH: Yes. Yes.

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

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

CHAIRMAN RYAN: Thank you, Sam.

Dennis.

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

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

works out fine.

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

CHAIRMAN RYAN: Thank you.

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

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

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

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

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

MEMBER BLEY: Yes.

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

CHAIRMAN RYAN: Yes.

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

CHAIRMAN RYAN: Yes.

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

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

CHAIRMAN RYAN: Interesting. Very good.

MEMBER BLEY: It is interesting,

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

CHAIRMAN RYAN: Okay. Dennis, thank you.

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

So -- but those are minor things we --

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

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

MR. WEAVER: Thank you.

CHAIRMAN RYAN: I think my summary is

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

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

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

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

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

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

MEMBER SIEBER: Just wait a couple more hours.

MR. WEAVER: Yes.

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

--

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

MR. HORNSETH: Oh, yes.

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

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

MR. WEAVER: Yes, I just --

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

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

CHAIRMAN RYAN: Yes. That's enough.

(Simultaneous speaking.)

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

CHAIRMAN RYAN: Yes. Perfect.

Perfect.

MR. HORNSETH: Okay.

CHAIRMAN RYAN: A couple of drafts never hurt.

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

MR. ISTAR: Pardon, sir?

CHAIRMAN RYAN: 18 through --

MEMBER SIEBER: 16 to 22.

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

MEMBER SIEBER: 16 through 22.

CHAIRMAN RYAN: Go out.

MEMBER SIEBER: Stay in.

CHAIRMAN RYAN: Oh, stay in.

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

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

MEMBER SIEBER: Okay.

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

MR. HORNSETH: The one flow chart

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

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

MR. HORNSETH: Okay.

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

MR. HORNSETH: Okay.

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

Motion to adjourn?

PARTICIPANT: So moved.

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

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

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

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

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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

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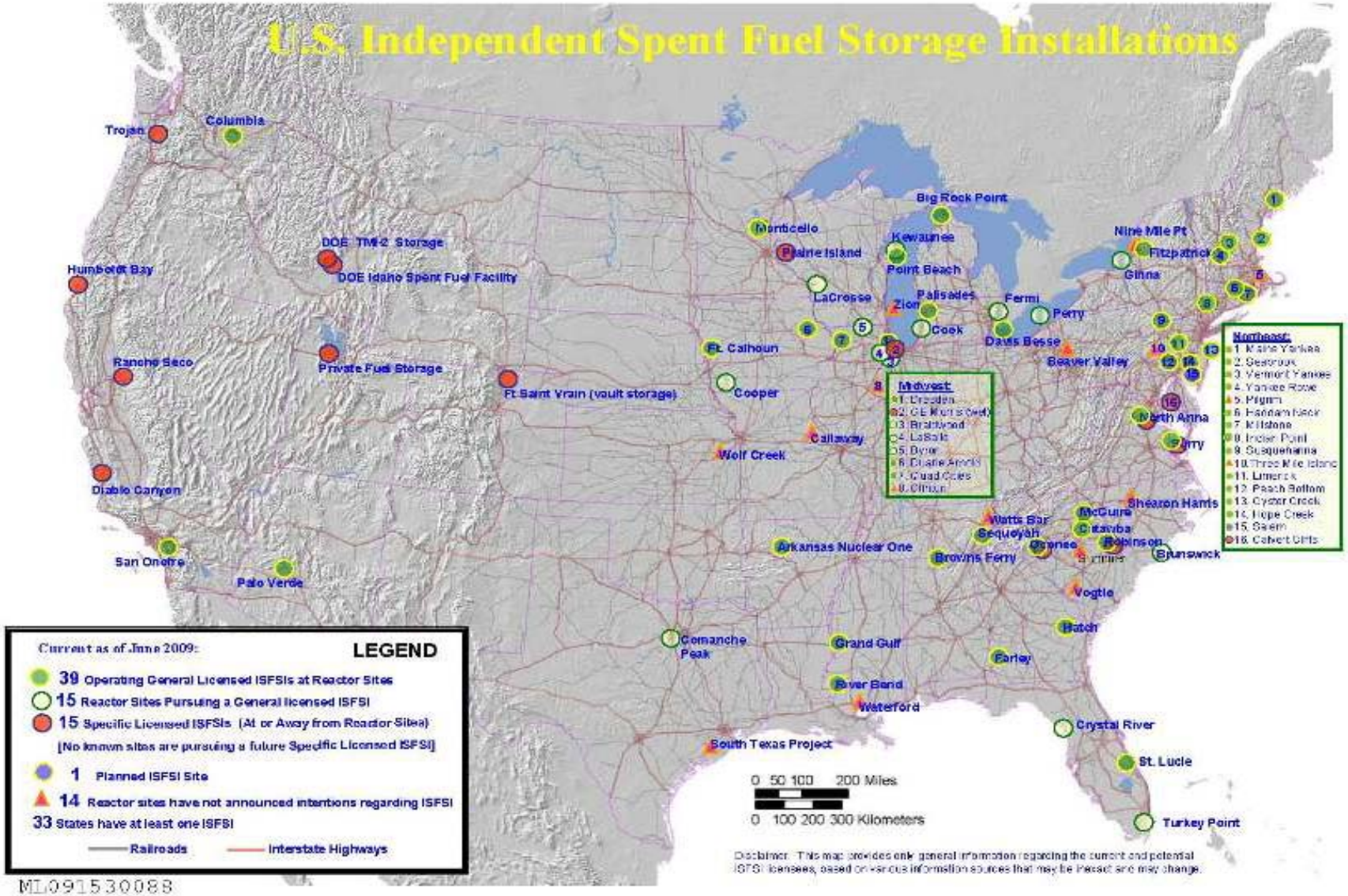

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Introduction to DCSS

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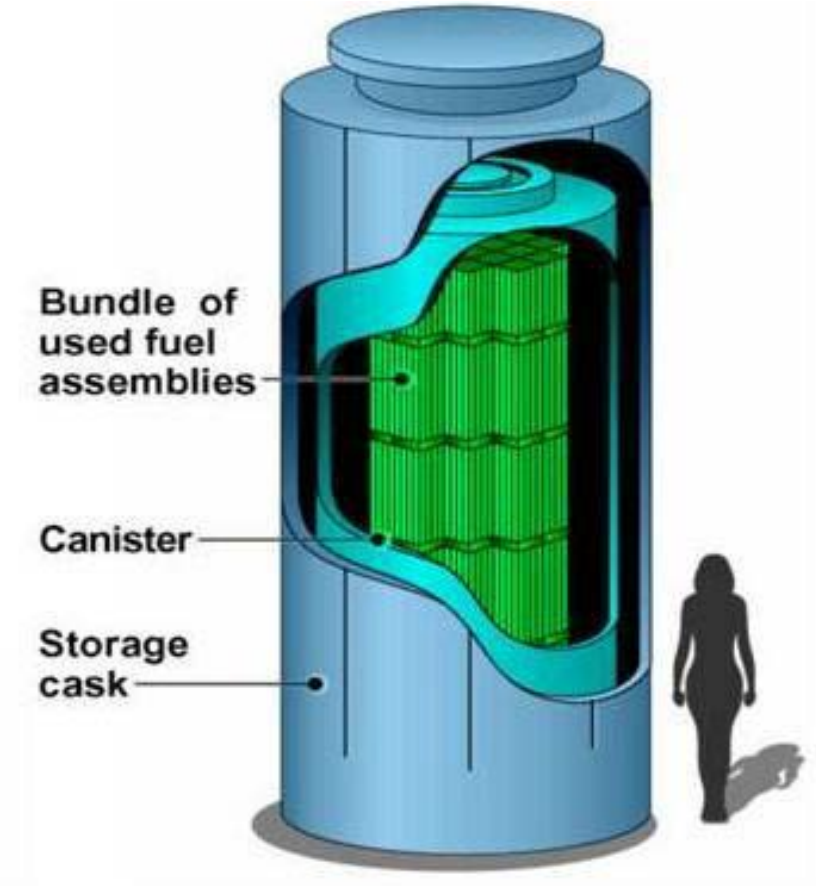

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License Renewal Background:

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.

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Technical Basis:

Preliminary guidance developed

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

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Key renewal issues:

Predominately assessment for material degradation

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

DCSS is passive, static.

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Canister exterior environment:

- Air
- Decay heat
- Temperature changes
- Dose

Shield Environment

- Weather
- Decay heat
- Temperature changes
- Dose

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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.

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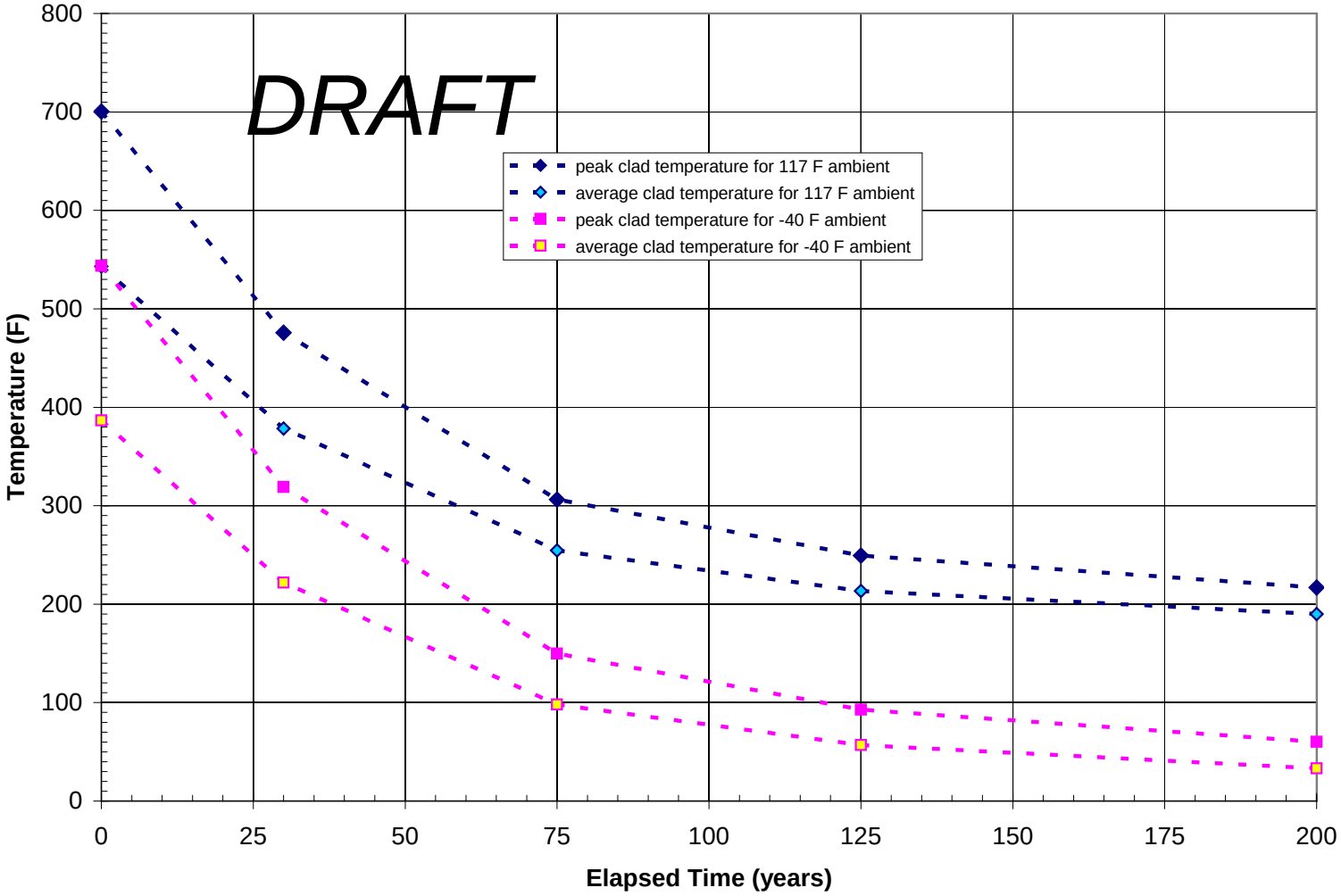
Representative Cladding Unshielded Temperature



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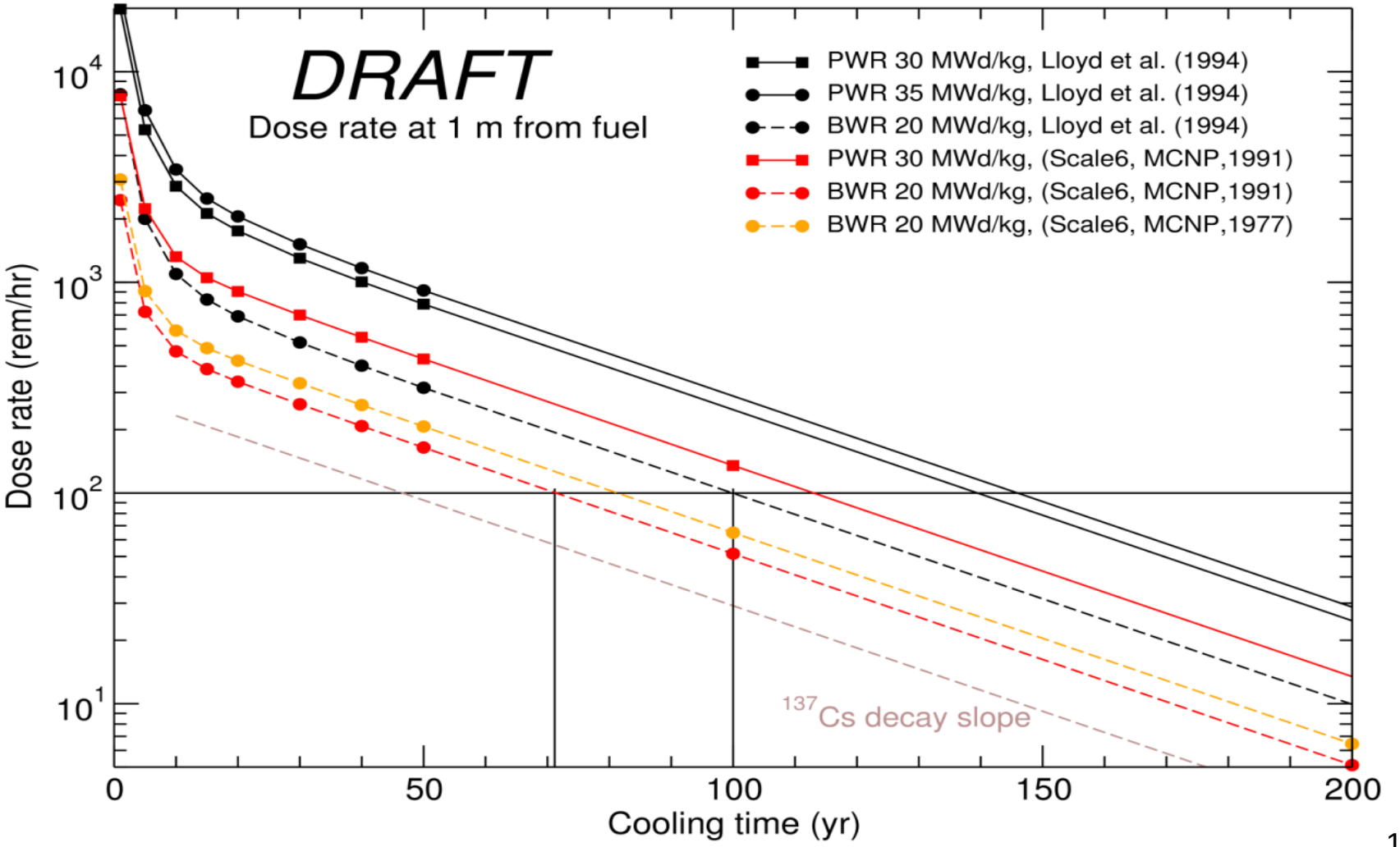
Representative Dose Rate



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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.

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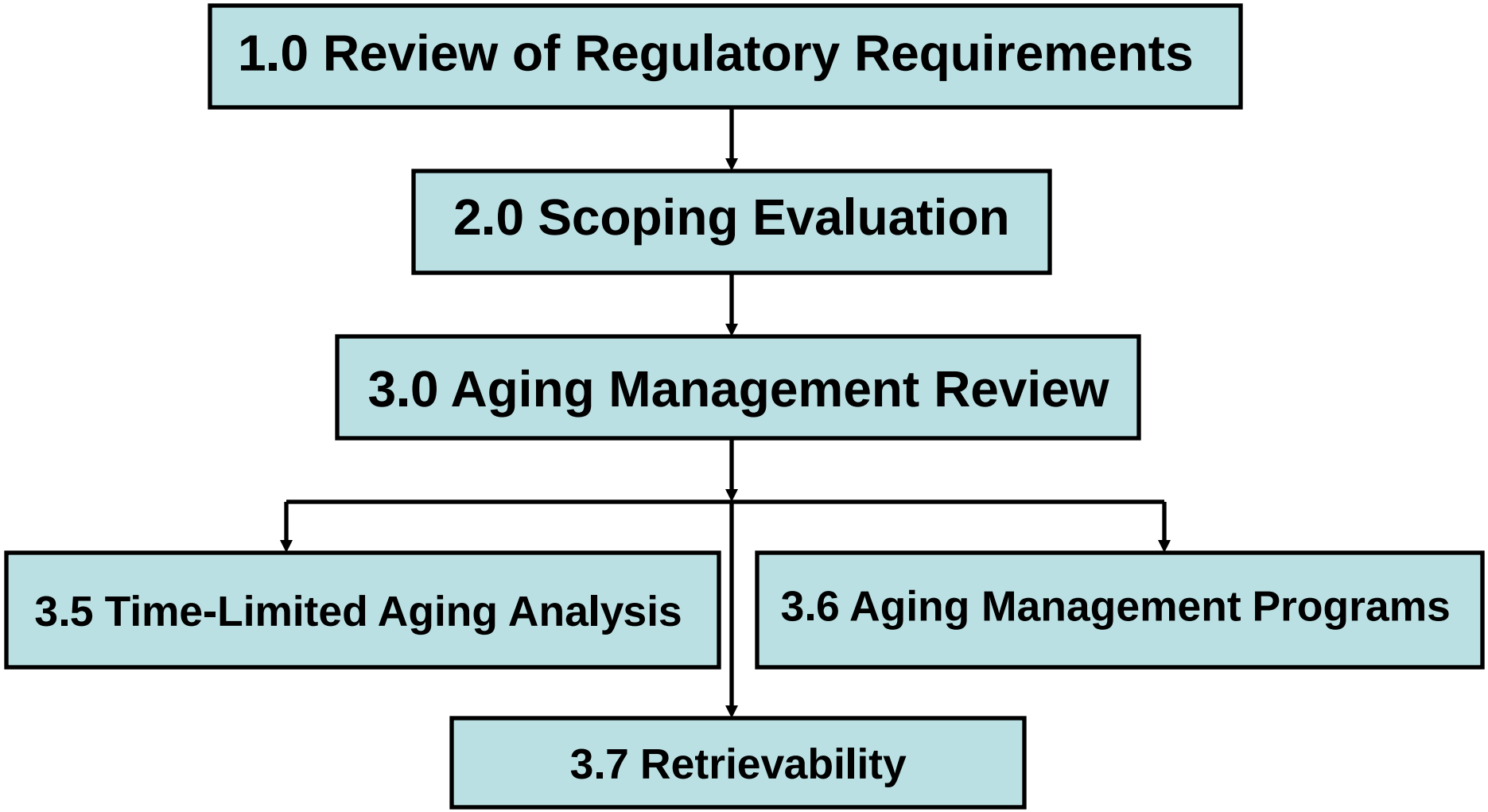
License Renewal Process



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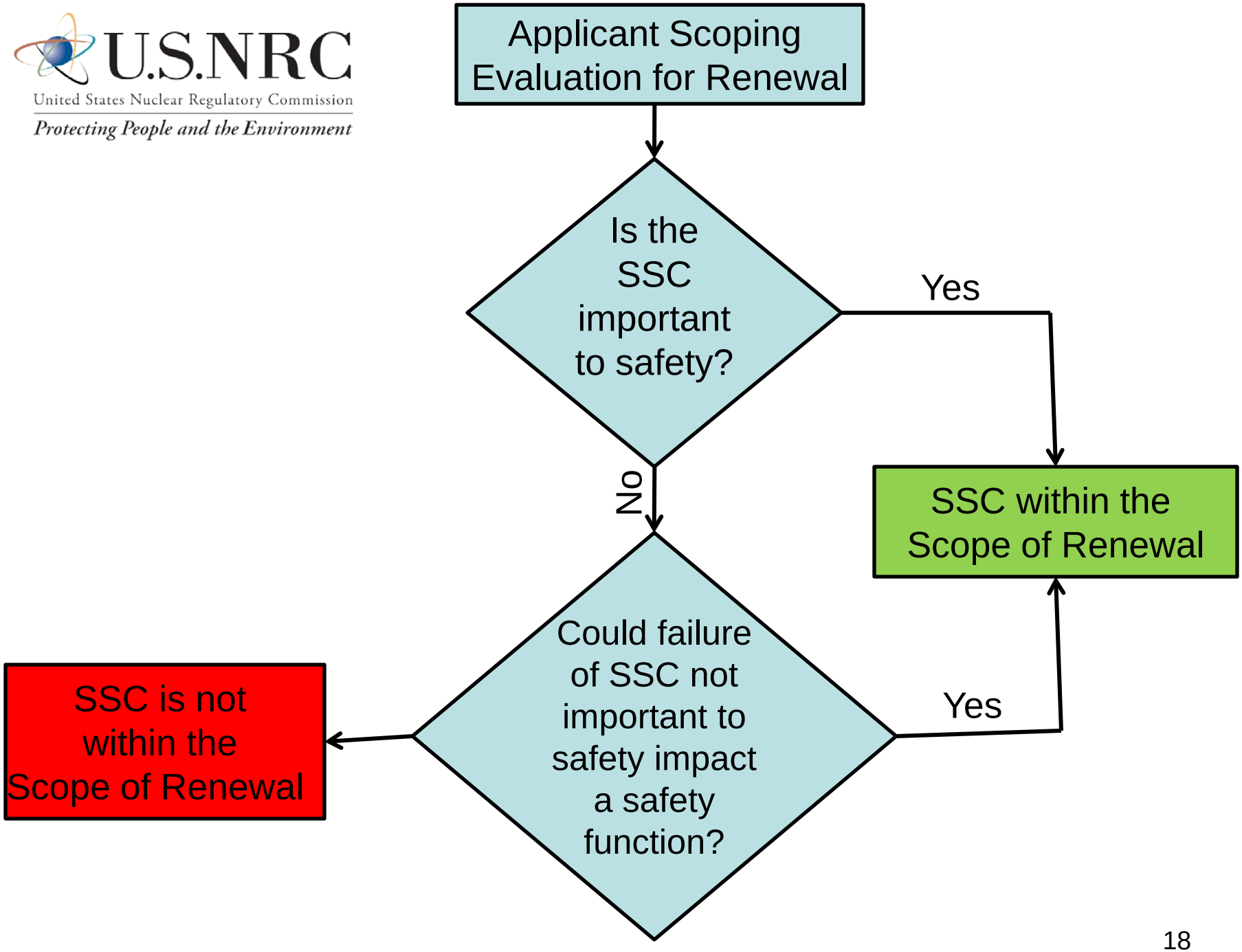

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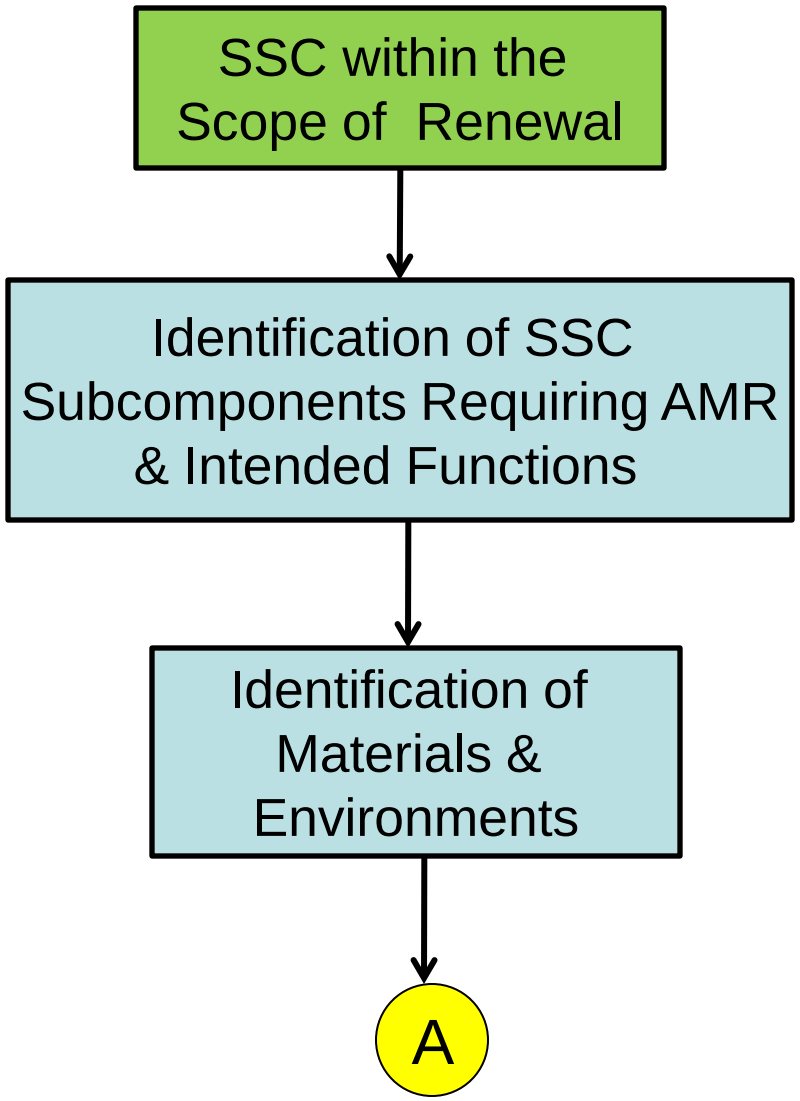

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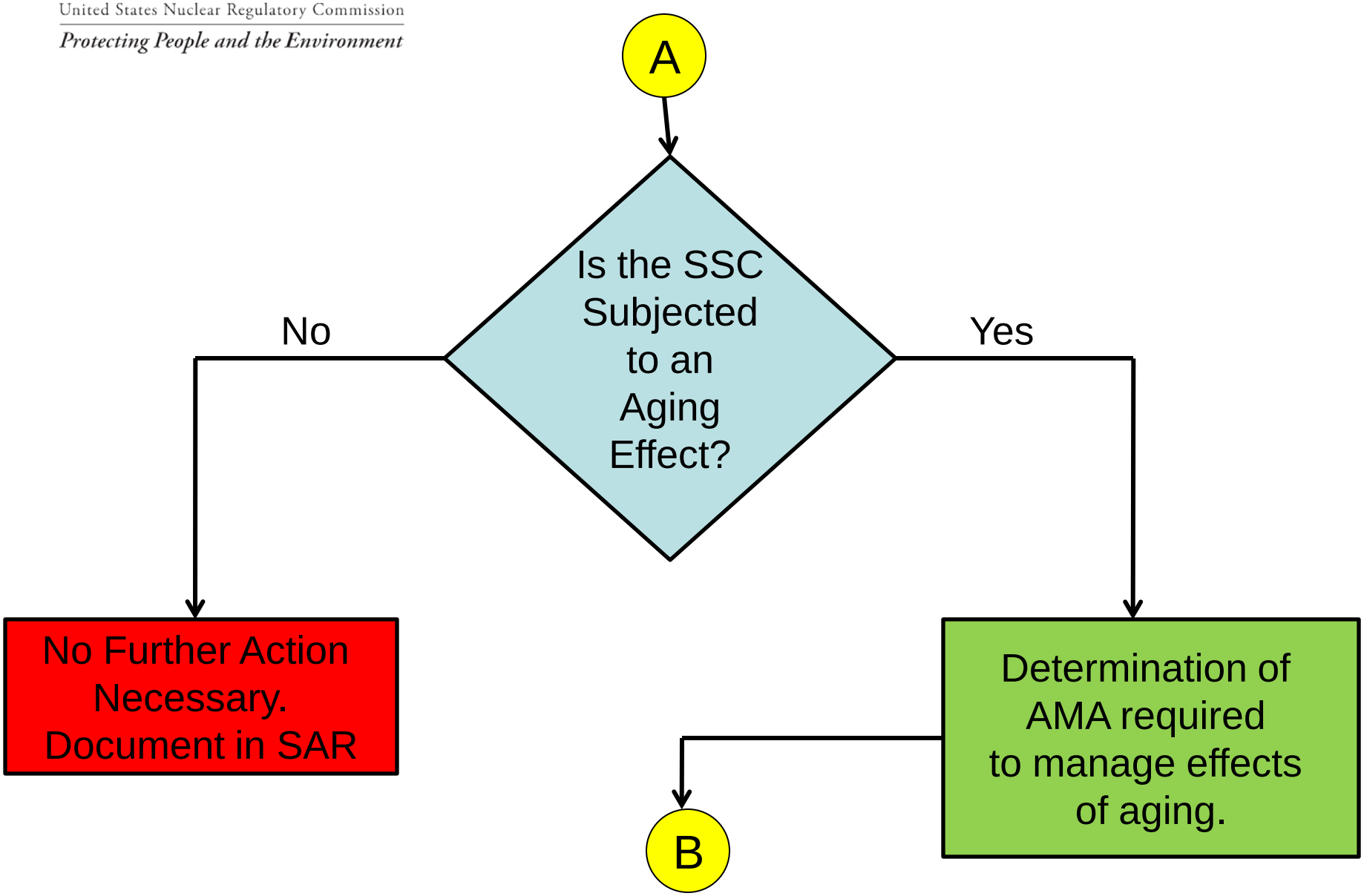

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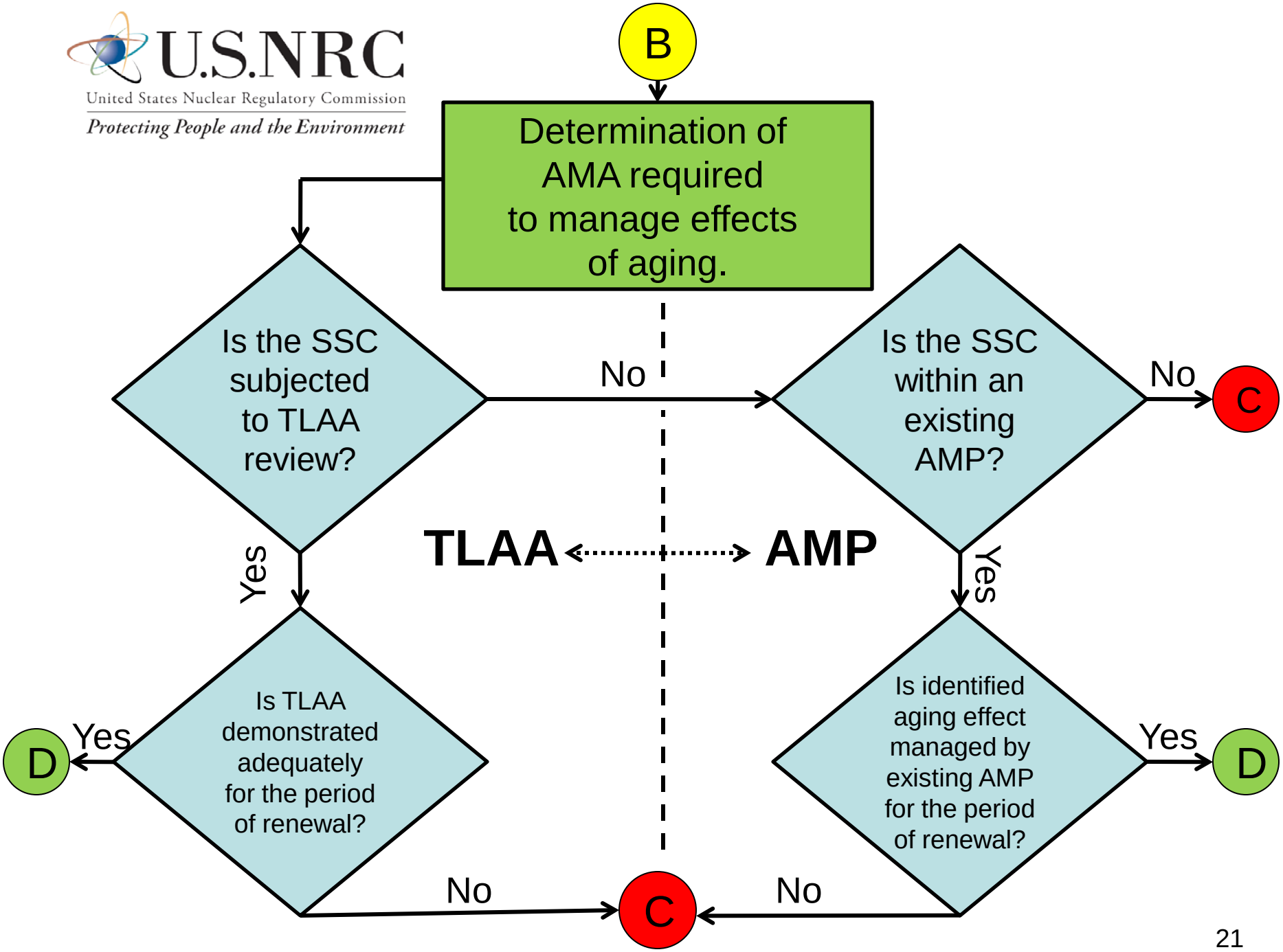

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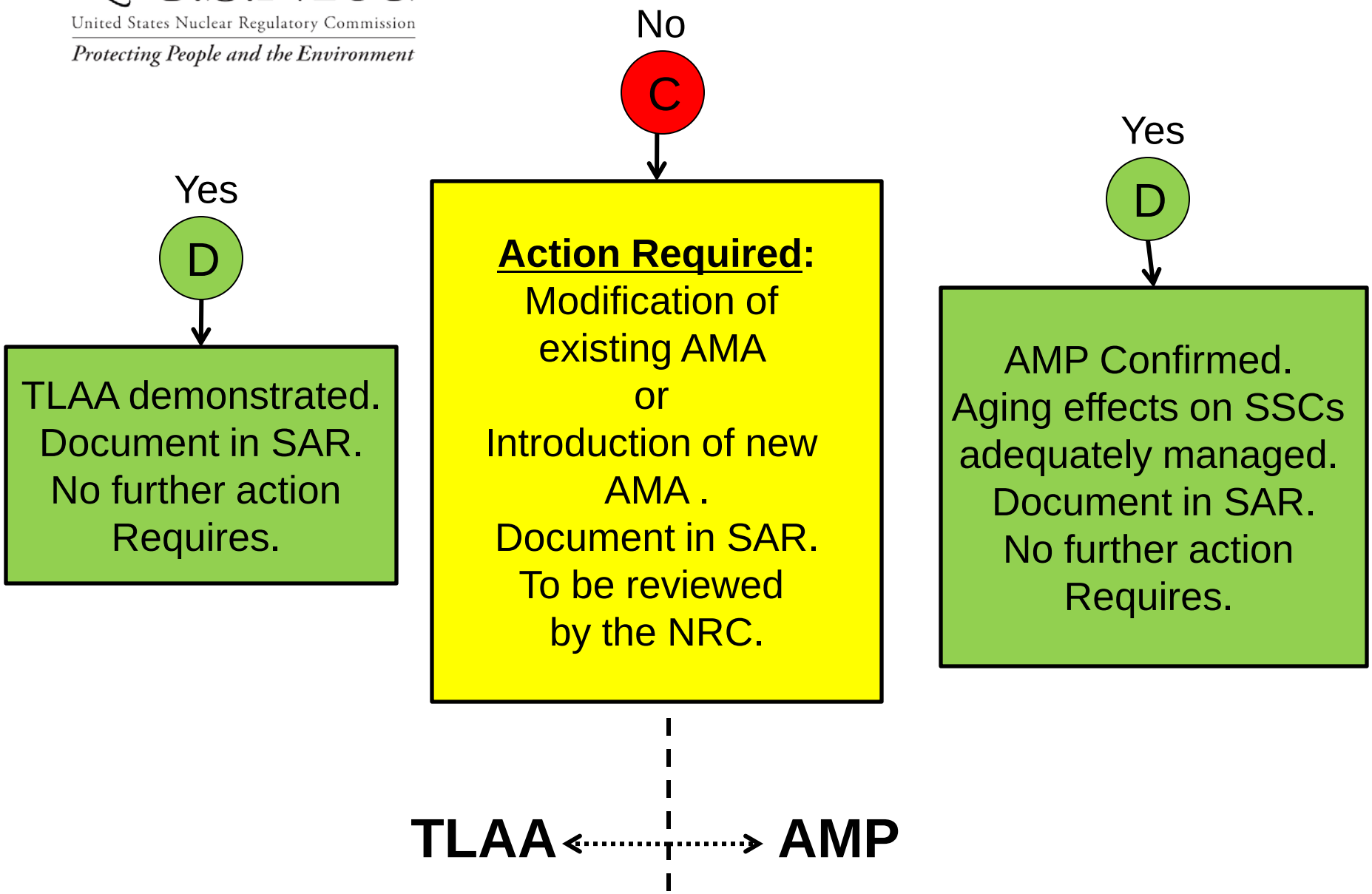

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Sample Table for Aging Management Review (AMR)

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

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Aging Management Programs (AMP):

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

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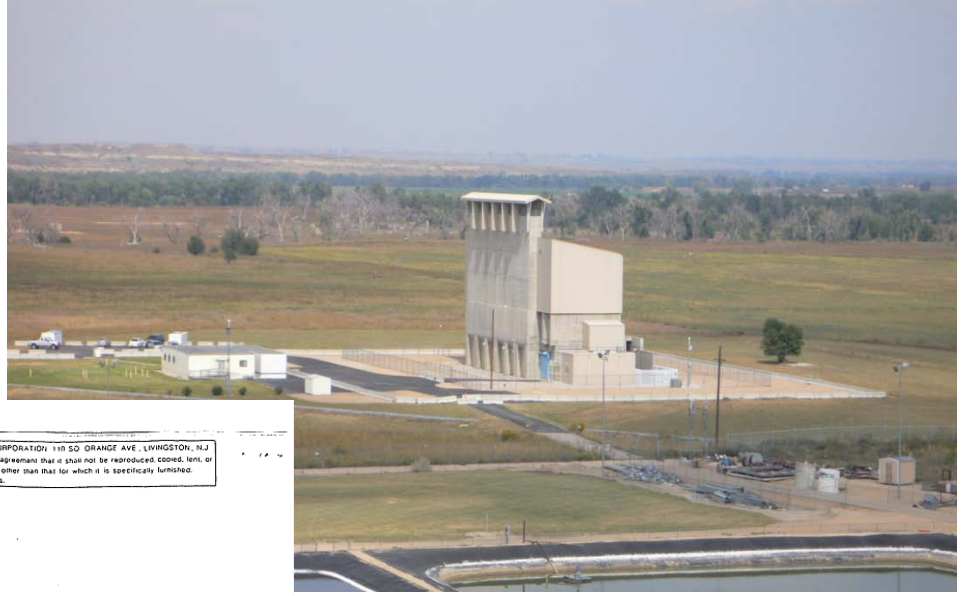

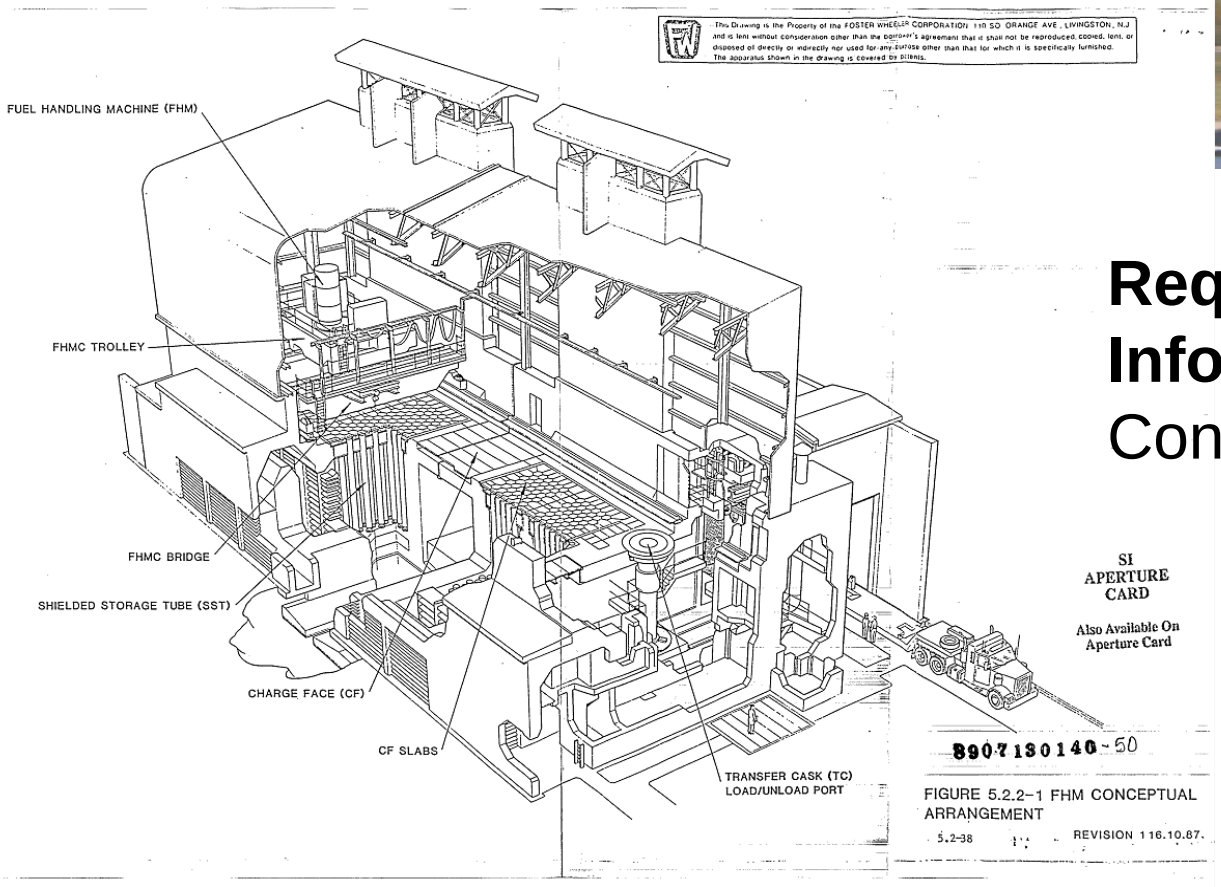

Request for Additional Information (RAI):
Concrete Inspection, AMP

Fort St. Vrain ISFSI

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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.

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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.