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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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PLANT LICENSE RENEWAL SUBCOMMITTEE

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WEDNESDAY

DECEMBER 15, 2021

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The Subcommittee met via Video-Teleconference, at 2:00 p.m. EST, Matthew Sunseri, Chairman, presiding.

COMMITTEE MEMBERS:

MATTHEW SUNSERI, Chair

RONALD G. BALLINGER, Member

VICKI BIER, Member

CHARLES H. BROWN, JR. Member

VESNA B. DIMITRIJEVIC, Member

GREGORY HALNON, Member

WALT KIRCHNER, Member

DAVID PETTI, Member

JOY L. REMPE, Member

ACRS CONSULTANT:

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

KENT HOWARD

ALSO PRESENT:

PAUL AITKEN, Dominion Energy
BRIAN ALLIK, NRR
STEWART BAILEY, Region II
ERIC BLOCHER, Dominion Energy
STEVE BLOOM, NRR
CHRISTOPHER BROWN, ACRS
LARRY BURKHART, ACRS
KENYA CARRINGTON, Region II
JOE COLACCINO, NRR
JOHN DISOSWAY, Dominion Energy
JEN ENGLAND, Region II
LAUREN GIBSON, NRR
CRAIG HEAH, Dominion Energy
ALLEN HISER, NRR
LOIS M. JAMES, NRR
BETH KEHLER HALUSKA, Dominion Energy
WILLIE LLOYD, Dominion Energy
KEITH MILLER, Dominion Energy

DUC NGUYEN, NRR

PAUL PHELPS, Dominion Energy

HECTOR RODRIGUEZ-LUCCIONI, NRR

P R O C E E D I N G S

2:00 p.m.

CHAIR SUNSERI: Good afternoon, the meeting will now come to order. My name is Matthew Sunseri and I am the Subcommittee Chair for the Plant License Renewal Subcommittee.

The purpose of this Subcommittee meeting is for the NRC staff and Dominion Energy to brief the Subcommittee on the North Anna Power Station Units 1 and 2 subsequent license renewal application.

ACRS members in attendance are -- I'm looking across the screen and see Member Ron Ballinger, Vicki Bier, Vesna Dmitrijevic, Greg Halnon, Dave Petti, Joy Rempe, and we are also joined by our consultant Steve Schultz.

Did I miss anybody that's hidden in a phone number without a name?

MEMBER BROWN: You missed me, but I'm not hidden. It's Charlie and I couldn't see anybody else's name other than yours and Vicki's, which was interesting.

CHAIR SUNSERI: Charles Brown, I see you now. During today's meeting, the Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as

appropriate. At the Subcommittee's discretion, any matter discussed will be considered for presentation to the full Committee, and I will summarize those at the end of the meeting.

The ACRS was established by statute and was governed by the Federal Advisory Committee Act. The Committee only speaks through its published letter reports. Because this is a Subcommittee meeting, participants should consider any remarks by ACRS members as their individual comments and not Committee positions.

We hold Subcommittee meetings to gather information and perform preparatory work that will support our deliberation at full Committee meetings. And just as a reminder, I believe the full Committee for this session is scheduled for February 2, 2022.

The rules for participation in all ACRS meetings including today's were announced previously in the Federal Register and included on our website. The ACRS Section of the U.S. NRC public website provides our charters, bylaws, agendas, letter reports, and transcripts of all full and Subcommittee meetings including the material present.

As stated on our website, members of the public who desire to provide written or oral input to

the Subcommittee may do so and should contact the designated federal officer.

Kent, have we had any request for public comment?

MR. HOWARD: None yet.

CHAIR SUNSERI: Okay, but we will still open up the line at the end. During today's meeting, it's open to public attendance and there will be time set aside during the meeting for comments from members of the public attending or listening in.

Due to the COVID-19 pandemic, today's meeting is being held over Microsoft Teams for ACRS members, Dominion Energy, and NRC attendees. There is also a call-in number allowed for participation of the public to connect to the Teams session.

A transcript of today's meeting is being kept; therefore, we request that meeting participants not on the agenda identify themselves when they are asked to speak, and to speak with sufficient clarity and volume so they could readily be heard.

At this time, I asked the attendees, with the exception of the Dominion presenters, participating through the public line to put their devices on mute to minimize disruptions and only unmute when you are speaking. And it's command star-6

to unmute yourself.

Based on some affiliations outside of the ACRS, I will be recusing myself for deliberations on metal fatigue analysis of the primary system and radiation analysis of the reactor pressure vessel.

Members, before we get into any comments, are there questions from members about today's agenda?

All right, then, we will proceed. And at this time I call on Mr. Brian Smith, Division Director of the Division of New and Renewed Licenses.

Brian, you have the floor.

MR. SMITH: Thank you, Chairman Sunseri and members of the ACRS Subcommittee on Plant License Renewal. Good afternoon. As the Chairman said, my name is Brian Smith and I'm the Director of the Division of New and Renewed Licenses here at NRR.

We sincerely appreciate the opportunity today to present to the ACRS Subcommittee on the results of the staff's review of the fourth application for subsequent license renewal.

This application was submitted by Virginia Electric and Power Company, or Dominion, for the North Anna Power Station Units 1 and 2, located in Louisa, Virginia.

By way of background, North Anna Units 1

and 2 received approval for their initial license renewal license from the NRC on March 20th of 2003.

The NRC review at that time was performed using guidance developed prior to the issuance of the generic aging license lessons learned report, or the GALL report.

The NRC guidance for license renewal over the years has evolved through enhancements and improvements based on the lessons learned from NRC reviews from both domestic and international industry operating experience.

The GALL report has gone through two revisions and additional interim staff guidance was issued following Revision 2. The guidance for subsequent license renewal is contained in the GALL SLR document.

This was built upon previous guidance and included additional focus and enhancements where necessary on aging, management, and time-limiting aging analysis for operation in the 60 to 80-year time period.

In the staff's presentation today, you will hear about some of the specific SLR issues as applied to the North Anna review. The NRC Project Managers for the North Anna subsequent license renewal

application review are Lois James and Hector Rodriguez-Luccioni.

Hector will introduce the staff who will be introducing or presenting the questions regarding the staff's review.

Part of the management team here with me today is Lauren Gibson, the chief of the License Renewal Project Branch, and branch chiefs for the staff involved in the technical review, including Joe Colaccino and Steve Bloom.

We also have with us representatives from Region II including Stewart Bailey, chief of the Reactor Project Branch and the Division of Reactor Projects in Region II. And Jen England, senior resident inspector at North Anna.

I'd like to note that the staff completed its review with no confirmatory or open items in the safety evaluation report.

The staff will provide an overview of the safety review and highlight a few technical areas that may be of interest to the Subcommittee members.

Finally, we will address any questions you might have on the staff's presentations. We look forward to a productive discussion today with the ACRS Subcommittee.

At this time I'd like to turn the presentation over to Paul Phelps, Dominion Engineering Director, SLR, to introduce his team and commence the presentation.

MR. PHELPS: Thank you, Brian. Good afternoon. My name is Paul Phelps and I am the Engineering Director responsible for the North Anna Power Station subsequent license renewal, or SLR, project.

We appreciate the opportunity to speak with the ACRS Committee today on Dominion Energy's application for subsequent license renewal. This is a very important day and we appreciate the support and look forward to presenting the SLR application highlights to the Committee.

By the way of my background, I have been in the nuclear industry for over 30 years. I am responsible for various SLR-related projects that are currently under development in Virginia.

We have stood up the organization not only to perform the requisite work for the relicensing of the station, but we also have a large organization that is currently working on projects to improve the safety, reliability, and aging management for North Anna Power Station through various modifications. I

will provide some of those insights in a couple of slides.

Next slide. I want to take the time to introduce the team assembled with me here today. Paul Aiken is the engineering manager responsible for the development of the North Anna SLR application. Paul led the team for the successful Surry subsequent license renewal project, which was the third SLR for the industry.

Paul was also involved in a leadership role in all of the Dominion Energy's first license renewal projects dating back to 1999 and over the last few years has been engaged with various organizations such as EPRI, Department of Energy, PWR Owners Group, NEI, and various vendors to ensure alignment on various technical topics in support of subsequent license renewal.

Keith Miller is one of the team's technical leads. Keith has been a member of the SLR team since 2017. He has served in different roles within the SLR team and is currently the technical staff lead for again management programs.

Eric Blocher is the next technical lead. Eric has been involved in various first license renewal applications in the industry. He brings his

extensive knowledge to the team and has been deeply involved in the development of the GALL SLR, not only on behalf of Dominion Energy but for the nuclear industry. Eric will be presenting the technical topics later in the presentation.

Craig Heah is the technical lead in the scoping and screening activities. Craig has 14 years of nuclear experience, he was the last chairman of the NEI mechanical license renewal working group during the transition to GALL SLR. Craig will be assisting the team with a slideshow and will be available to answer any scoping or screening questions that you may have during the presentation.

Along with the team I introduced, we have senior station leaders on the virtual call as well. I would like to recognize Fred Mildan. Fred is currently the site vice president at North Anna Power Station. Fred will be transitioning to Surry Power Station to be the site vice president in the New Year.

Lisa Hilbert, who is currently the plant manager, will transition to be the new site vice president at North Anna power station on January 1st, 2022.

In addition, we also have technical staff available in the virtual audience or in the room with

me should we need some assistance on any questions you may have during our portion of the presentation. If needed, they will identify themselves and address your question.

Next slide. I want to cover the agenda for today's meeting. We will discuss the station overview performance, SLR application development, SLR aging management programs, technical topics, and closing remarks.

Next slide. Here's an overview of the station in a 50-mile radius. North Anna Power Station is located in Louisa County, Virginia adjacent to Lake Anna. Lake Anna was constructed to serve the needs of the station by damming the North Anna River.

The area includes both populated and industrialized areas as well as expansive rural areas and spans from Northern Virginia to the suburb south of our state capital, Richmond, and from the upper Chesapeake Bay to the area West of Charlottesville.

Included in this area are many military installations and airports providing international travel. Next slide. North Anna is a Westinghouse three-loop pressurized water reactor with an output net capacity of over 1900 megawatts.

Together, these two units are capable of

producing approximately 15 percent of Virginia's electricity needs. Unit 1 started commercial operation in 1978 and Unit 2 started commercial operation in 1980.

The independent spent fuel storage installation facility recently had the site-specific license renewed in 2018. A 4.3 percent power upgrade was implemented in 1986 prior to the initial license renewal.

The renewed licenses for both Surry and North Anna Power Stations were issued in March of 2003. Lastly, North Anna entered the period of extended operation in 2018 and 2020 for Units 1 and 2 respectively.

Next slide. Here is an aerial view of the station. I will highlight some of the more significant features to help the Committee get orientated. At the upper right of the photo is the North Anna reservoir.

The reservoir is approximately 9600 acres and provides the condenser cooling water source for the station. After traveling through the station, circulating water exits to the discharge canal pictured in the bottom right.

The discharge canal flows into the waste

heat treatment facility which serves to dissipate waste heat from the circulating water discharged prior to returning to the reservoir.

The waste heat treatment facility is a series of a lagoons totaling about 3400 acres that is separated from the reservoir by a series of dikes. The water cools as the water traverses through the waste treatment facility and ultimately re-enters the North Anna reservoir at one of the dikes.

In the center of the photo are the Unit 1 and 2 reinforced concrete containment structures in the turbine building behind them in the light blue. At the upper left is the switch yard. At the lower left is the service water reservoir.

The administration building, the two-story white building between the reservoir and the discharge canal, is where many of the plant staff work. Here is some high-level information under performance of North Anna.

To note, North Anna operates on an 18-month refueling frequency. The plant capacity factor has been good, as reflected in the bullets above. As far as the regulatory oversight process, North Anna is in Column 1 and has been there since 2013.

Additionally, ROP indicator status has

been all green since 2000 for Unit 1 and 2010 for Unit 2. Next slide. There has been significant capital investments made to North Anna since the first re-license was issued in 2003.

As I mentioned in my opening remarks, Dominion Energy will continue to invest in North Anna to maintain safety and plant reliability for the current and the subsequent period of extended operation.

There is a partial list of some of the major mods that have been completed at North Anna. I would like to highlight a few.

North Anna has performed a reactor vessel head replacement on both units, replaced the reserve station service transformers, which supply power to the emergency buses, replaced the main transformers on both units, replaced the main generators on both units, and performed reactor vessel upflow conversion on both units.

At this time, I will transition the presentation to Paul Aiken to provide an overview of the SLR application development process.

MR. AITKEN: Thanks, Paul, good afternoon. My name is Paul Aiken and I'm the engineering manager responsible for the development of the Surry and North

Anna subsequent license renewal applications.

By way of background, I have been in the nuclear industry for over 30 years and as what previously mentioned by Paul, involved in license renewals for the Dominion fleet and most recently, the Surry applications.

I will be providing an overview of the North Anna SLR application development process and other considerations for the Committee today. Next slide, please.

Following a successful Surry project, the SLR team did a thorough evaluation to identify things that went well and things that we could improve on for North Anna both internally and working with the NRC on the NRC review process.

One area that we focused on was improving consistency with the GALL SLR. A significant advantage that we could leverage in the development of the North Anna application is that Surry and North Anna are considered sister plants based on similarities and design and operation.

In fact, the similarities were so profound that there was only one license renewal application submitted for both plants during the first license renewal.

I believe that the similarities between North Anna and Surry allow for a more efficient review by the NRC staff since many of the aging management programs and supporting materials where either the same or very similar.

For those three programs, we were proactive and implemented as many enhancements as we could for North Anna that were identified during the Surry application preparation in review.

For every procedure enhancement that we were able to implement prior to the North Anna application submittal, we increased our alignment to the GALL SLR and decreased the number of enhancements the station would need to implement upon issuance of the subsequent or renewed licenses.

I feel that we are very effective in that regard and reduce our total enhancements by over half.

In addition, the same Dominion project team identified and examined any lessons learned from the Surry review, including audit questions and RAIs, and incorporated those improvements into the North Anna application as appropriate.

Together, this resulted in reducing the overall number of RAIs between Surry and North Anna.

Additionally, following the Surry review,

the NRC staff in the first three lead SLR applicants, had identified various areas for which future SLR applications and staff reviews could be completed more effectively and efficiently.

One of the focus areas was related to aging management programs that required exceptions to be taken for issues that were generic in nature.

As an example, the GALL SLR water chemistry has endorsed an EPRI document that has since been revised to update the content based on more current information.

Due to the difference in revision levels, the SLR applicants had to take an exception and provide a basis.

It was an easy technical justification but the industry felt it was an opportunity to reduce an exception and suggested the change to the staff.

Ultimately, this example resulted in a series of four interim staff guidance documents issued in early 2021, which reduced the number of AMPs with exceptions by nearly half of North Anna.

Keith Miller will provide some additional context for the Committee following my presentation. Dominion and the industry also worked with the NRC to identify opportunities to streamline the overall

review process.

There were several improvements supported by the NRC. Among them were a focus from the industry -- there were several improvements supported by the NRC.

Among them were a focus from the industry and the NRC management teams on minimizing multiple rounds of RAIs, which can be a resource strength for the NRC staff and the applicant.

Another item that I would like to mention is the integration of the standalone OE audit used for the SLR lead plans. Instead, the NRC staff adjusted their review of OE into the larger safety office.

This change reduced the administrative burden on the staff related to the execution and reporting of a separate audit but it also eliminated the cost of supporting a separate audit for the applicants.

CHAIR SUNSERI: Hey, Paul, before you go onto the next slide, just a question. I think I heard you say that on the first round of license renewal, Surry and North Anna were treated as one application. Did I hear that right?

MR. AITKEN: Yes, sir, that's correct.

CHAIR SUNSERI: And so was there some

reason it was different this time?

MR. AITKEN: It was really just the timing of the plant, it was a period of extended operations. Surry entered in 2012 and 2013 respectively where North Anna was 2018 and 2020.

So, it was just a timing issue but if they were on the PO we could have done the same thing.

CHAIR SUNSERI: That makes sense to me then. I just was exploring whether or not there was any technical reasons but it's the administrative timing.

MR. AITKEN: No problem, good question, thank you.

I want to provide a brief summary of the difference between the first license renewal and the subsequent license renewal with respect to the integrated plan assessment.

For scoping and screening there were minimal changes in the overall process approach. This is primarily because the established industry criteria hasn't changed very much from first license renewal.

However, one area we expected to have adjustments was related to scoping and screening for altitude that's non-safety-related which can affect safety-related equipment.

This was due to the criteria and guidance evolving since the first license renewal, as Brian noted in his opening remarks. North Anna, as well as Surry, were pre-op plans so we're in the same situation of updating the methodology and scoping of additional plan equipment.

In the area of aging management reviews, the expansion in the number of aging effects that we had to address significantly increased due to the vintage of the previous application and the evolution of the GALL over the years.

The biggest difference was in aging management programs. Currently, for first license renewal, we have 25 aging management programs. Moving into subsequent license renewal, there will be 48 aging management programs.

Again, Keith Miller will speak to the aging management program details following my remarks. Next slide, please. During the aging management review, our alignment with the GALL SLR was at 99.7 percent, with the use of industry footnotes alpha through echo for aging management reviews.

I believe that this high degree alignment to the GALL SLR was the result of the efforts by the NRC staff in the industry to broaden the GALL SLR to

capture the additional material, environment, and aging accommodations that were identified during the first license renewal application.

Also, the recent interim staff guidance documents that I previously mentioned also adopted additional aging effects for material and environment combinations that did not previously exist that could now be used during the application development to further increase alignment with GALL SLR.

In terms of aging management programs, we have a total of 48 and the associated enhancements will be tracked on an amp-by-amp basis within the Dominion Energy commitment tracking system following issuance of the renewed license.

I will leave you with a sense that these commitments were discussed with the station team and agreed upon for implementation.

Some commitment items have already been addressed and Dominion Energy will ensure the proper resources in place to implement the commitment on or ahead of schedule.

That's all I have for my portion of the presentation. Are there any questions for me before I turn it over to Keith Miller?

CHAIR SUNSERI: This is Matt again, maybe

it's a question for you or somebody else later on. I'll just pose it here and then if you can answer it, fine, and if it needs to wait until later, that's fine too.

So, you're going to be in the situation where your requirements from your first license renewal are going to be overlapping with the subsequent license renewal.

So, is there any synergy there or overlap of activities that either make it more difficult or make it easier to transition to the subsequent license period?

MR. AITKEN: I think we're going to touch upon that matter with some of the Keith's information and if we don't hit the bulls eye with the question we'll revisit that.

CHAIR SUNSERI: Yes, because I just know some inspections are required in a timeframe tenure before entering the subsequent and the one period they're doing inspections and monitoring as well, I just was curious of how that was going to work.

Thanks.

MEMBER HALNON: This is Greg, I've got a couple questions if I can.

CHAIR SUNSERI: Yes, Greg, go ahead.

MEMBER HALNON: You've almost doubled your aging management programs and you said you had sufficient staff. How are those distributed? Are they mostly in the mechanical area?

Give me a general overview of the 23 new programs that you have and how those are being distributed with the staff?

MR. AITKEN: Yes, Greg, good question. Again, Keith is going to break that down for you in the next few slides and he'll give you a sense of the breakdown between mechanical, electrical and subtle.

MEMBER HALNON: Okay, I'll take that as a commitment. The other question, I'm just curious, with the experience you have with the license renewal, have you done any focused self-assessments on the aging management programs that are existing?

And if you did, what were the findings there?

MR. AITKEN: Yes, we did. We did some effectiveness reviews on the current aging management programs and I think, Keith is going to talk about that. I don't want to steal his thunder because he does have some good information to share with you.

MEMBER HALNON: You gave him plenty to talk about, I'll wait.

MR. AITKEN: For sure, good question and we appreciate it.

MR. MILLER: Thanks, Paul, and good afternoon. Again, my name is Keith Miller and I'm the aging management program lead for the North Anna subsequent license renewal project.

I'll be providing an overview of the SLR aging management programs and some other considerations for the Committee today.

North Anna SLR project team member have been deeply involved with industry groups such as NEI, EPRI, and the PWR Owners Group.

Additionally, as Paul previously mentioned, Dominion Energy actively participated in the identification and development of the ISGs issued in early 2021.

Operating experience was reviewed for a ten-year period to inform the aging management programs and in addition to operating experience, recent license renewal RAIs associated with the Surry, Turkey Point, and Peach Bottom SLR projects, and recent first license renewal projects were reviewed for insights.

A project team also participated in the Turkey Point and Peach Bottom industry peer reviews to

provide AMP insights and share constructive comments.

Prior to the submittal of the application, the effectiveness of aging management activities was assessed using the evaluation elements identification in NEI 1412, which provides industry guidance on AMP effectiveness reviews.

I think this goes to one of the previous questions but many of the programs had no gaps identified when that NEI 1412 review was performed. Where gaps were identified, they were recorded in the corrective action program.

And those NEI 1412 reviews were discussed in each of the Appendix B sections on operating experience in the application.

MEMBER HALNON: This is Greg. Did you have gaps that surprised you to the point where you had to take some immediate action? Or were they just basically administrative?

MR. MILLER: Yes, I would characterize any of the gaps you identified as administrative. There was nothing that jumped out to that extent that you highlighted.

MEMBER HALNON: I kind of figured that but when you double the programs, I was just curious if there was anything that carried over as corrective

actions that would be used in the new programs to ensure that those gaps didn't show up.

MR. MILLER: This slide provides some perspective on the first license renewal AMPs and how they've evolved for subsequent license renewal.

25 first license renewal aging management programs were the starting point for the evolution and enhancement into subsequent license renewal aging management programs.

All first license renewal aging management activities were continued and incorporated into SLR AMPs. None were discontinued, and several first license renewal AMPs were consistent with GALL SLR or else they required enhancement to be consistent.

As sort of an example of how we got to a total of 48 AMPs, we had several first license renewal aging management programs that were subdivided into GALL SLR AMPs.

One example I can give you is the containment inspection first license renewal program, which was subdivided into ASME Subsection IWE or IWL inspections. Another example is a work control program, which was actually subdivided into five GALL SLR programs.

This pie chart slide shows the final

results of the combination and subdivision process of the first license renewal AMPs, which produced 48 GALL SLR aging management programs. So, I think this gets to another of the previous questions.

But you can see there the majority of the SLR AMPs are mechanical-related. We had 28 SLR mechanical programs that evolved from 19 first license renewal programs.

You see there's also some significant change from first license renewal to SLR in the structural and electrical areas.

For structural we have eight SLR programs that have evolved from four first license renewal programs and electrical has nine SLR programs from two first license renewal programs.

And then you can see the three time-limited aging analyses. Next I'm going to discuss the consistency of the North Anna AMPs with the GALL SLR.

Looking at the left-hand column, you can see there are 41 existing AMPs that resulted from the combination and subdivision process of the first license renewal AMPs.

And SLR existing AMPs are augmented by seven new aging management programs. The remainder of the columns provide some perspective on our

consistency with GALL. So, half of the 48 SLR AMPs are consistent without enhancement.

Approximately a third are consistent with enhancement. We have three AMPs that are consistent with exception and four have exceptions and enhancements.

So, with regards to exceptions, this was particularly a major improvement from Surry.

Surry, we had 12 AMPs with exceptions whereas for North Anna we only have 7 AMPs with exceptions. For the next slide, I'll provide some context on the new GALL SLR AMPs and the AMPs with exceptions.

CHAIR SUNSERI: I would just comment that I think it's notable you had seven new AMPs and they were all consistent with the GALL, that's very good.

MR. MILLER: Thank you for that comment. So, this slide shows our new SLR aging management programs. The first three are mechanical in nature and primarily involve one-time inspections.

The next four are electrical-related and involve inspections of inaccessible cables, cable connectors, and high voltage insulators. Next, I'll provide a listing of GALL AMPs with exceptions.

So, this slide lists all the AMPs with one

or more exceptions and a brief description of the nature of each exception. The majority of these are related to alternate test frequencies, alternate inspection techniques, or to account for plant-specific configurations.

It's notable that six of the ten exceptions were confined to just three AMPs indicating that there's not exceptions spread across a large number of AMPs.

So, just to give you an example of the category of one that would fall into a test frequency exception, for outfits like cooling water, North Anna takes exception to the requirement to perform testing of the research spray heat exchangers every five years, due in part to the fact that significant design modifications would be required to support heat transfer testing of the research spray heat exchangers.

It's notable that their normal plant operation, the recirculation coolers are maintained in dry layout. North Anna flow tests the research spray heat exchangers every 18 months and any current tests individually inspects them every 18 years.

And engineering evaluated the once every 12 refueling outage at every current inspection

period. They looked at a review of prior operating experience, flow tests between 2009 and 2019 identified little or no blockage.

And all the tests were completed satisfactorily, as well as piping inspection results between 2007 and 2017 show the piping was in satisfactory condition.

An example I can give you of a plant-specific configuration exception is related to reactor head closure stud bolting.

The GALL recommends the use of material with actual yield strengths of less than 150K a side for replacement studs or 170K a side ultimate yield strength for in-service studs.

North Anna studs were not procured under prospects that limited the max yield and ultimate tests of strength, which presents the potential concern for stress corrosion cracking.

The volumetric exam method in place for the ASME code is appropriate to identify cracking and no recordable indications of cracking have been identified, indicating the program's been effective.

Next slide, please.

CHAIR SUNSERI: One question, Keith. On the open cycle cooling water heat exchanger, how much

margin do you have on that heat exchanger between baseline capacity and necessary capacity? Do you know or have any idea?

MR. MILLER: Off the top of my head, I don't know but we could take that question to the larger group and get back with you at the next break.

CHAIR SUNSERI: I'm just curious, if you're deferring or taking exception to the challenge, I just was curious of how much margin you have to support that. That would be good if you could get that.

MEMBER HALNON: Keith, one other question, this is Greg.

On the metallic storage tanks, the inspections of tank concrete foundation interfaces, back in 2013, I think in the October letter you guys had one issue that you identified from the earthquake, which is some grouting in containment that I think was cracked between a concrete wall and some grout.

Has this exception got anything to do with the earthquake to make sure any movement that would have occurred doesn't carry over into future inspections? What are the exceptions for?

Let me ask you that.

MR. MILLER: It doesn't have anything to

do with the earthquake. Primarily, it's a plant-specific consideration issue. An example I can give you is one piece of the exception is for the emergency common safe storage tanks.

They don't use hawking or sealant for the concrete component interface so they don't require inspection of it.

Their configuration is a little bit different in that they have a concrete missile shield that surrounds them and expansion filler foam that goes in between the gap between the shield and the tank itself, which prevents water from entering, basically serves the function of what the grout would do at the base of a tank.

MEMBER HALNON: So, the term emergency concrete storage tank, is that your emergency feedwater storage for extended-type access?

MR. MILLER: It is.

MEMBER HALNON: So, that's why it's a missile shield and whatnot to protect it.

And the next one down, the column where diesel fuel is just a one-time inspection, why just a one-time inspection?

Is it just to make sure everything is installed correctly? Explain why it's just one time.

MR. MILLER: Another plant-specific configuration issue, the fuel chemistry program primarily deals with loss of material of metallic fuel tanks. We have recently replaced those fuel tanks with fiber glass tanks.

So, we took exception to that so instead, we'll be looking for aging effects associated with polymer materials as opposed to metallic and because it's newly installed, we justified the 30 to 40-year inspection period because it's consistent with initial license renewal fuel chemistry verifications that were identified in NUREG 1801.

MEMBER HALNON: So, that one-time inspection is down the road a ways?

MR. MILLER: It is. And I should say too that there's also a component to sampling for water and sediment.

So, if we do sample and see water and sediment, there are some corrective actions associated with that, that would provide assurance that we don't have microbiological issues in the tank.

MEMBER HALNON: Did you use operating experience from outside the nuclear industry on that one? Because I'm sure there's plenty of that for fuel oil tanks underground.

MR. MILLER: I don't know the answer to that question. Again, I can get back with you.

MEMBER HALNON: I'm just curious if you limited your operating experience to justify that one-time inspection to just within the nuclear industry or if you went outside of that.

There's probably a ton of operating experience outside nuclear that could be used. So, if you could just go back and let me know what your sample size was there.

MR. MILLER: Sure. So, the first license renewal aging management programs have been and will continue to be assessed for AMP effectiveness.

As I mentioned before, AMP reviews, including NEI 1412 effectiveness review have confirmed implementation of the first license renewal commitments and performed assessments of inspection schedules, inspection results, and trending data.

And again, any identified gaps were addressed or included in the corrective action program.

Program owners received periodic training and are required to complete AMP effectiveness for use every five years as well as perform systematic operating experience reviews on an ongoing basis to

inform AMPs and augment AMP effectiveness.

As an example of regulatory acceptability of the Dominion Energy aging management programs, the IP 71003 Phase 2 NRC inspection identified no findings or concerns in the fourth quarter of 2017.

So, that's all I have for the AMP portion of the presentation.

I noted that we have two outstanding questions we're going to chase on margin on research for a heat exchanger and industry operating experience on the polymer diesel tank.

Are there any other questions before I turn it over Eric Blocher to discuss technical topics?

CHAIR SUNSERI: Members, any questions? Thank you, Keith.

MR. BLOCHER: Thank you, Keith and Matt, and good afternoon. My name is Eric Blocher and I was the SLR technical lead for the North Anna TL8As at SLR application development.

I will cover the technical topics of concrete and containment segmentation, reactor internals, plant-specific TLAAs, reactor vessel integrity, and reactor vessel support steel.

Next slide.

Aging management of structural concrete is

accomplished by the aging management programs noted upon the slide. There have been no loss of license renewal intended function due to aging since entering the period of extended operation.

Dominion Energy has recently implemented the EPRI alkali silicate reaction inspection guidance that was developed in part by members of the SLR team.

The guidance uses identification of leading indicator structures, conduct of augmented examinations for pattern cracking, section of water ingress, and identification of structural misalignment.

Plant operating experience has not identified any indications of ASR for the concrete structures at North Anna except for pre-cast concrete poles that support overhead electrical circuits from the Reserve Station Service Transformers to the turbine building.

There is a design change currently being implemented that either replaces or refurbishes the pre-cast concrete poles. After the design change is implemented, only three pre-cast concrete poles which are adjacent to the turbine building will remain.

The design change will reinforce these three pre-cast concrete poles with a carbon fiber

polymer wrap, which provides confinement and strengthening to the poles and will minimize future ASR-induced expansion.

Pre-cast concrete poles were fabricated offsite and their concrete is not representative of the concrete used in other site structures.

During the SLR review, service for how Settlement Monitoring Point 28 exceeded 75 percent of the technical requirements manual total allowable settlement.

The service water expansion joints were adjusted consistent with technical requirements manual required actions. Settlement Monitoring Point 28 was surveyed and new baseline elevations established for the 4 service water bath house settlement monitoring points.

Expansion joints are still well within their limits for face-to-face, lateral, and concurrent movement.

North Anna reinforced concrete containment examinations did not identify any loss of intended function or any areas requiring code repair based upon Unit 1 and Unit 2 inspections in the summer of 2016.

Unit 1 and Unit 2 concrete containment inspections are currently in progress.

Recent examinations of the liner to the concrete slab interface did not identify any relevant conditions based upon Unit 1 and Unit 2 inspections in the summer of 2016 and the summer of Unit 1 inspections in the summer of 2021.

Examination of the containment liner did not identify any relevant conditions based upon Unit 1 and 2 inspections in March 2015 and March 2016.

Containment concrete biological shield wall gamma and neutron for radiation remains conservatively low, GALL SLR radiation exposure levels through the subsequent period of operation.

Aging management of the North Anna reinforced concrete containments is accomplished by the aging management programs noted on the slide.

Next slide, please.

North Anna will manage reactor vessel internal's primarily expansion and existing examinations consistent with MRP 227 Rev 1 Alpha inspection and evaluation guidance that was issued in December of 2019 and includes NRC safety evaluation dated April 25, 2019 for the first period of extended operation.

The reactor vessel --

CHAIR SUNSERI: Did we lose him?

MEMBER BROWN: He can call back in.

MR. BURKHART: Somebody muted him. They can unmute themselves by hitting star 6. Somebody muted him and please don't do that again.

Somebody disabled your mic, now I just re-allowed it.

Please start.

MR. BLOCHER: Okay, I understand we're back on. So, I believe I left off -- Can you hear me?

CHAIR SUNSERI: Yes.

MR. BLOCHER: I believe we left off with a discussion about our program, including the NRC safety evaluation dated April 25, 2019.

The Reactor Vessel Internals Program also incorporates recent NRC interim staff guidance for update teaching management criteria for reactor vessel internal components and PWR that was issued in January of this year.

In addition, the examinations for the 10 SLR reactor vessel internals components noted on the slide are also incorporated into the PWR Vessel Internals Programs.

With the exception of the control rod guide tubes and the middle and lower axial weld examinations, the additional examinations are all

identified in MRP 2018-022 interim SLR guidance, and are required in part due to where the radiation-related degradation, that is very conservatively projected for the subsequent period of extended operation.

In addition to PWR vessel internals program, the neutron fluence monitoring program defines and monitors the protected fluence associated with the reactor vessel internals during the subsequent period of extended operation and will supplemental MRP 227 Rev 1 output inspection and evaluation guidance.

Next slide, please. Three plant-specific TLA technical reports were updated for 80 years and were recently approved by NRC safety evaluations.

These updates demonstrate the value of Dominion Energy's industry leadership and PWR Owner Group's participation.

PWR OT 17011, non-proprietary approved Revision 2 confirms the previous initial license renewal reactor coolant pump fly wheel in the fatigue crack growth analysis remains appropriate for 80 years.

The fatigue crack growth calculation assumes 6000 cycles of the reactor coolant pumps for

the 80 years of plant life bounds the projected North Anna cycle count for the reactor coolant pump operations.

ASME Code Case M481 allows the replacement of volumetric examinations of reactor coolant pump casings with a fracture and mechanics-based integrity evaluation supplemented by specific visual examinations.

North Anna reactor coolant pump model 93A casings are bounded by the evaluations and conclusions in PWR OG 17033 proprietary approved Revision 1 for the crack stability analysis and the fatigue crack growth analysis.

Therefore, ASME Code Case M481 is allowed. PWROG-17033-P-A, Rev 1 projected the reactor vessel under clad fatigue crack growth analysis associated with well deposited cladding to 80 years.

North Anna confirmed the three TLA action items identified in the NRC safety evaluation of PWR OG 17031 noted on the slide will be applicable to 80 years of operation.

Next slide, please. North Anna projected fluence values for a reactor vessel through 80 years of plant operation or based upon 72 effective full power years.

This is conservative because the current fluence projection for 60 years of plant operations is 50.3 effective full power years for Unit 1 and 52.3 effective full power years for Unit 2.

It is extended to 80 years using a 100 percent capacity factor for the additional 20 years. The PWR Owner's Group assisted Dominion in reviewing the reactor vessel CMTRs for re-baselining the initial toughness values in accordance with the ASME code and branch technical position 5.3.

The various reactor vessel time limit aging analysis for pressurized femoral shock, upper shelf energy, flow temperature over pressure protection, and heat-up and cool-down curves were then revised through 80 years of plant life using the updated fluence and material property information.

Locations with upper shelf energy values that have less than 50 pounds of sharp energy have been assessed through 72 effective full-power years using the equivalent margin analysis method outlined in the ASME code.

The applicability of existing heat-up and cool-down curves can be extended to 72 effective full-power years based upon using updated material property data and application of the K1C methodology.

The reactor vessel surveillance program will update the PT limits through the 5059 process at a later appropriate date.

North Anna will use the two aging management programs which are consistent with GALL to manage fluence and embrittlement during the subsequent period of extended operations.

Dominion plans to remove and test one surveillance capsule for each reactor prior to the subsequent period of extended operation.

This leaves four untested capsules remaining in each unit that are available for a subsequent period of extended operation fluence monitoring.

Next slide, please.

MEMBER HALNON: Before you go too far on that one, this was very good.

We just had a presentation not too long ago about Reg Guide 1.99 Rev 2 which I think you guys used. That showed some significant deviations at super high fluences, 10 to the -19 I think in the upper hood.

Where are you guys with your fluence and what that deviation, that 199, now shows happening? Are you getting a margin there?

MR. BLOCHER: Yes, this is the embrittlement

trend curve and potential impact of ASME code changes on that. I'd like some assistance from Dr. Beth Kehler Haluska for that. Beth, are you online?

MS. KEHLER HALUSKA: Yes, can you hear me?

MEMBER HALNON: Yes, I can hear you.

MS. KEHLER HALUSKA: We would see some changes if the embrittlement trend curve changed. Towards 80 years you'll start to see those higher fluences.

But North Anna's capsule and reactor vessel integrity program are designed to ensure that all of the NRC requirements are implemented and changes are made as needed.

MEMBER HALNON: I guess the point is those NRC requirements may be changing based on the revelation of this deviation in the curve at high fluences. It looks like if you use international data you'll get a lot better correlations.

I guess I was wondering what is the margin to that magical -- it's not really magical -- at least today we see that around 10 to the 19 fluence levels, at 80 years where will these plants be relative to that point?

MS. KEHLER HALUSKA: At 80 years they're around 7 times 10 to the 19.

MEMBER BALLINGER: This is Ron Ballinger. You use the words magic numbers I guess but if you look at Table 4, Tables 4, it gives you all the fluence in there. Up over the number 6 times 10 to the 19th, which is when you get significant deviation.

MEMBER HALNON: Okay, so it's something to keep an eye on very closely obviously, then. This whole study is going in research.

MEMBER BALLINGER: In fact, the presentation that we saw, I believe, if I'm correct, North Anna was the example that they used.

CHAIR SUNSERI: Steve Schultz has a question. Steve?

MR. SCHULTZ: Yes, thank you. Is there any prospective planning associated with those four untested capsules in each unit? Have you thought about that with regards to your long-term fluence management program?

MR. BLOCHER: Well, for surveillance capsules we're planning on pulling Capsule X in 2025 for Unit 1 and Unit 2 in 2026, and again, that will satisfy both the current period of extended operation and the subsequent period of extended operation.

And if you project out, I assume that's what your question is, Steve?

MR. SCHULTZ: Yes.

MR. BLOCHER: We'll have Capsule Z some time in 2036 for Unit 1 and 2032 for Unit 2, 2043 and 2044, Capsule Y, Unit 1 and Unit 2. And then Capsule T, 2049 for Unit 1, 2047 for Unit 2.

And again, those projections would be dependent on what we see with Capsule X.

MR. SCHULTZ: Of course, I appreciate the tentative schedule, thank you. That helps.

MEMBER BALLINGER: According to my records, you've delayed twice removal of capsules, right?

MR. SCHULTZ: Exactly.

MR. BLOCHER: Yes. Hearing no more questions, next slide, please.

The next technical topical I will discuss deals with reactor vessel support steel. Dominion Energy created this sketch to provide an overview of reactor vessel support configuration at North Anna.

The reactor vessel supports at Surry and North Anna are similar. The Surry and North Anna reactor supports are different from reactor vessel supports used at many other nuclear plants.

At North Anna, reactor vessel support is provided by the neutron shield tank. At some other plants, reactor vessel support is provided by columns

and candelene (phonetic) ravines.

This sketch shows the position of the reactor vessel and how it is supported by the neutron shield tank relative to the location of the concrete biological shield goal.

The reactor vessel is located in the center of the sketch. The position of the core where the neutrons are generated within the reactor is shown by the blue and gray stripes. The neutron shield tank is shown in blue.

The tank is about 23 feet high, it split 34 inches, filled with chromated water. The inner and outer plates are 1.5 inches thick. Next to the neutron shield tank is the concrete biological shield wall.

The concrete biological shield wall is 4.5 feet thick. One of the purposes of the neutron shield tank is to provide shielding to protect the concrete biological shield wall.

CHAIR SUNSERI: Eric, this is Matt, let me interrupt you for a second.

I know you're in a challenged audio configuration there but if the folks in your room could avoid typing right next to the microphone or shuffling papers?

It really comes across pretty loud and I'm having a hard time hearing you.

MR. BLOCHER: Okay, let us know if there's problems in the future, Matt. I think we're going to stop shuffling papers.

Okay, the other purpose of the neutron shield tank is to transmit loads from the reactor vessel through the supports located under the nozzle of the reactor vessel to the top of the neutron shield tank, and then to the lower elevation of containment.

There is no vertical loading on the concrete biological shield wall. Next slide, please.

Now that we have reviewed the general configuration of the neutron shield tank, I will discuss the radiation of the reactor vessel support steel for North Anna.

At North Anna the support steel of interest is the region of the neutron shield tank adjacent to the reactor core where the neutrons are generated.

The radiation of the reactor vessel support steel was originally assessed in 1986 using fractured mechanics in preparation for future license renewal considerations by Stone & Webster under contract from the Department of Energy, Westinghouse Owner's Group, EPRI, and Virginia Power.

The original assessment used a Westinghouse discreet ordinance radiation transport fluence model for projecting fluence on the neutron shield tank through 100 years of plant operation, roughly 76.8 effective full power years.

To address the radiation of the neutron shield tank for SLR, a new fracture mechanics evaluation was performed by Dominion Energy. The new fracture mechanics evaluation uses load for dead weight, LOCA, and seismic.

Stress intensity formulas for the ASME code that are normally used for developing heat-up and cool-down limit curves for operation of the reactor vessel, and an infinite amount of fluence based on the use of the lower K1C curve, which is 33.2 KSI square root inches.

The analysis shows that the allowable critical stress is greater than the stress on the neutron shield tank, therefore, brittle fracture will not occur.

The future mechanics evaluation is bounding through the use of the lower K1C curve, 33.2 KSI per square root inch or NUREG 1509 Section 4.3.4.1. It is permissible to use K1C instead of K1R when there is information available for material toughness.

Thus, North Anna fracture mechanics evaluation and neutron shield tank is both bounding and conservative. North Anna has four programs for managing aging of the reactor vessel support steel during the SLR.

The closed treated water system monitors the corrosion in each refueling outage. A Section 11 IWF inspection is performed on the nozzle supports every 10 years.

The structure is monitoring an external services monitoring program performance of visual inspection of the external services of the neutron shield tank and neutron shield tank support skirt.

At this time, I will turn the presentation over to Paul Aiken who will provide summary remarks.

MR. AITKEN: Thanks, Eric. I hope you found the presentation informative and helpful today. I would just quickly summarize by stating I first want to commend the NRC staff on their efforts over the last couple of years.

The staff has worked very hard in reviewing the North Anna application and in conducting the various public meetings which provided the appropriate form for stakeholder involvement.

I want to emphasize that the Department of

Energy has been engaged and integrated with the work leading up to SLR issuance through our highly experienced team.

We have been heavily invested along with the others in the industry over the last couple of years to ensure that we have the appropriate guidance and have explored areas for optimization with the NRC staff.

Dominion Energy has developed a high-quality application for North Anna, has benefitted from the insights and lessons learned gained from the Surry application that I mentioned earlier.

As Paul Phelps mentioned at the opening, Dominion Energy will continue to invest in North Anna Power Station and into the future to ensure the continued safe and reliable operation for 80 years.

So, this ends our prepared remarks. I know we have a couple of opening questions. I think we can try to address the research with Willie.

MR. LLOYD: Yes, I'm Willie Lloyd, the site engineering manager at North Anna Power Station.

Our USFAR for North Anna assumes a two percent plugging margin. Our program for heat exchangers, those calculations assume a one percent plugging margin is allowable.

For these heat exchangers, each heat exchanger has 1500 tubes and that results in a 15-tube plugging margin and then for 2 of those heat exchangers, 1 on each unit they have 1 plug each.

So, programmatically, we have in most heat exchangers 15 allowable tubes margins for plugging and for those two heat exchangers I spoke of, there would be 14 tubes available.

And then it would be a double-back for the ultimate USFAR margin.

CHAIR SUNSERI: Very good, that answers my question, I appreciate it.

MR. AITKEN: Okay, I think Keith Miller will address the question on the tank.

MR. MILLER: Yes, I can circle back on the fuel and storage tanks. So, the short answer is we didn't look outside of the nuclear industry for OE related to these types of tanks.

But we are very confident in the one-time inspection for a couple of reasons. First, the tank was just installed in 2015, so it's basically new. Also of note is the double-wall tank.

I should point out that, and this is in the justification in the application, the Vermont Yankee first license renewal safety evaluation report

documented that underground fiberglass diesel fuel tanks do not have any aging effects requiring management.

So, we're not expecting any aging with these tanks without having water or microbiological contamination. And a little bit more on that, we are sampling for water and sediment quarterly. We do look for bacteria if water is present and treat with a biocide if bacteria are present.

And also, on the periodicity, the draining and cleaning between 30 and 40 years of service, that's consistent with GALL Revision 2 guidance, which recommended performing those types of inspections within 10 years of the initial period of extended operation, which would be that 30 to 40-year window.

MEMBER HALNON: Thanks for that. I had some experience with some polymer tanks and basically, it wasn't installed correctly and we had some shifting of the soils and it caused some problems.

So, I was just curious, I'm sure the modification took into account all the different requirements for soil in protecting from creep and other things.

I never really did get a good feel from the aging management programs.

I mentioned that it looks like you almost doubled the amount of programs you had and I was curious if it caused any excessive burden on any part of the staff relative to either mechanical, electrical, INC type of thing.

Was it pretty well distributed or did you have to share some resources with Surry, or add any resources because of the amount of aging management programs you had to have or modify?

That's probably a question for leadership.

MEMBER BROWN: Greg, I think they dropped off but they're trying to call back in.

MEMBER HALNON: I don't know if I can ask the question again. I'll try to figure it out, see if I can ask it more succinctly.

CHAIR SUNSERI: Well, if they dropped off, did the public line drop? I don't see it. Oh, wait, there it is.

MEMBER HALNON: We can move on, it's not a critical question, it's more curiosity, Matt. We can go ahead and move on.

CHAIR SUNSERI: I believe Dominion was finished with their presentation.

MEMBER BROWN: Matt?

CHAIR SUNSERI: Yes.

MEMBER BROWN: Can I backtrack for a second? It's Charlie.

CHAIR SUNSERI: Sure, I was going to ask members if you had anything before we --

MEMBER BROWN: I'm ahead of you. Should I go on?

CHAIR SUNSERI: Yes.

MEMBER BROWN: Could you backtrack to Slide -- if I can find it for myself.

CHAIR SUNSERI: We're not going to be able to do that because we lost the applicant.

MEMBER BROWN: I can do this without that. Okay, it doesn't matter. Is the applicant still on at all?

CHAIR SUNSERI: They will be joining again.

MEMBER BROWN: Should I wait then because the question is to them?

CHAIR SUNSERI: Okay, if the question is to them then yes, wait.

MR. HOWARD: They are about to be back on people, hang on. Hang on, Charlie.

MEMBER BROWN: That's okay.

MR. HOWARD: They should be up now.

MR. AITKEN: We're back. Sorry, challenges of the virtual world, I guess. That ended our

prepared remarks. I think Charlie had a question.

MEMBER BROWN: Yes, you talked about existing GALL lamp programs, a number of them with enhancements. Looking at the electrical items, I just had a question on -- I'll just use one as an example.

And it applied to I think your Section B2.1.37, it was on electrical installation of electrical cables and connections not subject to 10 CFR 5059,environmental qualification requirements.

And that's an existing program today and you're expanding that program. You had about half a dozen or more enhancements to it.

Just an example of the enhancements, which is where I have the questions, I'll just use an example instead of all seven of them, like if adding a description of the testing methodology, should testing be deemed necessary?

That's one item. These during the visual lead will be addressed through the corrective action program and another one which comes out says that verify that test results for the cable are to be within acceptance criteria as identified in the procedures.

I guess I would have expected all of those items to be part of the existing program and not have

to be added as enhancements. I was going to ask the question of the staff but it's really you all's program so I thought I'd ask that of you.

And the last thing you say in each of these is you will implement the enhanced program within six months, I think, of the period of extended operation in the subsequent license period.

I guess my question is why aren't those specific types of items needed today? It gives the implication that we don't evaluate test results against acceptance criteria but now you're going to do it later. I'm not trying to be critical, it's just that's the way it read.

MR. DISOSWAY: This is John Disoway, I'm responsible for the electrical portion of the application. So, what we found in looking at this as well as Surry is that the procedure that was used for initial license renewal was a type of procedure called the guidance and reference document, which is not a level of document, we'll call it a tier of document that we would now consider acceptable to implement this kind of program.

So, what we're trying to say, which may not have been worded the best, in here is that we're replacing that particular type of guidance document

with a procedure, a standard procedure.

So, it's a matter of are rewriting the guidance that was given originally and the guidance and reference document into a higher-tier procedure.

That captures not only what we're already doing but it also captures the few items that were more or less an increased focus with subsequent license renewals.

That's really what that's trying to get to. It's not that we have not done that type of inspection with that type of analysis in the past, it's just the type of document we're using procedurally to document what we're doing.

MEMBER BROWN: Okay, so I take it from the explanation that in fact, if you went back and looked at what you were doing today explicitly, you're already into your first license renewal, in fact, you would be looking at the test results and making sure they're within the acceptance criteria?

It's just that it's not called out the right way? Is that what you're telling me?

MR. DISOSWAY: Let me give you a different example that maybe is better.

A subsequent license renewal being done with sample size 20 percent, maximum sample of 25 to be

tested, that type of guidance does not exist for initial license renewals either.

So, that's the type of thing we're adding as we upgrade this procedure. That's what we're saying.

In fact, we've done this inspection before and the things that we found which were minimal were evaluated and were addressed by engineering transmittal to accept what was found in the fields corrected.

So, it's not a matter of not evaluating, it's a matter of how we evaluate it, and the fact that there are some things that are included in subsequent license renewals not represented in initial license renewals that we're putting in.

MEMBER BROWN: I guess the staff ought to amplify that for me so we don't hold things up. If they can keep that in their knapsacks until we get there? Is that okay, staff?

CHAIR SUNSERI: Yes, that's fine, Charlie, you'll have to remind him.

MEMBER BROWN: I will.

I'm not trying to be critical, it's just the way they were worded made it sound like -- when you say connection materials, insulation is make sure they're the acceptance criteria within the boundaries

or the values within the acceptance criteria.

It has very specific wording, that's why I asked the question. I'll finish at that point.

CHAIR SUNSERI: Any other members? All right, thank you for that presentation, very good. We'll go into the staff presentation right now but it's 3:17 p.m.

Why don't we take a little bit of a break to allow a transition here? While the staff is getting their shared screen up and getting ready, the rest of us will take a break until 3:25 p.m.

Is that right? Yes, 3:25 p.m. Eastern time. We are recessed until 3:25 p.m. Thanks.

(Whereupon, the above-entitled matter went off the record at 3:18 p.m. and resumed at 3:25 p.m.)

CHAIR SUNSERI: Okay, it's 3:25 p.m., we will reconvene the meeting. At this point, we are ready to hear from the staff and I will turn the floor over to I believe it's Hector Rodriguez Luccioni.

MR. RODRIGUEZ-LUCCIONI: Yes, good afternoon, can you hear me?

CHAIR SUNSERI: Yes, very well, thank you.

MR. RODRIGUEZ-LUCCIONI: Good afternoon, Chairman Sunseri and members of the ACRS. My name is Hector Rodriguez and I go by they, he, and she

pronouns. I am a project manager for the safety review of subsequent license renewal applications, or SLRA.

We are here today to discuss the NRC staff's safety review of the North Anna Power Station SLRA as documented in the safety evaluation report. Joining me today are Lauren Gibson, chief of the License Renewal Projects Branch; Jen England, North Anna's senior resident inspector; and Dr. Allen Hiser, senior technical advisor for license renewal, Aging Management Division of New and Renewed Licenses. Also joining us are members of the technical regional staff.

We will begin today's presentation with an overview of the safety review of the North Anna SLRA before moving onto the SER specifically to Section 2, the scoping and screening review, Section 3, the 18 management review, Section 4, the time-limited aging analysis.

Then we will hear from Region II on inspections and plant material conditions before sharing the conclusions of the different views as related to the North Anna accelerated review.

North Anna Units 1 and 2 were initially licensed in April 1978 and August 1980 respectively.

In May 2001, the applicant, Virginia Electric and Power Company, or Dominion, submitted the initial license renewal application.

The initial renewed licenses were issued in March 2003 extending the expiration dates to April 2038 and August 2040 for Units 1 and 2 respectively. On August 24, 2020, Dominion submitted an SLRA for North Anna Units 1 and 2.

The application was accepted for review on October 15, 2020 and the draft safety relation report was issued on October 18, 2021 with no open confirmatory items.

The North Anna review is the fourth safety review performed by the staff using the GALL SLR and SLP SLR guidance since their issuance in 2017. Between the third and fourth SLR reviews, we implemented the lessons learned, including consolidating the previous three audits into single audit with three parts, an office technical review audit, onsite audit, and an in-office breakout session.

During the in-office technical review portion of the audit, the staff reviewed information presented in the application by specific operations experience provided by the applicant in the

application, and audit information provided on the electronic portal.

During the next phase of the audit, the staff developed audit questions that were discussed with the applicant during the breakout session to better understand the information provided in the application and to fill holes in the development of the safety evaluation report.

The onsite audit portion of the audit is limited to those technical areas that needed further review following the in-office audit. For North Anna, no onsite audit was performed through the COVID-19 pandemic.

The North Anna Draft SER was issued with no open or confirmatory items on October 18, 2021 --

CHAIR SUNSERI: Hector, can I interrupt you for a second? I think your slides are off by quite a few by now. It seems like they're advancing by two every time. I think you're on Slide 5 right now but I'm not sure.

Are you on the right slide?

MR. RODRIGUEZ-LUCCIONI: No, I'm not, thank you. Let me go back, I am on Slide 5.

CHAIR SUNSERI: Thank you, it helps to keep up with you so thanks.

MR. RODRIGUEZ-LUCCIONI: Thank you so much.

The North Anna draft SER was issued with no open or confirmatory items on October 18, 2021. During the staff in-depth technical review, a total of 47 requests for information were issued.

38 requests for additional information and 9 requests for confirmation of information. In the next few slides, I will present the results of the staff's safety review as described in the SER.

The SER Section 2 described the scoping and screening of structures and components subject to aging management review. The staff reviewed the applicant's scoping and screening methodology, procedures, and results.

The staff also reviewed the various summaries of the safety-related system structures and components, the non-safety-related system and components affecting safety functions, and system structure and components relied upon to perform functions in compliance with the Commission's regulation for fire protection, environmental qualification, station blackout, anticipated transience without scram, and pressurized thermal shock.

Based on the review, the results from the

audits and additional information provided by the applicant, the staff concluded that the scoping and screening methodology and implementation were consistent with the criteria of the SRP SLR and requirements of 10 CFR Part 54.

CHAIR SUNSERI: I have a question. You mentioned because of the pandemic we were not able to do the, quote, on-site portion of the audit. Did that have any effect on you?

Was there any compensatory action --

(Simultaneous speaking.)

CHAIR SUNSERI: -- in the resident inspector photographs? Can you walk me through that a little bit?

MR. RODRIGUEZ-LUCCIONI: That's correct, the staff actually work with an applicant by virtually getting pictures and videos and anything that was requested. It was uploaded to the e-portal and that way they were able to continue the review.

CHAIR SUNSERI: So, you were able to complete the audit then with some, I'll call it, visualization of the material conditions of the station?

MR. RODRIGUEZ-LUCCIONI: Correct.

CHAIR SUNSERI: Thank you.

MEMBER BALLINGER: This is Ron Ballinger. To follow up on that, what you said was, at least what I thought I heard was, that normally what happens is you do an onsite audit and then based on the results of the onsite audit, you do the next step I guess.

I'm wondering whether or not not being able to do the onsite audit may have resulted in missing something, is that possible?

MR. RODRIGUEZ-LUCCIONI: The three onsite audits for the technical review in the office that everybody does, based on that technical review in the office, which is the first step of the audit, the technical staff make a decision if they need these onsite audits.

Not every single technical staff requires to do an onsite audit. It depends on what they looked at in the application and if they need or require additional information to continue their review.

And then the next step is breakout questions and breakout sessions, and the breakout session questions may be based on the initial review that they did or additional information that they need after they do the onsite audit.

But the onsite audit does not need to have it unless the technical staff need it.

MEMBER BALLINGER: Thank you.

MEMBER HALNON: Typically, isn't the scoping and screening results a comprehensive walk-down of the plant done to make sure the scoping was done appropriately, non-pandemic?

MR. RODRIGUEZ-LUCCIONI: Lauren, there was an echo.

MS. GIBSON: Yes, we just switched with the method of me getting on. This is Lauren Gibson, I'm the Branch Chief. There are different procedures for the initial license renewal than there are for the subsequent license renewal.

And so that type of walk-down may have been part of the initial but it's not part of the subsequent license renewal right now.

MEMBER HALNON: That makes sense. This is my first experience with subsequent so, yes, I'm kind of going off a little bit of the first license renewal knowledge.

So, I guess there would be a delta analysis on first versus subsequent license renewal to see if anything additional is added. I'm making that assumption but that would trigger me to at least ask questions, I think.

MS. GIBSON: We do usually review the whole

thing as an application as a whole, not just delta from what was in the initial one.

MEMBER HALNON: All right, thanks.

MR. RODRIGUEZ-LUCCIONI: Any additional question before I continue?

So SER Section 3 and it's subsections cover the staff's review of the applicant's program for managing the effects of aging in accordance with 10 CFR 54.2183.

Section 3.1 through 3.6 include the aging management review or AMR items in each of the general system areas within the scope of subsequent license renewal as shown on this slide.

For a given aging management review item, the staff reviewed the item in accordance with the criteria of the SRP SLR to determine whether it is consistent with the GALL SLR.

For AMR items not consistent with the GALL SLR, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that there is reasonable assurance that the effects of aging will be adequately managed so that the intended functions will be maintained, consistent with the current licensing basis for the subsequent period of extended operation.

Based on the review, the results from the audits, and additional information provided by the applicant, the staff concluded that the applicant's aging management review activities and results were consistent with the criteria of SRP SLR and the requirements of 10 CFR Part 54.

The SLRA describes a total of 48 AMPs, 7 new and 41 existing. The slide identified the applicant's original disposition of these AMPs as stated in the SLRA in the left column and the final disposition, as documented in the SER in the right column.

All of the AMPs were evaluated for consistency with the GALL SLR. As a result of the review, the staff documented one staff-identified exemption in the neutral influence monitoring program in the SER.

This accounts for the different and the existing programs consistent with GALL SLR from 17 consistent in the SLRA to 16 consistent in the SER. And 24 consistent with enhancements are exemptions to 25 consistent with enhancements and/or exemptions.

Also, in preparing for this presentation, we identified an error in SER Table 3.01. North Anna aging management programs selective leaching shall be new and consistent, not new and consistent with

enhancements.

Neutron influence moderating should be existing and consistent with exemptions. The SER section for selective leaching mentions an enhancement in the various piping program and this enhancement was inadvertently translated to Table 3.01.

The SER section for neutral influence monitoring notes that staff identified exceptions. We will character this in the final SER.

Based on the review, the results from the audits and additional information provided by the applicant, the staff concluded that the applicant's aging management program activities and results were consistent with the criteria of the SRP SLR and requirements of 10 CFR Part 54.

SER Section 4 identifies time-limited aging analysis or TLAAs. Section 4.1 documents the staff's evaluation of the applicant's identification of applicable TLAAs.

The staff evaluated the applicant's basis for identifying those plant-specific or generic analysis that need to be identified as CLAAs and determine that the applicant has provided an accurate list of TLAAs as required by 10 CFR 54.21 C1.

Section 4.2 through 4.7 document the staff's

review of the applicable TLAAs for the areas shown on this slide.

Based on the review and the information provided by the applicant, the staff concludes that each TLAA is classified, as required by 10 CF 54.21 C1 as either the analysis remains valid for the subsequent period of extended operation, that analysis has been projected to the end of the subsequent period of extended operation, or the effects of aging on the intended functions will be adequately managed for the subsequent period of extended operation.

Based on the review, the results from the audits, and additional information provided by the applicant, the staff concluded that the applicant's CLAA activities and results were consistent with the criteria of SLP SLR and the requirements of 10 CFR Part 54.

At this time, I would like to pass it to Alan Hiser that will discuss specific areas of review.

MR. HISER: Thank you, Hector. As Hector mentioned, my name is Allen Hiser, I'm the senior Technical advisor for license renewal and aging Management in the Division of New and Renewed Licenses.

Since the draft SER was issued with no open

or confirmatory items, I will highlight some specific areas of the review. The first topic identified on this slide is a plant-specific item that was identified during the staff's review.

The remaining topics were identified in the Commission's staff requirements memorandum on subsequent license renewal. This is SRM-SECY-014-0016, which was issued in August 2014.

In the SRM these items were identified as requiring plant-specific evaluation until generic resolutions were approved. Next slide. The plant-specific addresses varied great cast-iron piping in the fire protection system.

This piping had six ruptures prior to 2003 with the root cause identified as cracking due to cyclic loading that occurred during pump start testing.

The plant changed the test procedures to limit the pressure transient in the downstream piping and no ruptures have occurred since 2003. Multiple inadvertent pump starts have occurred since 2003 without any ruptures occurring.

The gray cast iron piping material is also subject to loss of material due to selective leaching and the material was identified in Dominion documents

as brittle from impact testing.

Next slide, Hector.

MEMBER HALNON: This is Greg. Just real quick, they had some underground leaks other than fire protection system piping so there's a 2016 fuel oil leak where the pipes are replaced. Was this extended condition any concern of you guys when you were looking at the full gamut of underground piping?

MR. HISER: If I could ask Brian Allik. Are you available, Brian?

MR. ALLIK: Yes, this is Brian Allik with the staff. So, this specific issue on the slide, I believe that was carbon steel lines that fuel oil 2016, is that correct?

MEMBER HALNON: Yes, correct, it was December of 2016 fuel oil.

MR. ALLIK: So, that certainly impacted our review. That's why we asked questions about cathodic protection, making sure those buried steel lines are coded.

So, this cyclic loading issue wasn't pertaining to the gray cast iron that wasn't really part of the steel review that we did.

MEMBER HALNON: So, you chased the other leaks to your satisfaction then?

MR. ALLIK: Yes, so the difference here was those are where you would have leaks before you would have a rupture in the system where you had a brittle type fracture.

So, that's why this issue was flagged in the acceptance review letter that we issued a month or two after receiving the application.

MEMBER HALNON: I'm done, Ron, go ahead.

MEMBER BALLINGER: I was looking at the gray cast iron leaks and it made me wonder, I'm assuming you did a root cause analysis, or they did, and if you get rupture on these things without some kind of other degradation prior to that, does that tell us the margin is pretty low?

MR. HISER: I think their conclusion for the root cause was that there was crack growth from the manufacturing flaws if you will that's in the piping.

So, there was additional aging that ultimately resulted in a rupture when these pressure spikes occurred from the pump start test.

MEMBER BALLINGER: So, it was an initiation and propagation followed by ruptures?

MR. HISER: That's correct.

And as indicated on the prior slide, they have had multiple similar, if you will, pressure

excursions, presumably from inadvertent pump starts and have had no failures.

MEMBER BALLINGER: I think I recall something about that. Now, the enhancements to the aging management program, are we satisfied that they have identified what samples need to be taken where?

MR. HISER: Yes, we are.

MEMBER BALLINGER: Thank you.

MR. HISER: We're on Slide 12. The applicant provided two enhancements to the buried and underground piping and tanks program, directed towards management of selected leaching for Enhancement 5.

And then also cracking due to cyclic loading in Enhancement 6.

For these enhancements the applicant committed to Excavate 6 gray cast iron locations of each unit in each ten-year operating period beginning prior to entering the subsequent period of extended operation.

So, a total of three periods under which they would do these excavations.

Five of these excavations will be ten-foot blanks of piping, the remaining excavation will be either piping or a component location, for example, a hydrant location with a focus on identification of

selective leaching in that sixth location.

For the piping location, the applicant will use visual and magnetic particle testing to inspect for cracking on both the inside diameter and the outside diameter of the piping.

If cracks are identified, the applicant will perform radiography on a one-foot length to determine the cause of the cracking. If the cause is from manufacturing flaws and not an age-related degradation mechanism, then the results from the inspections will be documented.

If the cracking is identified as due to aging, then the applicant will perform crack and lost stability evaluations that will cover through the end of the subsequent period of extended operation.

If these evaluations project a loss of function of the piping, this finding will be entered into the applicant's corrective action program for an evaluation of an extent of condition, an extent of cause, and to identify any needed follow-on actions.

The staff found these enhancements to be adequate to provide reasonable assurance that the piping will perform its intended functions during the subsequent period of extended operation.

MEMBER BALLINGER: This is Ron Ballinger

again. I think we're talking about two different things here. It's one thing to identify areas where you suspect selective leaching might be occurring and do that inspection.

But if the failures before due to crack initiation and propagation were due to manufacturing defects of some kind, then that's pretty random. And it's hard for me to understand how you would decide what section of pipe to excavate to deal with those.

And then you would have to fall back on operational parameters that don't result in start/stop cycles for the pumps.

MR. HISER: Their inspections will look at locations that they believe are potentially susceptible to the cyclic loading. And I guess from that perspective, they are out there taking a look at some of the piping.

And just to be clear, they did change their pump test procedure, and to me that's where the inadvertent pump starts provide some assurance there are not conditions that would have led to failure during the inadvertent pump starts.

MEMBER BALLINGER: Thanks.

MR. HISER: Next slide, Hector.

One of the topics identified in the

Commission's SRM on subsequent license renewal relates to reactor pressure vessel neutron embrittlement at high fluence.

This topic has two aspects, the adequacy of the applicant's reactor vessel material surveillance program, and the disposition of the vessel embrittlement, time limited aging analyses for the 80-year operating period.

This slide identifies the peak reactor vessel levels for each unit on the left, which are in excess of 7 times 10 to the 19 neutrons per centimeters squared on the reactor vessel surface.

The applicant has identified one capsule at each unit to assess the RPV embrittlement at the 80-year fluence levels. As indicated, testing of these capsules will occur in about the next five years.

On the right side of this slide, we plotted the completed surveillance testing and the planned testing for North Anna Unit 1. The graph for Unit 2 is nearly identical to this.

The axes on this graph are calendar time on the IKSISA and the neutron fluence on the ordinate. The blue dashed lines represent the 60-year RPP fluence and the end of the current 60-year license.

The solid green lines represent the same

quantities for 80 years. The solid black data-points provide the neutron fluence and the test date for the prior tested capsules.

The orange symbols represent the applicant's change in testing of a capsule to obtain the 80-year fluence.

In this case, the applicant will test the capsule that is located at a higher neutron flux location and will acquire data for 80-year fluence levels earlier than originally planned.

Next slide, Hector.

MEMBER HALNON: Allen, do you recall the capacity factor they assumed?

MR. HISER: I believe for an 80-year fluence it was 7280 FPY. It's actually indicated on the slide on the screen, it's about 90 percent for the entire 80-year operating period. I think as Eric mentioned, they've assumed more than 100 percent capacity factor for the 60 to 80-year period.

MR. HISER: For the TLAAs, time-limited aging analyses, certain RPV materials at Unit 2 were projected to exhibit upper shelf energies below the 50-foot pound limit of Appendix G to 10 CFR Part 50.

For all of the RPD materials in both units, the applicant implemented equivalent margin analyses,

or EMAs, to demonstrate adequate safety margins for these locations to the end of the subsequent period of extended operation, consistent with the requirements of Appendix G to 10 CFR Part 50.

Regarding pressurized thermal shock, the applicant projected the pressurized thermal shock evaluations to the end of subsequent period of extended operation and demonstrated all of the RPD materials meet the screening criteria in 10 CFR 50.61 generally with considerable margin.

The applicant has demonstrated that the upper shelf energy and pressurized thermal shock TLAs had been projected to the end of the subsequent period of extended operations in accordance with 10 CFR 54.21 C(1)(ii).

Next slide, Hector. There is no staff approved generic methodology for aging management of reactor vessel internals for 80 years of operation.

The SLR report finds it acceptable for applicants to use the staff-approved guidance for 60 years and MRP 227 Revision 2 in combination with a gap analysis to identify appropriate changes in the inspection program for 80 years of operation.

The GALL SLR guidance for PWR reactor internals has been updated in recent interim staff

guidance, SLR ISG 2021-01-PWRVI, which allows use of MRP 2018-022 for fluence-related screening of RVI components.

As Hector mentioned, the scope of the applicant's neutron fluence monitoring AMP is limited to the monitoring of the neutron fluence exposures of the reactor pressure vessel materials, which represented an exception from the GALL SLR AMP, X.M2, neutron fluence monitoring.

For the assessment of neutron fluence projections for the reactor pressure vessel internals components at 72 effective full power years, the staff reviewed the vessel internal neutron fluence exposures as part of its review of the PWR vessel internals aging management program and the gap analysis in Appendix C of the SLRA.

From its audited information, the staff verified that the neutron fluence methodology and the calculated fluence values for the internal components are acceptable.

The staff also verified that the component-specific fluence exposures were consistent with the MRP guidance identified in the ISG-SLR, and thus acceptable for use in the RVI aging management program.

Next slide. In this structural area, two topics were identified for effects of radiation, specifically for the concrete biological field or CBS wall, and the reactor vessel steel support assemblies.

The latter is principally the neutron shield tank structural steel and sliding support feet assemblies. The staff reviewed various applicant documents, audit activities, and requests for additional information.

Next slide, please. For the CBS wall, the staff agreed with the applicant that a plant-specific program was not necessary for several reasons, principally because the calculated limiting neutron fluence and the limiting gamma dose on the CBS wall are below criteria in the SRP-SLI.

In addition, the maximum temperature estimated in the CBS wall concrete including radiation induced heating is also below the criteria in the SRP SLR.

In lieu of a plant-specific program, the applicant stated that it will continue to monitor accessible areas in the CBS wall by visual inspection on a five-year interval using a structures monitoring program.

Based on this approach, the staff concluded

that the effects of aging due to radiation on the CBS walls will be adequately managed so that the intended functions will be maintained, consistent with the CLB during the subsequent period of extended operation.

For the reactor vessel steel supports, the applicant at the application included a fracture mechanics evaluation consistent with NUREG 1509 and concluded that a plant-specific program is not needed.

The staff's review of this evaluation concluded that the fractured mechanics evaluation adequately addressed the loss of fracture toughness of the RVE steel supports for the subsequent period of extended operation.

In addition, the staff concluded that other aging effects for the reactor vessel steel supports specifically, loss of material and loss of mechanical function, will be adequately managed by the structures monitoring, the external surface monitoring of mechanical components and the closed treated water system AMPs to provide reasonable assurance that applicable aging effects will be adequately monitored and managed during the subsequent period of extended operation.

Next slide, please. Capable qualification is required in accordance with 10 CFR 50.49 and as a

PLAA for subsequent license renewal.

The applicant disposition to TLAA in accordance with 10 CFR 5421 C(1)(iii) by demonstrating that the effects of aging on the intended functions will be adequately managed for the subsequent period of extended operation.

The staff reviewed each U for environmental components AMP and finds it acceptable to manage the qualification PLAA because it is consistent with all SLR AMPs X.E1.

For cable condition assessment, in addition to aging management of electrical installation for in-scope, inaccessible meeting voltage power cables, the applicant also proposed aging management for in-scope and accessible instrumentation and control cables and low-voltage power cables.

The AMPs proposed by the applicant are condition monitoring AMPs, however, periodic actions are taken to prevent inaccessible in-scope cables for being exposed to significant moisture such as identifying and inspecting conduit ends in cable manhole vaults for water accumulation and removing the water as needed.

The inspections are performed based on plant-specific operating experience with cable wetting

or submergence. The periodic inspection occurs at least annually.

Additional inspections for water accumulation are also performed after event-driven occurrences such as heavy rain, rapid thawing of ice and snow, or flooding.

staff reviewed these AMPs and finds them acceptance because they are consistent with the related GALL SLR AMPs that are indicated in this slide.

Based on its review, the staff concluded that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the COB for the subsequent period of extended operation as required by 10 CFR 54.21 A3.

Next slide.

MEMBER BROWN: Before you shift slides, this is Charlie again. I asked a question before, did you hear it or do I have to repeat it?

MR. HISER: Actually, if you could repeat it because we have the electrical reviewer too?

MEMBER BROWN: Yes, I want to get your read. You did a nice job of going through the enhancements and giving a break-out of what was added to existing

program elements that they have in place today.

And I guess I was a little surprised, and I'm not quite sure I understood their answer all the way, when I think Enhancement 6 on the D2137, which is I think if I read it again it's electrical insulation for electric cables, connections not subject to 10 CFR 50.49.

There were seven or eight, seven I think, enhancements on this one and they had at the description of the testing methodology in case testing should be deemed necessary, that was Enhancement 4.

Then they added a requirement that if anomalies are found during visual, they will address during a corrective action program.

I would have expected in the last one I used in the example was adding a requirement for the test results when they run insulation resistance or time to remain or whatever type of testing they're doing.

The test results equally over the last 50 years would have been addressed to ensure they were within acceptance criteria, and yet, they've been added to this, and its nice that it's written down, but did you all see that as it wasn't there before or not? I understand they're consistent with the generalities in the GALL, as you all stated, but did

you all read that as something they hadn't been doing before?

Or what? Is your electrical guy there?

MR. NGUYEN: I cannot check that. My name is Duc Nguyen, I am the technical review of the electrical portion. Okay, let's go back to the history of the GALL, the GALL Version 2, Revision 1, Revision 2.

We did not require the applicant to do the testing for the interim control cable and a low-voltage cable. So, they had one pull-down which includes XIE1 and XIE2 and XIE3.

But the XIE3 is only covered intercepted medium voltage and that program testing was only there. The testing acceptance criteria is spelled out in the general document.

So, after we issued the GALL revised 3M, XIE1A, E1B, and E1C, this one, they'll provide acceptance criteria in the position. And the staff during the oversight inspection will look at the procedure.

Typically, the acceptance criteria would not include the end, it would include a specific procedure. And the procedure according would actually pay 400, it would spell out what the acceptance

criteria, how often you have to test.

So, for medium voltage cable, they have to do the testing every six years and if they don't miss the criteria they have to sort the frequency and eventually, if they don't meet the criteria they have to replay the cable.

So, that's already there. For the low-voltage cable and internal-controlled cable, initially they don't have the program because of the GALL Revision 2, Revision 1, and Revision 3.

We don't have that program because the water-free phenomenon only affected the medium from the cable. But seeing we issue the generic order, we found out some examples for low-voltage cable failures.

So, that's why we edit in the subsequent license renewal but the third license renewal, these two programs are not there.

So, we added subsequent license renewal but to answer your question, test procedure is always there in the original engineering program.

Does that answer your question?

MEMBER BROWN: I'm working on it.

I appreciate the little bit of history back on the original GALL because I know we went through

the existing version of it a little while ago in terms of what we would do for the subsequent license renewals.

So, you're telling me, if I read you right, that the GALL before, this expanded what was already required in the GALL that was approved for SLRs?

MR. NGUYEN: Yes.

MEMBER BROWN: And we provide more definition to it. That didn't mean they weren't doing what they should be doing before, and I presume you all would have known that if they hadn't, I hope?

MR. NGUYEN: Yes.

MEMBER BROWN: Let me ask the second. I'll accept your answer on that. I'm not going to mouse-milk this one too hard.

The other thing they committed to with these new requirements, they're 18 years away from SLRs right now, they're quite a while. I think it would be 2038 or so. They said they would be implementing this within six months prior to the subsequent period of extended operations. So, we're going to go 17 or 18 years without these, quote, enhancements.

And you all deem that okay even though they needed to add those for the SLR? But it's okay to go --

MR. NGUYEN: I plan to do the low-voltage cable and not the concern for the water tree. The water tree only concerns from the voltage. So, now this program during the subsequent license renewal, they still inspect the water. They still inspect the water in the manhole and remove the water every quarter.

MEMBER BROWN: But I'm now looking at the medium-voltage one. The medium-voltage one had the same issues in it.

MR. NGUYEN: As they do right now, they still continue to do now to the subsequent license. They still do it right now. They have to require to test and they have to require to remove the water in the manhole.

MR. HISER: Can I jump in for a minute?

MR. NGUYEN: Yes.

MR. HISER: I think partly what may be going on is the enhancements are things that are not identified in their current AMP but it is things they are doing by plant procedure.

So, in order to bring their program as defined in their program documents up to be consistent with GALL SLR, they need to take these things that they are currently doing and identify them

specifically in the GALL SLR AMP.

MEMBER BROWN: Thank you, I guess what you're saying is that they're doing them, they're not as part of the existing GALL programs they have for their extended procedure but they are in other procedures. They're not getting lost, in other words.

MR. HISER: That's correct and the applicant may be able to confirm that.

MEMBER BROWN: I'll take your word for it. You guys know how to look for stuff. You answered my question. This applied to a number of the different electrical testing operations. The medium voltage one was my biggest concern because there were seven enhancements on that one as well.

It's nice to have them explicitly called out but medium voltage, we've had issues in the past when we were looking at extensions on how were their medium-voltage cables addressed and were they satisfactory? That's what triggered my thought process based on some of our reviews from several years ago.

MR. HISER: That is a subtle point, that enhancements may not be things I'm not doing now but suddenly I'll start to do them, they're just not within my program definition right now.

MEMBER BROWN: It was just the way it was worded that was raised and I asked the question. You've satisfactorily answered my question and I appreciate that.

MR. HISER: Okay.

MEMBER BROWN: Thank you very much.

MR. NGUYEN: You're welcome.

MR. HISER: If we go to the next slide, Jen England, senior resident inspector at North Anna, will present retail activities associated with license renewal. Jen?

MS. ENGLAND: Good afternoon. My name is Jennifer England and I use the pronouns she and her. I'm the acting senior resident inspector at North Anna. With me is Kenya Carrington, North Anna resident inspector; Adam Wilson, our senior project engineer; and Stu Bailey, our branch chief.

We are here to provide Region II's review and assessment of the implementation of the aging management programs, material condition, and overall regulatory assessment of North Anna Units 1 and 2.

The license renewal inspection program and the RLP baseline inspection program are both used to inspect aging management activities at North Anna.

I'll start with the activities performed

under the license renewal inspection program, then discuss the ROP inspections and follow up with material condition of the plant.

In order to assess the adequacy of the license renewal program for the initial period of extended operation, inspection procedure 71003 recommends using a four-phase approach to license renewal inspections.

This slide details the specific license renewal inspections that have been performed at North Anna. The Phase 1, 2, and 3 inspections were performed for both units on the dates listed with no findings identified.

Finally, the Phase 4 inspection, which typically occurs 5 to 10 years into the period of extended operation has not been performed at North Anna as the period of extended operation began in 2018 for Unit 1 and 2020 for Unit 2.

Next slide, please.

In addition to the inspections mandated by the license renewal inspection program, inspectors use several ROP-baseline procedures to evaluate the implementation of aging management activities.

As an example, the baseline inspection of the in-service inspection program, this inspection is

performed each refueling outage and provides the inspectors the opportunity to review and assess inspections credited for aging management.

The second example is the HESIC inspection, which provides the inspectors an opportunity to review the service water system including heat exchangers, the service water intake structure, and both above ground and buried or inaccessible piping and components.

All of these activities are within the scope of license renewal. Lastly, the design basis assures inspection or DBAI includes a review of the aging management activities for the safety structure systems and component selected.

At North Anna, the regional inspectors have found no violations or findings of greater than green significance as a result of the inspections performed using these procedures.

Also of note, the tri-annual fire protection procedure has been updated to review aging management of this equipment. Next slide, please.

MEMBER HALNON: Jen, this is Greg, did you guys see any trends in their cross-cutting areas?

MS. ENGLAND: No, we have not. Currently, North Anna Units 1 and 2 are in the licensee response

column and have all green findings and performance indicators.

This indicates that the licensee has been able to effectively identify conditions adverse to quality and correct them in a timely manner.

We did want to highlight some inspection results that relate to the material condition of the plant.

As mentioned, no findings were identified during the license renewal program inspections but in 2013, the NRC issued a self-revealing green finding for the failure to establish and implement appropriate periodic maintenance for the Charlie 4 capacitor in the speed era amplifier card, which resulted in a reactor trip.

In 2021, the NRC identified a green finding and a non-cited violation for inadequate instructions for handling of aged cables. This procedure did not identify the allowable end radius for battery cabling.

Next slide, please.

MEMBER BROWN: Jen, could you go back? Stay on the existing slide, please. I just had a question. It's just an understanding question.

On the previous slide, if you go back it was on the 2013, the C4 capacitor that was in the -- what

system or what instrument was that in or do you know?

MS. ENGLAND: Yes, it was for the main turbine, it resulted in a turbine trip and a reactor trip.

MEMBER BROWN: That's not unexpected. I've been dealing with this stuff in the naval nuclear program forever, since 1965. Is that now a standard part of their PMs for this particular capacitor or inspections?

MS. ENGLAND: Yes.

MEMBER BROWN: It doesn't bother me, it just that's kind of a very unique thing to focus in on one capacitor when I suspect that there's other individual cases that face different failure modes at various times with age. And I just wanted to understand it a little bit better. So, they're replacing that periodically now because of this?

MS. ENGLAND: Yes, that's correct. We basically wanted to go through and we went back to pre-2013 just to look for anything related to aging management and just bring anything we could find to your attention.

MEMBER BROWN: Thanks. Just out of curiosity, just good information for me since I've not been in the commercial world that long, only the last

12 years.

(Simultaneous speaking.)

MEMBER KIRCHNER: Jen, this is Walt Kirchner. On the last bullet on this slide, was the inadequate procedure finding -- not finding, but was that identified because there was a degraded safety-related cable that was found?

Do you see what I mean? Did you have a plant-related problem that led to determining there was an inadequate procedure? Was this just a desk review of procedures that uncovered this issue?

MS. CARRINGTON: Jen, I can speak to that. This is Kenya Carrington, Resident Inspector. So, we had a design basis assurance inspection this year performed at North Anna and inspectors performed a walkdown of various areas of the plant.

They reviewed various procedures. So, it wasn't specifically related to a degraded cable but the procedure was based on how they handle degraded safety-related cables, if that answers your question.

MEMBER KIRCHNER: Thank you.

MS. ENGLAND: I can add a little bit to that. If they manipulate the cables, they didn't have criteria to ensure that the bed radius was not exceeded. And that was what was identified in the

inspection, if that detail helps you at all.

MEMBER KIRCHNER: Thank you very much.

CHAIR SUNSERI: Steve Schultz has his hand up. Go ahead, Steve.

MR. SCHULTZ: Walter began the discussion. I presume then that essentially, the corrective action was identified as part of the inspection finding?

MS. CARRINGTON: That would be correct. The licensee placed this issue or captured this issue into their corrective action program.

MR. SCHULTZ: And resolved the issue?

MS. CARRINGTON: That's correct.

MR. SCHULTZ: Thank you.

MS. ENGLAND: Are there anymore questions?

CHAIR SUNSERI: No, please continue, thanks.

MS. ENGLAND: Next slide, please. I will now speak to the material condition of North Anna from the resident inspector viewpoint. Overall --

MS. CARRINGTON: Sorry, Jen, we have another question. Steve Schultz, do you have a question?

MR. SCHULTZ: That was just my question, I'm just taking my hand down. Thank you.

MS. ENGLAND: Overall, the plant that is in its first period of extended operation, the material condition is generally acceptable. The licensee has

been successful at completing large, capital improvement projects that maintain or improve the material condition of its structured systems and components.

The licensee renewal program inspections did not identify any substantial weaknesses in the station's performance in managing the effects of aging at the site. The inspectors will continue to inspection and assess the licensee's ability to manage the effects of aging through the NRC's baseline inspections. Are there any additional questions?

MEMBER BROWN: This is Charlie Brown again. You say the plant condition is generally acceptable, that gives a connotation that there's something that's not generally acceptable.

(Simultaneous speaking.)

MS. ENGLAND: And it is. We don't generally bless them off and say it's excellent or something like that, that's just not --

MEMBER BROWN: That part I got. I just would have not put generally, I just would have said plant condition is acceptable. Our sailors would have gotten killed if they said we were sort of okay but not really.

(Simultaneous speaking.)

MEMBER BROWN: It's wordsmithing, that's all.

MS. ENGLAND: Lessons learned. Are there any other questions? Okay, I would like to hand the presentation over to Lauren, thank you.

MS. GIBSON: This is Lauren. Good afternoon. Before we get to our final wrap up slide, I'd like to note that we did receive two different professional views during the review.

They both related to the gray cast iron piping in the fire protection system. Management has been working to address the issues.

As part of that, we ask the licensee through an RAI to ensure that their FSAR supplement portion matches the program description that they've given in the supplements and previous RAI responses.

We received that from the licensee and are reviewing it. The final SER will address that RAI in the response. Next slide, please.

In conclusion, for the SLRA safety review, the staff finds the requirements of 10 CFR 54.29A have been met for the subsequent license renewal of North Anna Power Station Units 1 and 2.

We will now be happy to answer any additional questions that you may have. Thank you.

MEMBER BALLINGER: This is Ron Ballinger. I looked at the buried piping thing pretty carefully. Can you tell us the nature of the differing professional opinions? Not the detail, I suppose, but just the nature of them.

MS. ENGLAND: No, we can't at this time. We're still working through the process and the details on it will be available closer to when the SER is issued as final. Everything will be documented.

Allen, is there anything further that we can say?

MR. HISER: No, just that we're working to resolve them and at that point, the entire packages should be made public, I think is the expectation right now.

CHAIR SUNSERI: As I read through the SER, I saw in this area a lot of what looked like additional requests for additional information as the review is conducted. And those RAIs have been addressed and incorporated into the SE.

So, is it fair to say that the technical aspects of any concerns are incorporated into the current version of the SC that we reviewed?

Can I have the licensee's response?

MS. GIBSON: I think it would be fair to say

that there's a differing professional view on whether or not they have been.

MR. HISER: And we do have the FSAR RAI that went out recently and that the applicant has responded to. That is a part of our technical review.

CHAIR SUNSERI: Very good then.

MEMBER BROWN: Matt, when's our full Committee meeting on this?

CHAIR SUNSERI: February 2, 2022.

MEMBER BALLINGER: This is Ron again. I don't know what the exact procedure needs to be, but is this something that we need to think about delaying until we have a completed adjudication of the difference of professional opinions?

MS. GIBSON: No, we will have the completed adjudication of the differing professional view when the final SER is published to support the ACRS Subcommittee meeting.

MEMBER BROWN: You mean full Committee meeting?

MS. GIBSON: I'm sorry, yes, I mean full Committee meeting.

CHAIR SUNSERI: Which is on track for February still with the final SE?

MS. GIBSON: Yes, and the documentation

related to these views will be made publicly available to support that meeting.

MEMBER BALLINGER: Good, thank you.

CHAIR SUNSERI: Good questions. Any other members' questions?

MEMBER KIRCHNER: Just a comment, Matt, this is Walt. We should go back and look at the other differing professional views on the same topical area for another plant.

MEMBER BALLINGER: That's the reason I was making the comments.

MEMBER KIRCHNER: I think we just should revisit what we heard then. It seems to me this is a very similar issue. Thank you.

CHAIR SUNSERI: I have some points that I think should be included for the full Committee briefing and I'll characterize how I've got this covered. But any other questions from members?

I would just say this has gotten a lot of attention here at the end of this meeting. The ACRS is always appreciative of hearing from individuals with differing views and it just aids in informing our own technical perspectives on these topics.

It helps us identify whether or not we missed anything or not. So, we are interested in the

outcome of the review and so as far as the full Committee goes, I have a couple of recommendations here.

First off, I think for the full Committee review, we don't need so much emphasis on the process improvements. Those were interesting and we're always glad to hear those from the Subcommittee's perspective and see that progress has really been made on improving the process and learning from the industry. We seek to improve our process as well.

I don't think there needs to be so much emphasis at the full Committee because it's not relevant to the license approval.

The grey cast iron pipe, the cyclical fatigue, I think that would be an area that we would love to see emphasized in the technical part of the presentation in addition to the reactor pressure vessel fluence.

Both those topics have been of general interest to the full Committee outside of subsequent license renewals. So, just touching on those I think would be important.

And then finally, to get the update on the outcome of the differing professional view or assessment or reconciliation. So, those are the

things to be emphasized.

Any questions about that?

MS. GIBSON: No, but I've gotten written down in my notes that this is what you'd like.

CHAIR SUNSERI: Members, anything else? Okay, at this point, we would like to open up the floor to any comments that the general public might have.

So, members of the public listening in, this is your opportunity to provide a statement or comment. If you are on a phone, you can unmute using star 6. If you're in the Teams session, just unmute your phone on your entry and make your statement.

All right, we can close the public line, not close it, close it figuratively speaking. And I've offered the same courtesy that any members of staff or others listening in on the Teams chat as a member of the public, any comments?

All right, well, then I suppose that concludes are meeting today. I would like to express appreciation to the Dominion staff.

I know it's hard work operating the plants and this time of year there's a lot of things going on, so we appreciate the senior staff took such valuable time and devoted it to this.

And this activity is certainly useful to us as we deliberate the application. The staff presentations were informative and very insightful so thank you to the staff.

Thank you to our staff for helping make this virtual call or meeting a success. So, without any further comments, I will adjourn this meeting. Thank you, the meeting is adjourned.

(Whereupon, the above-entitled matter went off the record at 4:30 p.m.)

North Anna Power Station

Units 1 and 2

Subsequent License Renewal Application

ACRS Sub-Committee Meeting

December 15, 2021

Dominion Energy®

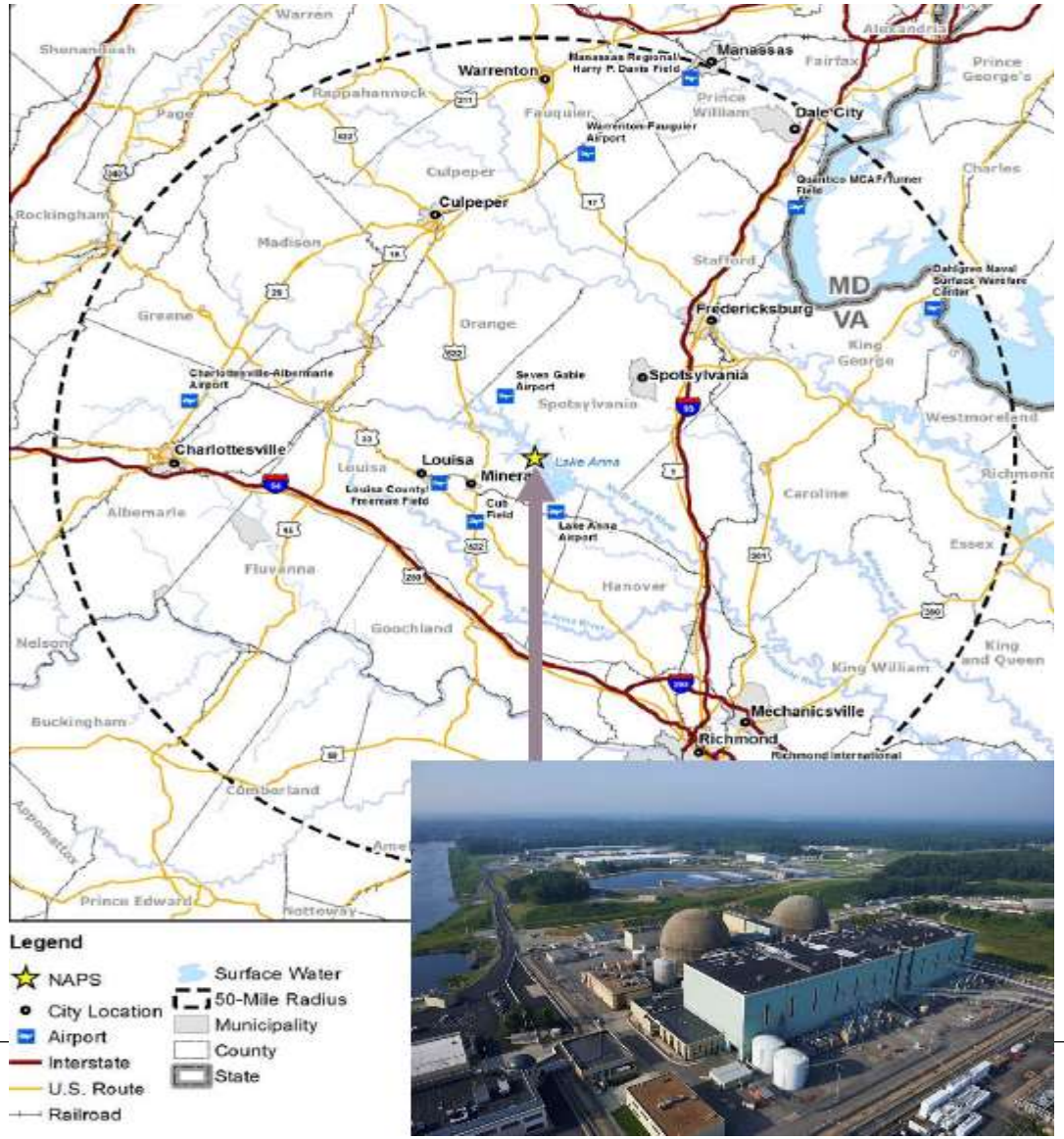
Introductions

- Paul Phelps - SLR Director
- Paul Aitken - SLR Manager
- Keith Miller - SLR Technical Lead
- Eric Blocher - SLR Technical Lead
- Craig Heah - SLR Technical Lead

Agenda

- Station Overview/Performance
- SLR Application Development
- SLR Aging Management Programs
- Technical Topics
- Closing Remarks

North Anna Power Station



Station Overview

	Unit 1	Unit 2
Full Power License – 2,775 MW_t	April 1, 1978 (Operating License Issued)	August 21, 1980 (Operating License Issued)
Independent Spent Fuel Storage Loading (ISFSI)	Pad 1: 1998, Pad 2: 2008, Pad 3: 2021	
4.3% Power Uprate to 2,893 MW_t	1986	
First License Renewal Approval	2003	
1.6% MUR to 2,940 MW_t	2010	
Entered Period of Extended Operation	April 1, 2018	August 21, 2020
Current License Expiration	April 1, 2038	August 21, 2040

Dominion Energy

Station Overview

Dominion Energy

North Anna Performance

- North Anna operates on an 18-month refueling frequency
- Plant Capacity Factor:
  - 2018: U1 – 91.14% U2 – 101.93%
  - 2019: U1 – 94.53% U2 – 90.38%
  - 2020: U1 – 101.7% U2 – 88.41%
- Regulatory Status
  - ROP Actions Matrix Column 1
  - All ROP Indicators are Green

Significant Plant Modifications

North Anna Power Station	Unit 1	Unit 2
A/B RSS Transformer Replacement	2021	2021
C RSS Transformer Replacement	2019	2019
Reactor Vessel Upflow Conversion	1996	2018
Buried Fuel Lines Replacement- EDG Transfer Pumps	2017	2017
Reactor Vessel Head Replacement	2003	2003
Main Transformer Replacement	2006	2006
Station Service Transformers Replacement	2010	2010
Main Generator Replacement	2014	2008
Underground Fire Protection Piping Replacement	2012	2012
Fire Detection System Replacement	2021	2012
Service Water Spray Array Piping Replacement	2009	2009
AL-6XN Service Water Charging Piping Replacement	2001	N/A
Service Water Instrument Air Compressor Dryer Replacement	2003	2003
Underground Security Diesel Generator Fuel Oil Supply Tank Replacement	2015	N/A
Flux Thimble Tube Replacements	2016	N/A

SLR Application Development

SLR Application Improvement

- Implementation of Lessons Learned from Surry
  - Fewer Than Half the Enhancements
  - More Efficient Review – Half the RAIs
- Improved Consistency with GALL SLR
  - Led Industry/NRC Effort to Identify and Issue ISGs
  - Reduced Number of AMPs with Exceptions
- Review Process Improvement
  - Focus on Minimizing "Multiple-Round" RAIs
  - OE Audit – Integrated with Safety Audit

Integrated Plant Assessment

Deltas between First License Renewal (FLR) and Subsequent License Renewal (SLR)

- Scoping & Screening
  - Minimal Differences from FLR (pre-GALL)
  - Some updates required to address 10 CFR 54.4(a)(2)
  - Followed NUREG-2191 (GALL-SLR) and NUREG-2192 (GALL-SRP)
- Aging Management Reviews
  - NAPS FLR was pre-GALL, additional aging effects required disposition based on NUREG-2191 (GALL-SLR)
- Aging Management Programs
  - FLR – 25 AMPs
  - SLR – 48 AMPs

GALL SLR Consistency

- Submittal consistent with GALL-SLR
- High AMR Consistency (99.7% Notes A thru E)
- License Renewal Commitments
  - 48 Aging Management Programs
  - UFSAR Supplement (Appendix A)
  - Managed by the Dominion Commitment Tracking System
- Implementation activities have begun and will continue following issuance of renewed license

SLR Aging Management Programs

North Anna SLR AMP Considerations

- NEI involvement, collaboration with EPRI, and PWROG participation informed AMPs with New Industry Guidance, R&D products, and NRC Interim Staff Guidance

- Incorporation of operating experience (OE):
  - Industry and plant specific OE reviewed for a 10-year period
  - Reviewed Surry and Industry RAIs for AMP insights
  - Participation in Industry Peer Reviews

- AMP Effectiveness Reviews performed on all first license renewal AMPs using elements of NEI 14-12

First License Renewal AMPs

All First License Renewal (FLR) AMPs will be continued and incorporated into SLR AMPs:

- No FLR AMPs discontinued
- Some FLR AMPs are consistent with GALL-SLR AMPs
- Several FLR AMPs required enhancement for consistency with GALL-SLR AMPs
- Several FLR AMPs subdivided into other GALL-SLR AMPs

Mechanical		Structural
XI.M1 ASME Section XI Inservice Inspections, Subsections IWB, IWC, and IWD	XI.M30 Fuel Oil Chemistry	XI.S1 ASME Section XI, Subsetion IWE
XI.M2 Water Chemistry	XI.M31 Reactor Vessel Material Surveillance	XI.S2 ASME Section XI, Subsetion IWL
XI.M3 Reactor Head Closure Stud Bolting	XI.M32 One-Time Inspection	XI.S3 ASME Section XI, Subsetion IWF
XI.M10 Boric Acid Corrosion	XI.M33 Selective Leaching	XI.S4 10 CFR Part 10, Appendix J
XI.M11B Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	XI.M35 ASME Code Class 1 Small-Bore Piping	XI.S5 Masonry Walls
XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	XI.M36 External Surfaces Monitoring of Mechanical Components	XI.S6 Structures Monitoring
XI.M16A PWR Vessel Internals	XI.M37 Flux Thimble Tube Inspection	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants
XI.M17 Flow-Accelerated Corrosion	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	XI.S8 Protective Coating Monitoring and Maintenance
XI.M18 Bolting Integrity	XI.M39 Lubricating Oil Analysis	**Electrical**
XI.M19 Steam Generators	XI.M41 Buried and Underground Piping and Tanks	XI.E1 Electrical Insulated for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M20 Open-Cycle Cooling Water System	XI.M42 Internal Coatings/Linings For In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
XI.M21A Closed Treated Water Systems	**TLAA**	XI.E3A Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refuling) Handling Systems	X.M1 Fatique Monitoring	XI.E3B Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M24 Compressed Air Monitoring	X.M2 Neutron Fluence Monitoring	XI.E3C Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M26 Fire Protection	X.E1 Environmental Qualification of Electric Components	XI.E4 Metal Enclosed Bus
XI.M27 Fire Water System		XI.E5 Fuse Holders
XI.M29 Outdoor and Large Atmospheric Metallic Storage Tanks		XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
		XI.E7 High Voltage Insulators

North Anna SLR – 48 GALL-AMPs

	Consistent with GALL-SLR	With Enhancement	With Exception	Exception and Enhancement	Plant Specific
Existing 41	**17**	**17**	**3**	**4**	**0**
New 7	**7**	**0**	**0**	**0**	**0**
Total 48					

New SLR AMPs

- XI.M32 - One-Time Inspection
- XI.M33 - Selective Leaching
- XI.M35 - ASME Code Class 1 Small Bore Piping
- XI.E3B - Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49
- XI.E3C - Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49
- XI.E6 - Electrical Cable Connections Not Subject to 10 CFR 50.49
- XI.E7 - High Voltage Insulators

AMPs with Exceptions

- X.M2 Neutron Fluence Monitoring
  - Monitoring for changes in fluence values of reactor vessel internal components
- XI.M3 Reactor Head Closure Stud Bolting
  - Closure stud yield strength and ultimate tensile strength recommendations
- XI.M20 Open-Cycle Cooling Water System
  - Recirc spray heat exchanger test interval
- XI.M27 Fire Water System
  - Fire pump suction screen inspection alternative
  - Main drain test frequency of water-based system risers
- XI.M29 Atmospheric Metallic Storage Tanks
  - Inspections of caulking at tank/concrete foundation interfaces
  - Emergency Condensate Storage Tanks external surface examination alternative
- XI.M30 Fuel Oil Chemistry
  - One Time Inspection of the recently installed polymer diesel fuel oil storage tank
- XI.M42 Internal Coatings/Linings
  - Service water inspection sample size, inspection, and re-inspection frequency
  - Inspection frequency for turbine lube oil storage and transfer subsystem

FLR AMP Effectiveness

- FLR AMPs have been evaluated for AMP effectiveness:
  - AMP reviews conducted in 2016 and 2017
  - AMP review conducted in 2019 using NEI 14-12 guidance
  - FLR commitments have been implemented
  - Assessment of inspection schedules, results and data have been conducted
- Identified gaps have been included in the CAP system as described in Appendix B
- Periodic AMP effectiveness reviews are required to be completed by the program owners every 5 years
- OE is systematically reviewed on an on-going basis
- Training is conducted periodically for program owners
- IP 71003 Phase 2 inspection identified no findings or concerns in 4Q17

Technical Topics

Concrete and Containment Degradation

	SLRA Sections Addressing GALL-SLR Recommendations
Concrete and containment degradation	3.5.2.2.1 Pressurized Water Reactor and Boiling Water Reactor Containments 3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due To Irradiation 4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis A1.29 ASME Section XI, Subsection IWE A1.30 ASME Section XI, Subsection IWL A1.32 10CFR Part 50, Appendix J A1.34 Structures Monitoring A1.35 Inspection of Water-Control Structures Associated with Nuclear Power Plants

- Concrete overall is in good condition
  - With exception of the reserve station service transformer concrete poles, no effects of ASR have been identified for NAPS concrete structures
  - During SLRA review, Service Water Valve House SM-28 exceeded 75% of the TRM total allowable settlement. Service water expansion joints were adjusted consistent with TRM required actions. SM-28 was surveyed and new baseline elevations established
  - NAPS concrete structures are managed consistent with GALL-SLR AMPs XI.S2, ASME Section XI, Subsection IWL, XI.S6, Structures Monitoring, and XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- The NAPS reinforced concrete Containments are in good condition
  - Recent containment liner - slab interface region examinations did not identify degradation
  - Containment concrete biological shield wall gamma and neutron irradiation remains within conservative radiation exposure levels, through SPEO, consistent with GALL-SLR
  - NAPS will manage each Containment consistent with GALL-SLR AMPs XI.S1, ASME Section XI, Subsection IWE, XI.S2, ASME Section XI, Subsection IWL, and XI.S4, 10CFR Part 50, Appendix J

Reactor Vessel Internals (RVI)

	SLRA Sections Addressing GALL-SLR Recommendations
Aging management of reactor vessel internals	3.1.2.2.9 Aging Management of PWR Vessel Internals (GAP Analysis) 3.1.2.2.10(2) Loss of Material Due to Wear A1.7 PWR Vessel Internals A2.2 Neutron Fluence Monitoring B2.1.7 PWR Vessel Internals

- NAPS will manage RVI Primary (P), Expansion (E), and Existing (X) examinations consistent with MRP-227, Rev. 1-A and associated NRC Safety Evaluation dated April 25, 2019
- In addition, the following SLR RVI component examinations are also incorporated into the PWR Vessel Internals program:
  - MRP-2018-022:
    Primary: Clevis Insert Bolts, Clevis Insert Dowels, Thermal Sleeves, Radial Support Key and Clevis Bearing Stellite Wear Surfaces
    Existing: Fuel Alignment Pins (Malcomized)
  - MRP 2019-009: Middle Axial and Lower Axial Welds (OTI – 50 year)
  - WCAP-17451, Rev 2: CRGT Continuous Section Sheaths and C-Tubes (Expansion)
- NAPS will manage RVI fluence projections consistent with GALL-SLR AMP X.M2, Neutron Fluence Monitoring Program
- NAPS will manage RVI examinations consistent with GALL-SLR AMP XI.M16A, PWR Vessel Internals including recent NRC guidance changes noted in SLR-ISG-2021-01, Updated Aging Management Criteria for Reactor Vessel Internals Components for PWRs.

Plant Specific TLAAs

	SLRA Sections Addressing GALL-SLR Recommendations
Plant Specific Time Limited Aging Analysis	A3.7.2 Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis A3.7.6 Reactor Coolant Pump Code Case N-481 A3.7.7 Cracking Associated With Weld Deposited Cracking

The following TLAA topical reports updated for 80 years were recently approved by NRC SE

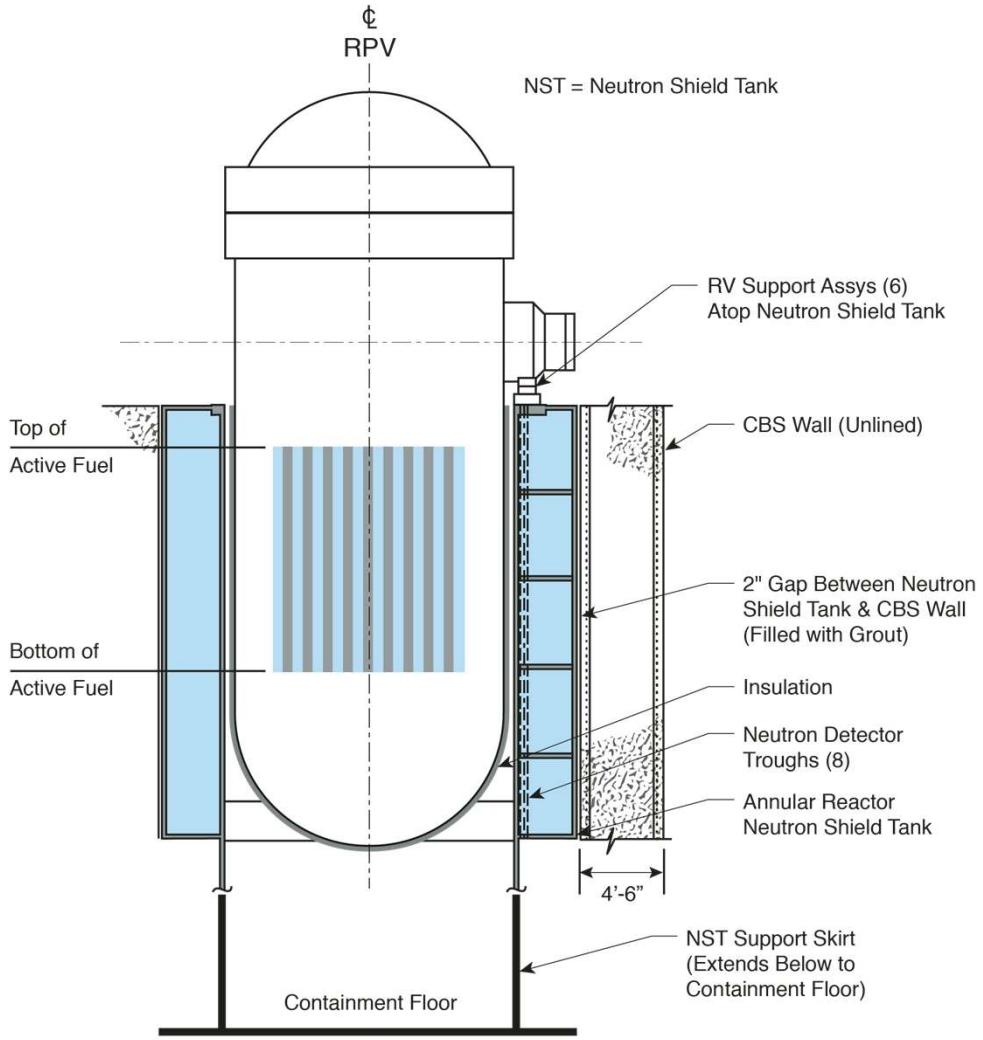
- Reactor coolant pump (RCP) fatigue crack growth analysis (PWROG-17011-NP-A, Rev 2)
  - PWROG-17011-NP-A, Rev 2 confirms the previous analysis remains appropriate for 80 years
  - The fatigue crack growth calculations assumed 6000 cycles of RCP start/stop for 80 years of plant life that bounds the projected NAPS cycle count.
- Fracture mechanics integrity assessment for RCP Code Case N-481 (PWROG-17033-P-A, Rev 1)
  - NAPS RCP model 93A casings are bounded by the evaluations and conclusions in PWROG-17033-P-A, Rev 1 for the crack stability analysis and the fatigue crack growth analysis; therefore, ASME Code Case N-481 is allowed.
- Reactor vessel underclad cracking associated weld deposited cracking (PWROG-17031-NP-A, Rev 1)
  - PWROG-17031-NP-A, Rev 1 projected the reactor vessel underclad fatigue crack growth analysis associated with weld deposited cladding to 80 years.
  - The following TLAA Action Items in the NRC Safety Evaluation were confirmed:
    - NAPS transient types and projected number of transient cycles are bounded by the analysis
    - Limiting RPV beltline forgings meet the 10 CFR 50.61 PTS screening criterion of 270°F
    - NAPS has implemented Leak-Before Break (LBB) analyses for primary loop piping

Reactor Vessel Embrittlement

	SLRA Sections Addressing GALL-SLR Recommendations
Reactor Pressure Vessel Neutron Embrittlement at High Fluence	3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement 4.2 Reactor Vessel Neutron Embrittlement Analysist A1.19 Reactor Vessel Material Surveillance A2.2 Neutron Fluence Monitoring

- Fluence projections through SPEO (72 EFPY) were performed for neutron embrittlement analyses
- Analyses for USE, ART, and P-T Limits for beltline materials have been satisfactorily evaluated using the 72 EFPY fluence projections
- USE analysis with less than 50 ft-lb Charpy USE was projected to the end of the SPEO with Equivalent Margin Analysis
- The applicability of the existing P-T limit curves has been extended to 72 EFPY with the use of updated initial material properties used to calculate ART values and K_{IC} methodology
- NAPS will manage fluence projections consistent with GALL-SLR AMP X.M2, Neutron Fluence Monitoring Program
- NAPS will manage embrittlement consistent with GALL-SLR AMP XI.M31, Reactor Vessel Material Surveillance Program
  - One capsule will be withdrawn from each unit prior to the SPEO during 2025 and 2026 RFOs
  - Four untested capsules remain in each unit and are available for SPEO fluence monitoring

Reactor Vessel (RV) Support Steel Configuration



Reactor Vessel Support Configuration

Dominion Energy®

Irradiation of RV Support Steel

	SLRA Sections Addressing GALL-SLR Recommendations
Irradiation of RV Support Steel	3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due To Irradiation A1.12 Closed Treated Water Systems A1.24 External Surface Monitoring of Mechanical Components A1.31 ASME Section XI, subsection IWF A1.34 Structures Monitoring

- Originally assessed in preparation of future license renewal activities by Stone & Webster under contract from DOE, WOG, EPRI, and Virginia Power
- Westinghouse DORT fluence model through 100 years (76.8 EFPY)
- New analysis was performed by Dominion for North Anna SLR
  - Fracture mechanic evaluation (ASME Code formulas for PT Curves)
  - Loads for dead weight, LOCA, and seismic
  - Based on use of lower bound K_{Ic} value of 33.2 ksi $\sqrt{in}$ to represent infinite amount of fluence
  - Critical stress (based on the K_{Ic} curve) using the lower bound toughness of 33.2 ksi $\sqrt{in}$ is greater than the stress on NST
  - Therefore, brittle fracture will not occur
- NAPS will manage aging consistent with:
  - B2.1.12 Closed Treated Water Systems
  - B2.1.24 External Surface Monitoring of Mechanical Components
  - B2.1.31 ASME Section XI, subsection IWF
  - B2.1.34 Structures Monitoring

Dominion Energy SLR Summary

- North Anna SLR met the expected norms established with the most recent industry LR/SLR applications
- North Anna SLRA was developed using the same highly experienced team used for Surry SLR
- North Anna had a high degree of consistency with GALL-SLR, which resulted in a high quality SLR Application that included lessons learned from Surry's SLRA
- Dominion Energy has committed future investments in people, program enhancements and equipment modifications for the SPEO

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Protecting People and the Environment

Advisory Committee on Reactor Safeguards
Plant License Renewal Subcommittee

North Anna Power Station, Units 1 and 2
Subsequent License Renewal Application (SLRA)
Safety Evaluation Report (SER)

December 15, 2021

Hector Rodriquez-Luccioni, Project Manager
Office of Nuclear Reactor Regulation

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Presentation Outline

- Overview of Safety Review of North Anna SLRA
- SER:
  - Section 2: Scoping and Screening Review
  - Section 3: Aging Management Review
  - Section 4: Time-Limited Aging Analyses
- Specific Areas of Review
- Inspections and Plant Material Conditions
- Conclusion on North Anna SLRA Review

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North Anna, Units 1 & 2: License Renewal

Initial License Renewal

Unit	Initial License	Initial License Renewal Application	Renewed License	Expiration Date
1	4/1/1978	5/29/2001	3/20/2003	4/1/2038
2	8/21/1980	5/29/2001	3/20/2003	8/21/2040

Subsequent License Renewal

Application Submitted	8/24/2020
Acceptance Determination	10/15/2020
Draft Safety Evaluation Report with No Open or Confirmatory Items	10/18/2021

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Audits

- Aging Management Audit
  - October 13, 2020 – January 8, 2021
- Three Parts
  - In-Office Technical Review Audit
  - In-Office Breakout Sessions
  - On-Site Audit

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SER Overview

- Draft SER with No Open or Confirmatory Items: October 18, 2021

- Requests for Information (total – 47):
  - Request for Additional Information (RAIs)- 38
  - Request for Confirmation of Information (RCIs) - 9

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SER Section 2

Structures and Components Subject to Aging Management Review (AMR)

- Section 2.1 – Scoping and Screening Methodology
- Section 2.2 – Plant Level Scoping Results
- Sections 2.3, 2.4, 2.5 – Scoping and Screening Results

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SER Section 3

Aging Management Review (AMR)

- 3.0 – Use of the Generic Aging Lessons Learned Report
- 3.1 – Reactor Vessel, Internals, and Reactor Coolant System
- 3.2 – Engineered Safety Features
- 3.3 – Auxiliary Systems
- 3.4 – Steam and Power Conversion Systems
- 3.5 – Containment, Structures and Component Supports
- 3.6 – Electrical and Instrumentation and Control Commodities

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SER Section 3

3.0.3 - Aging Management Programs (AMPs)

SLRA - Original Disposition of AMPs	SER - Final Disposition of AMPs
○ 7 new programs • 7 consistent ○ 41 existing programs • 17 consistent • 24 consistent with enhancements and/or exceptions	○ 7 new programs • 7 consistent ○ 41 existing programs • 16 consistent • 25 consistent with enhancements and/or exceptions

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SER Section 4

Time-Limited Aging Analyses (TLAAs)

- 4.1 – Identification of TLAAs
- 4.2 – Reactor Vessel and Internals Neutron Embrittlement Analyses
- 4.3 – Metal Fatigue Analyses
- 4.4 – Environmental Qualification of Electric Equipment
- 4.5 – Concrete Containment Tendon Prestress Analysis
- 4.6 – Primary Containment Fatigue Analysis
- 4.7 – Other Plant-Specific TLAAs

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Specific Areas of Review

- Buried Gray Cast Iron Piping
- Reactor Pressure Vessel Neutron Fluence
- Irradiation Effects on Reactor Internals
- Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation
- Electrical Cable Qualification

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Buried Gray Cast Iron Piping in Fire Protection System

- 6 ruptures prior to 2003
- Identified as cracking due to cyclic loading – during pump start testing
- Changed test procedure in 2003 to limit pressure in downstream piping – no ruptures since then
- Multiple inadvertent pump starts have occurred without failures
- Material is also subject to selective leaching
- Material is brittle

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Buried Gray Cast Iron Piping in Fire Protection System

- Enhancements 5 (for selective leaching) and 6 (for cracking) to the Buried and Underground Piping and Tanks Program
- 6 gray cast iron locations to be excavated each 10 years
  - 5 piping 10-foot lengths and 1 piping or component for Selective Leaching program
  - Visual and magnetic particle to inspect for cracking
  - Radiography on a 1-ft section if cracking is identified, to determine cause
    - If defect is from manufacturing and not aging: document
    - Cracking due to aging will result in crack growth and flaw stability evaluations to end of subsequent PEO
    - Projected loss of function will enter the Corrective Action Program for extent of condition, extent of cause and further follow-on actions

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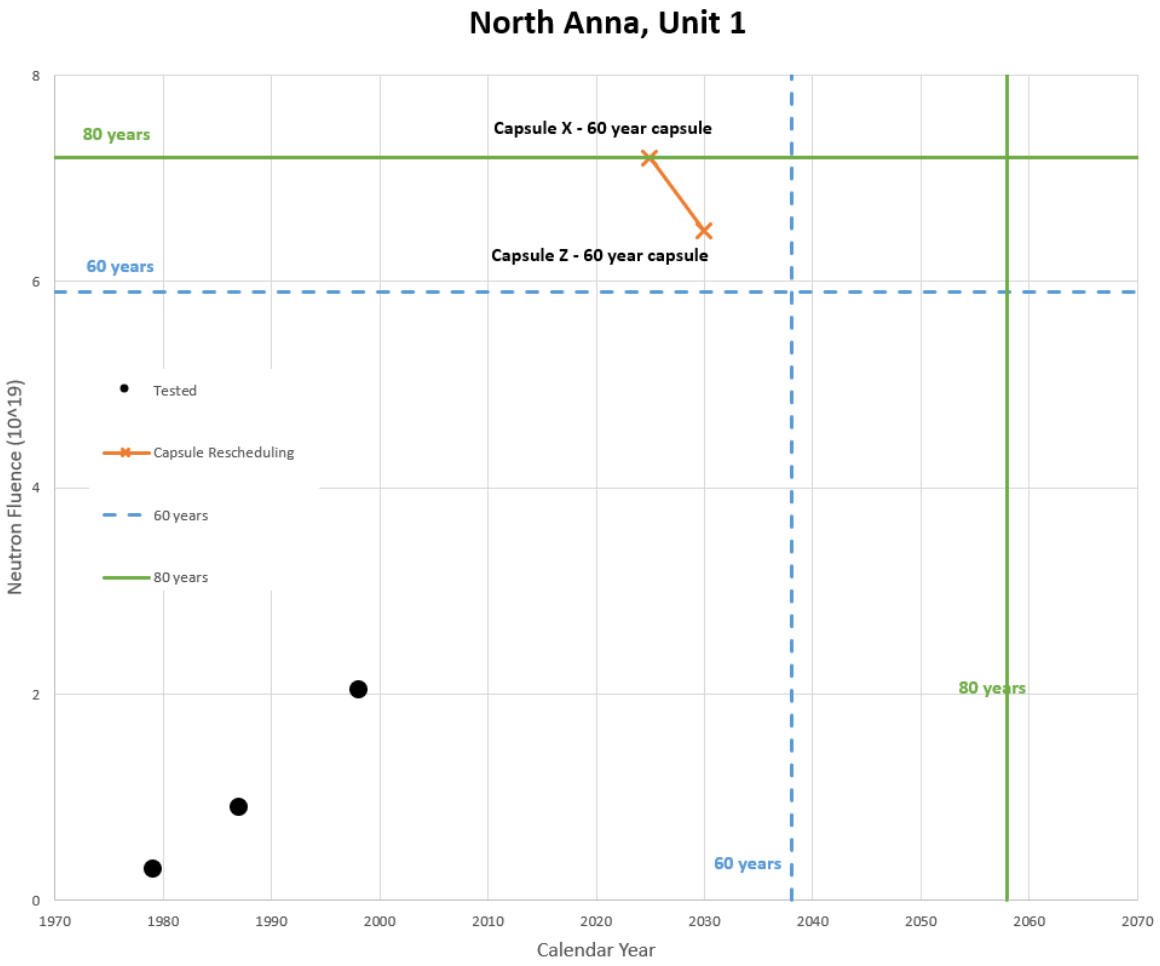
Reactor Pressure Vessel Neutron Embrittlement

- Unit 1 – 80-year projected peak neutron fluence of 7.20 x 10^{19} n/cm^2 (E>1.0 MeV)
  - Capsule X achieves 80-year projected peak neutron fluence at approximately 39.1 EFPY (~2025)
- Unit 2 – 80-year projected peak neutron fluence of 7.34 x 10^{19} n/cm^2 (E>1.0 MeV)
  - Capsule X achieves 80-year projected peak neutron fluence at approximately 39.3 EFPY (~2026)



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Reactor Pressure Vessel Neutron Embrittlement

- Upper Shelf Energy (USE)
  - Limiting USE value at 72 EFPY
    - 50.0 ft-lbs for the Unit 1 Inlet Nozzle Forging 11
    - 48.2 ft-lbs for the Unit 2 Intermediate Shell Forging 04
  - Applicant conservatively performed equivalent margin analysis (EMA) for:
    - Upper and Intermediate Shell Forgings
    - Inlet and Outlet Nozzle Forgings and Welds
  - Analyses have been projected to be no less than 50 ft-lbs or EMA demonstrated lower values of Charpy USE will provide margins of safety against fracture to the end of the SPEO
- Pressurized Thermal Shock (PTS)
  - Limiting RT_{PTS} value for base metal or longitudinal weld materials at 72 EFPY
    - 212.2° F - Unit 2 Lower Shell Forging 03
  - Limiting RT_{PTS} value for circumferentially oriented welds at 72 EFPY
    - 136.3° F - Unit 1 Intermediate to Lower Shell Circumferential Weld Heat # 25531
  - PTS analyses have been projected to be below screening criteria in 10 CFR 50.61 at the end of the SPEO

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Reactor Vessel Internals Neutron Fluence

- Review Basis: The staff reviewed the 80-year neutron fluence values for the reactor vessel internals (RVI) components as part of the staff review of the RVI gap analysis that was included as part of SLRA AMP B2.1.7, PWR Vessel Internals.

- Staff Verification: The staff verified that the 80-year neutron fluence values for the RVI components were within the MRP-2018-022 neutron fluence ranges for the components at 72 EPFY.

- Reasonable Assurance: The staff determined that the 80-year neutron fluence values for the RVI components are appropriately accounted for in the applicant's gap analysis-adjusted PWR Vessel Internals Program.

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Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

- Review Basis: The staff reviewed Dominion's further evaluation of "Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation" of the concrete biological shield (CBS) wall and the reactor vessel (RV) steel support assemblies (SSAs).

- Staff Verification: Through review of documentation, audit activities, and requests for additional information, the staff reviewed and evaluated the aging management reviews (AMRs) of CBS wall and RV SSAs.

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Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation (cont.)

- Reasonable Assurance:

  For the CBS wall, the staff concludes that:
  - A plant-specific AMP is not required to manage aging effects due to irradiation.
  - Dominion Energy has demonstrated that the effects of aging due to radiation for Units 1 and 2 CBS walls will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

- For the RV SSAs (including Neutron Shield Tanks –NSTs), the staff concludes that:
  - Dominion Energy adequately assessed through fracture mechanics evaluations that a plant specific program is not needed to manage the effects of aging due to radiation (loss of fracture toughness, loss of function due to irradiation embrittlement) for Units 1 and 2 RV SSAs.
  - Dominion Energy has demonstrated that the effects of aging for the RV SSAs will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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Electrical Cable Qualification and Condition Assessment

- Review Basis:
- Cable qualification is required per 10 CFR 50.49.
  - For license renewal, cable qualification is a TLAA.
  - The applicant dispositioned the TLAA in accordance with 10 CFR 54.21c(1)(iii).
  - Environmental qualification (EQ) of electric component aging management program (AMP) consistent with GALL-SLR AMP X.E1.

- For cable condition assessment, the applicant proposed aging management consistent with:
  - XI.E3A, Electrical Insulation for Inaccessible Medium Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
  - XI.E3B, Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification
  - XI.E3C, Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

- Staff Verification: Through review of documentation, audit activities, and requests for additional information, the staff verified that the electrical cables will be age managed by AMPs that address the 10 program elements described in the GALL-SLR report.

- Reasonable Assurance: The staff determined that Dominion Energy has demonstrated that the effects of aging will be adequately managed, so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

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Region II
AMP Inspections

License Renewal Inspection Program for Initial Period of Extended Operations

Inspection	Dates	Results
U1 & U2 IP 71003 Phase 1	September 19-22, 2016 ML16306A189	No Findings
U1 & U2 IP 71003 Phase 2	Nov 27-Dec 15, 2017 ML18029A029	No Findings
U1 & U2 IP 71003 Phase 3	March 11-15, 2019 ML19134A146	No Findings
U1 & U2 IP71003 Phase 4	TBD	

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Region II: AMP Inspections
ROP Baseline Inspections

Inspection	Date	Aging Management Program
IP71111.08 ISI	Annually alternate units	Augmented Inspection Activities Boric Acid Corrosion Surveillance ISI Program – Component and Component Support Inspections ISI Program – Containment Inspections ISI Program – Reactor Vessel Reactor Vessel Internals Inspection Steam Generator Inspections
IP71111.07T Heat Sink	2006, 2008, 2011, 2014, 2017, 2020	Service Water System Inspections
IP71111.21M DBAI	4Q 2018 4Q 2021	Ensure the selected SSCs that are subject (operating in the post-40-year licensing period) to aging management review pursuant to 10 CFR Part 54 are being managed for aging in accordance with appropriate aging management programs.
IP71152 PI&R Sample Age-related capacitor degradation resulted in a reactor trip	2Q 2018	Preventive Maintenance Program

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Region II
AMP Inspections

Resident Inspector Insight and Inspection Results

- No findings from License Renewal Program inspections
- 2013: Green finding for the failure to failure to establish and implement appropriate periodic preventive maintenance for replacement frequency of the C4 capacitor on the Speed Error Amplifier card B (1A08D). The C4 capacitor failed due to age related degradation. (FIN 05000339/2013007-01)
- 2021: Green NCV for an inadequate procedure for handling age degraded safety related cable. (NCV 05000338,05000339/2021010-03)

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Region II: Plant Material Condition + Conclusion

- Plant material condition is generally acceptable and meets regulatory requirements for systems, structures, and components.
- The inspectors found that the AMPs were being implemented in accordance with the license condition.
- The NRC will continue to monitor AMPs using the baseline Reactor Oversight Process.

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SLRA Review Conclusion

Two differing professional views were provided during the review and concurrence process regarding the buried gray cast iron piping in fire protection system:

- Management has been working to address the issues identified.
- On December 6, 2021, Dominion provided a response to the staff's request for additional information (RAI) to ensure that the Final Safety Analysis Report (FSAR) supplement submitted on the docket matches the program as described in the supplements and RAI responses. The final safety evaluation will address the RAI and response.

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SLRA Review Conclusion – cont.

On the basis of its review of the SLRA, the staff determined that the requirements of 10 CFR 54.29(a) have been met for the subsequent license renewal of North Anna Power Station, Units 1 and 2.

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Backup Slides

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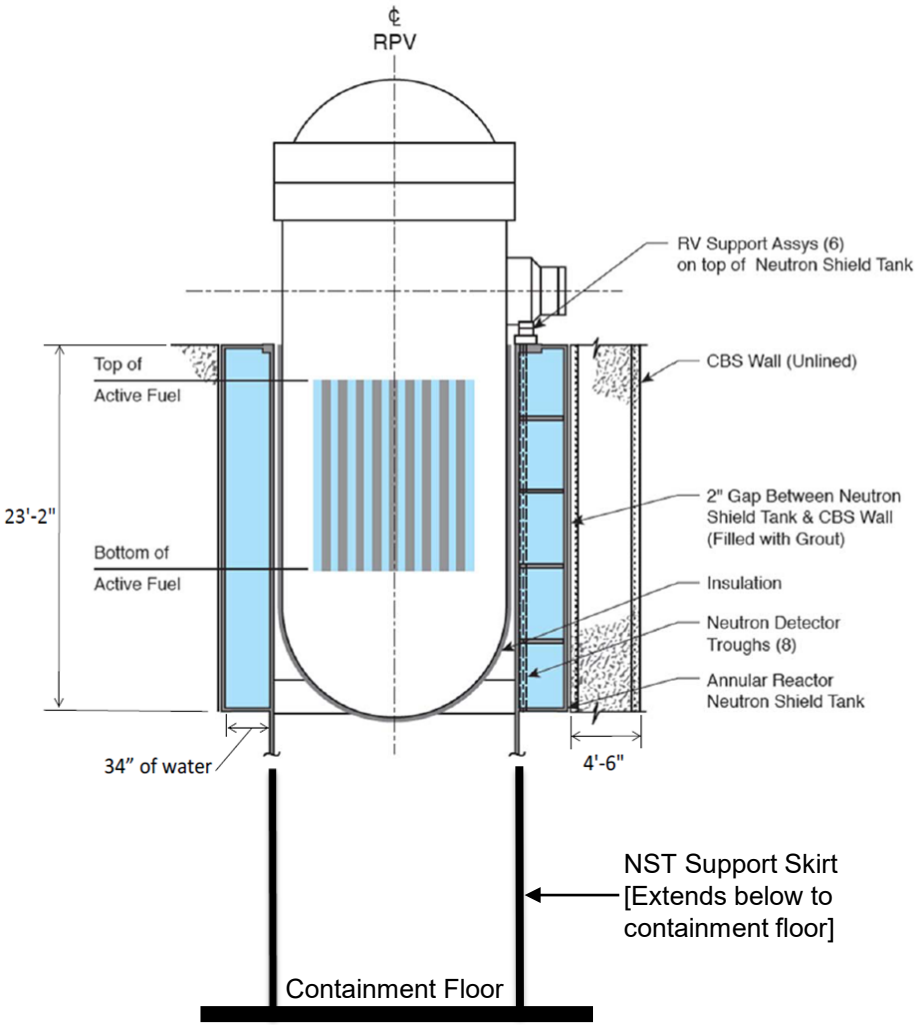
Irradiation Effects on Concrete Biological Shield Wall



Reactor Vessel Support Configuration

NST = Neutron Shield Tank

SRP-SLR 3.5.2.2.2.6 criteria for concrete is met and Dominion's determination that a plant-specific AMP is not required is acceptable:

- Calculated neutron fluence (3.15×10^{18} n/cm^2) and gamma dose (2.93×10^8 rad) at limiting locations for 72 Effective Full Power Years [EFPY] are below respective SRP-SLR thresholds (1×10^{19} n/cm^2 and 1×10^{10} rad) for potential degradation
- No plant-specific operating experience of irradiation degradation noted to date
- Accessible portions of wall will continue to be visually inspected by the Structures Monitoring Program

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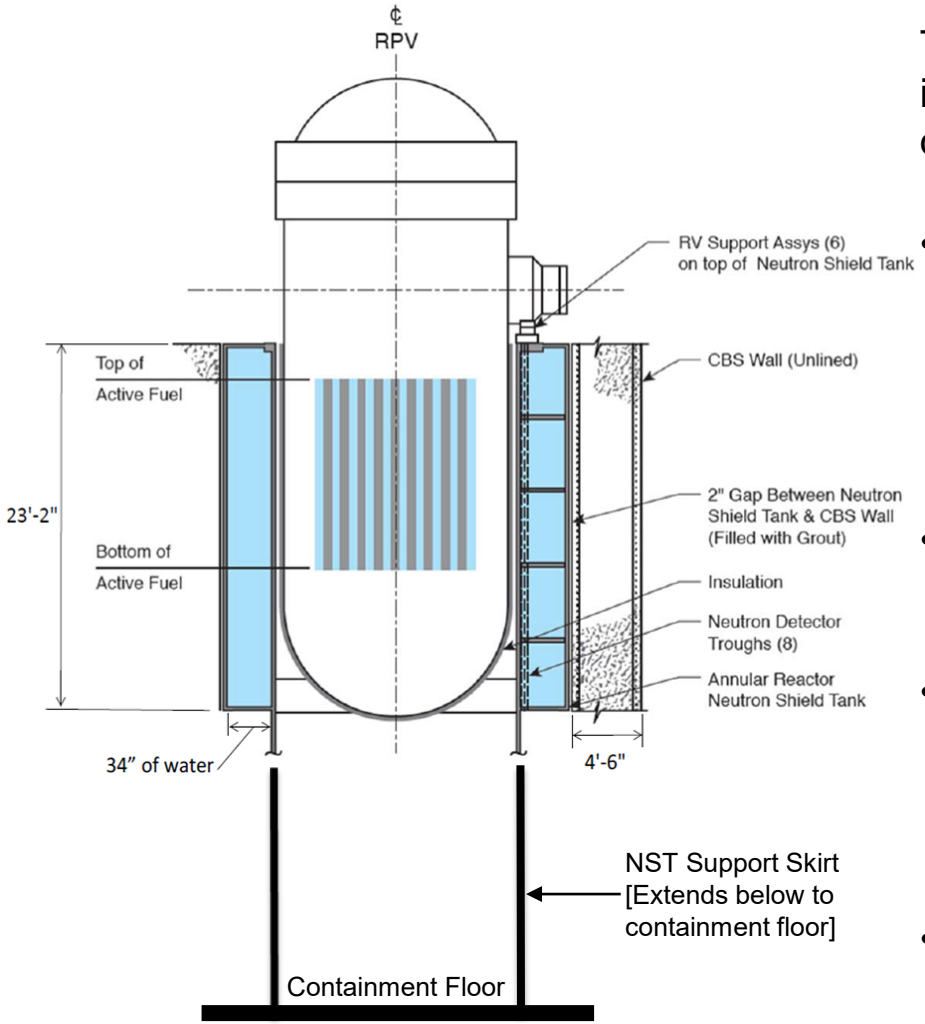
Irradiation Effects on Reactor Vessel (RV) Steel Supports



Reactor Vessel Support Configuration

NST = Neutron Shield Tank

The loss of fracture toughness due to irradiation embrittlement is an aging effect that does not require management:

- NST fluence and fracture mechanics evaluation demonstrated the aging effect will not occur and structural integrity will be maintained during subsequent period of extended operation
- No plant-specific operating experience of the aging effect identified to date
- Susceptible aging effects (loss of material / mechanical function) of RV Support Sliding Feet Assemblies (above NST) managed by *ASME Section XI, Subsection IWF* AMP
- Susceptible aging effects (loss of material / support function) of NST managed by *Structures Monitoring, and Closed Treated Water Systems* AMPs