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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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702ND MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

THURSDAY

FEBRUARY 2, 2023

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The Advisory Committee met via teleconference at 8:30 a.m., Joy L. Rempe, Chairman, presiding.

COMMITTEE MEMBERS:

JOY L. REMPE, Chairman

WALTER L. KIRCHNER, Vice Chairman

DAVID A. PETTI, Member-at-Large

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

CHARLES H. BROWN, JR., Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

JOSE A. MARCH-LEUBA, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANT:

DENNIS BLEY

DESIGNATED FEDERAL OFFICIAL:

WEIDONG WANG

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

8:30 a.m.

CHAIRMAN REMPE: Okay. Good morning everyone. It's 8:30 on the East Coast, and this meeting will now come to order. I hear an echo, so If you're out there on the virtual area, please make sure your microphones are muted. This is the second day of the 702nd Meeting of the Advisory Committee on Reactor Safeguards. I'm Joy Rempe, Chairman of the ACRS.

Other members in attendance are Ron Ballinger, Vicki Bier, Charles Brown, Vesna Dimitrijevic, Greg Halnon, Walt Kirchner, Jose March-Leuba, Dave Petti and Matt Sunseri, so we do have a quorum.

Similar to yesterday, the Committee is meeting in person and virtually. A communications channel has ben opened to allow members of the public to monitor the Committee discussion. Mr. Weidong Wang is the Designated Federal Officer for today's meeting.

During today's meeting, the Committee will consider the following topics: The Oconee subsequent license renewal application review. A transcript of the open portions of the meeting is being kept, and it's requested the speakers identify themselves and speak with sufficient clarity and volume so they can

be readily heard.

Additionally, participants should mute themselves when they're not speaking. At this time (audio interference) that even though Kent is the DFO for this topic, that Weidong, the minutes were provided or the opening remarks were provided to me, that he is still the DFO, okay? But anyway, do any other members have any opening remarks?

MEMBER HALNON: Joy, you didn't mention the consultants that are here.

CHAIRMAN REMPE: We don't usually do that in full Committee, okay?

MEMBER HALNON: That's right.

CHAIRMAN REMPE: Okay, anyway. Since yeah, we do not. Although we do have our consultant, Steve Schultz with us, we don't usually introduce them. It's only subcommittees that we do that. Okay. So then If not, I'd like to ask Matt Sunseri to lead us through our first topic for today's meeting. Matt.

MEMBER SUNSERI: Good morning. Thank you, Dr. Rempe. Today -- so I am Matt Sunseri. I'm the lead member for the Subsequent License Renewal Subcommittee. Today's review is for the Oconee Nuclear Station, which is operated by Duke Energy Carolinas, LLC. We handle the subsequent license

renewal review slightly different than other technical reviews that we engage, and that is for applications that have no open or confirmatory items.

We combine the subcommittee review with the full committee presentation into one session, and then bring that before the full Committee, and that's what we're doing today. Then we schedule a subsequent full Committee meeting to do the report preparation and further deliberations. However, the ACRS is an agile committee and we have found ourselves with some windfall time available during this session.

The Chairman is asking to see If could pull up the deliberations from the next meeting to this meeting for the report preparation, so we intend to do that. So after the presentations today, we will need some time to collect our thoughts and get ready, but we anticipate -- well no, we will start deliberations at 2:00 p.m. Eastern Time this afternoon, deliberation and report preparation for the Oconee SLR report that we will prepare.

And I make that announcement for any members of the public that are listening in and care to oversee that deliberation this afternoon. So I before I continue, are there any questions about that change in the process?

CHAIRMAN REMPE: I'd just add, although I anticipate we will be done this afternoon with -- and be able to pass out the letter report, if something were to happen, because you never know at the ACRS, we do also have time after our PMP tomorrow too to finish it. So I really do suspect we'll be done with the report this meeting.

MEMBER SUNSERI: Yeah, that's a good point. So we have the rest of this session to complete that report if we need to take that time. Hopefully, we'll get through it this afternoon.

Okay, very good. So I'll continue on, and like other members, because I do some work outside of the ACRS and other clients that I support, I have a potential conflict on one of the technical aspects of this review. So I will be recusing myself from deliberations on the portion of the review related to metal environmental fatigue, or irradiation, embrittlement and reactor --

Now I now turn to Brian Smith, Director of the New and Renewal Licenses, for comments. Brian.

MR. SMITH: Good morning, Chairman Rempe and Committee members. My name is Brian Smith. I'm the Director of the Division of New and Renewed Licenses.

(Audio interference.)

CHAIRMAN REMPE: Yes. Thomas, do you know why it did this? Okay, okay. We'll see If that keeps up. The other thing I wanted to mention Brian, would you put your microphone a little closer to where you're talking so we can hear you better. Thank you.

MR. SMITH: Yes ma'am. Once again, good morning everyone. Brian Smith, Director of the Division of New and Renewed Licenses in NRR. Pleased to be here today, and we appreciate the opportunity to present the results of our review of the sixth application for Subsequent License Renewal.

This application was submitted by Duke Energy for the Oconee Nuclear Station, Units 1, 2 and 3, located in Seneca, South Carolina. The background: Oconee Units 1, 2 and 3 received approval for their initial license renewal from the NRC on May 23rd, 2000. The application at that time was submitted prior to when NRC issued the initial generic Aging Lessons Learned report or the GALL report.

The initial GALL report was issued in 2011. The NRC guidance for license renewal has evolved over the years through enhancements and improvements based on the lessons learned from NRC application reviews and from consideration of both

domestic and international industry operating experience.

This initial GALL report for license renewal went through two revisions, with additional interim staff guidance following Revision 2. GALL Report Revision 2, along with these ISGs, were used to develop the guidance for subsequent license renewal that's contained in the GALL SLR report.

In addition to the previous license renewal guidance, the GALL SLR report included additional focus on aging management and time-limiting aging analyses for operation in the 60 to 80 year time period.

The NRC project manager for the Oconee Subsequent License Renewal application review is Mark Yoo. Mark will introduce the staff who will be presenting and addressing the questions regarding the safety review. Part of the management team here with me today is Lauren Gibson, to my right, Chief of the License Renewal Projects Branch, as well as branch chiefs for the staff involved in the technical review.

Also with us today is our senior technical advisor for Aging Management, Dr. Allen Hiser, who will be able to answer questions from the Committee. This will be Allen's last time for the ACRS before he

retires, we think for the last time, at the end of the month. So we appreciate Allen coming back for an additional year to help us with some knowledge management activities.

Replacing Allen is Dr. John Wise, who's here today as well. He comes to us from NMSS. He does have prior experience in reactor license renewal reuse. He left NRR to go to NMSS to help them develop their license renewal program for storage casks. He's presented in front of you several times in that role at NMSS. So we're glad to have John on board with us.

Jared Nadel, senior resident inspector at Oconee, will discuss the regional inspection activities, and Paula Cooper, Region II, Senior Reactor Inspector, is attending virtually and will also support today's presentation. I'd like to note that the staff completed its review with no confirmatory or open items in the safety evaluations.

Finally, we will address any questions you may have on the staff's presentation, and we look forward to a production discussion today with the ACRS. At this time, I would like to turn the presentation over to Ms. Rounette Nader, Director of License Renewal at Duke Energy, to introduce her team and commence the presentation.

MS. NADER: Thank you, Brian. Good morning. Thank you Chairman Rempe and members of the ACRS. My name is Rounette Nader. I am the Director of License Renewal for Duke Energy, including the Oconee Subsequent License Renewal Project. I'm going to MC the Duke discussion today. We appreciate the opportunity to speak with the ACRS Full Committee today on Duke Energy's application for subsequent license renewal.

This is an important milestone in the process, and we look forward to presenting the application highlights to the Committee.

Next slide, please. I want to take a moment to introduce the team assembled to present the application, the Oconee subsequent license renewal application. I'll provide additional background on each speaker throughout as I introduce them to speak, but I will introduce them now. First we have Mr. Steve Snider to my left. Steve is the Oconee Site Vice President.

Next we have Greg Robison to my right. Greg is the engineering manager responsible for the development of Oconee subsequent license renewal application, and finally we have Joe Terrell. Joe is a lead engineer responsible for the Cost 1 portions of

the Oconee subsequent license renewal application, and will be discussing some specific programs today.

In addition to the presenters at the table, we have other members of the Duke subsequent license renewal team throughout the room here today, as well as a Duke team assembled in a conference room in Charlotte. These teams are in a position to assist with any questions the ACRS may have today.

So first a little about myself. As I mentioned, I'm responsible for license renewal at Duke Energy and the SLR application process, as well as the project to implement the commitments from the initial license renewal for the Duke Energy fleet. I began my career at Oconee Nuclear Station in design engineering, and from there I joined the initial license renewal team in 1996, and was part of the team that assembled the second license renewal application in the country to be submitted to the NRC.

After finishing license renewal on Oconee, McGuire and Catawba Nuclear Stations, I had various roles in licensing, projects, business planning and strategy before rejoining the license renewal efforts at Duke.

Next slide, please. So I want to cover the agenda for today's meeting. First, Steve Snider

will provide an overview of the Oconee Nuclear Station and discuss recent station performance. Steve will also discuss significant plant upgrades that demonstrate Oconee's investment in the continued safe and reliable operation of the plant.

Then Greg Robison will discuss the Oconee subsequent license renewal application. Greg will discuss the development of the application and the advancements and changes between Oconee initial licensure renewal, which was a pre-GALL plant, as Brian mentioned, and subsequent license renewal.

Greg will discuss the integrated plant assessment results and provide an overview of the subsequent license renewal aging management program alignment to the SLR GALL. Finally, Greg will discuss initial licensure and aging management program effectiveness reviews, and how Oconee is continuing to ensure license renewal commitments are met and will continue to be met for subsequent license renewal.

Joe Terrell will discuss our specific technical topics. He will discuss the reactor vessel internals, reactor vessels supports and irradiated concrete. Finally, I will wrap up with some closing remarks. So of course, the ACRS members, you are welcome to ask questions as we go, but do note that

I'll pause at the end of each of these three major topics that we plan to cover and open the floor for any questions that you may have, and we can cover them then as well. Next slide, please.

MEMBER SUNSERI: And so I'll just interject now. So I just meant to say this during the opening, but I think it's remarkable that you have so many folks here to participate in this deliberation in-person, and that we've done this a couple of times and I think this truly shows the commitment on your part to have a quality interaction with us today.

I think that is also reflected in the quality of the application. So I just wanted -- I know it's a hardship to bring this many people to Washington, D.C., but I wanted to extend my appreciation for it.

MS. NADER: Thank you, and we very much appreciate being here in person. I'm glad that we were able to do that. So next up is Steve Snider. Steve Snider will give, as I mentioned, the Oconee Nuclear Station plant overview.

Steve began his career, his energy career as an electrical engineer in design engineering. He held various positions of increasing responsibility in engineering at Catawba Nuclear Station, receiving his

senior reactor operator license and continued with management roles at Catawba and McGuire Nuclear Stations in engineering, operations and maintenance.

In 2019, Steve was named the Vice President of Corporate Nuclear Engineering, responsible for functions such as nuclear fuel management and procurement, core design and nuclear safety analysis, and in April 2021, Steve was named the Oconee Site Vice President.

MR. SNIDER: Good morning Chairman Rempe and board members. So I'll start with -- go to the next slide. I'll give a quick overview of Oconee. You can see Oconee is a three unit Babcock and Wilcox nuclear station processing design. We are a pressurized water reactor with -- cooling. I'm standing closer to the mic.

We produce nominally 2,554 megawatts. That's enough to power more than 1.9 million homes. We sit adjacent to Lake Keowee and Seneca in upstate South Carolina. Our emergency AC power supply for Oconee is supplied by Keowee Hydroelectric Station, which is a bit unique for a nuclear power plant. Then we also have a standby shutdown facility, which is a backup to existing safety systems and provides additional defense-in-depth.

A couple of other comments. Duke Energy's annual economic impact just in Oconee County each year is roughly $1.8 billion, so a rather significant impact, positive impact to the communities and customers that we serve. Also, our -- and also --

(Audio interference.)

CHAIRMAN REMPE: That isn't coming from your computer, right? Because they -- okay. There seems to be a mic open. Can figure out who's line is open?

(Pause.)

CHAIRMAN REMPE: So let's try again. We are having the other noise. If that happens again, we'll continue to try and figure out where it's coming from, and I apologize.

MR. SNIDER: Okay.

CHAIRMAN REMPE: Go ahead.

MR. SNIDER: The last comment I was going to make on this slide is that we are a carbon free source of energy, so in the County alone it counts for avoiding 15 million tons of CO2 annually.

We'll move to the next slide. Here's another layout of the site. If you start in the lower left-hand corner, north is pointing up. So like in the southwest corner you can see the intake for the

site. Just above that, you can see the shutdown, standby shutdown facility that each one of the three units lined up there over Unit 1, the north-most unit. Then Unit 2, then Unit 3 to the south.

There is an aux building adjacent to that, and then a common turbine building that houses the turbine generators and secondary systems. Unit 1 output to the 230 kV switch yard, which you see relatively in the middle of the picture, and then Unit 3 outputs to the 525 kV switch yard.

And then further to the right, you can see Keowee hydroelectric station, and then Lake Keowee to the north. Any questions about the layout?

MEMBER HALNON: Yeah Steve, it's Greg. The intake, is that -- is that the river that feeds Lake Keowee or is it --

MR. SNIDER: It's hard to look at looking at it from above, because of the elevation differences. But the intake is part of Lake Keowee. It just circles around that part of the plant.

MEMBER HALNON: Okay. In the switch yards, you say 1 and 2 is out to 230. Is it a ring bus, or is that a -- how is that? I'm looking at shared systems. What are the shared, where's the shared systems up there?

MR. SNIDER: The 230 kV switch yard is the emergency offsite power source. It all comes to this 230 kV switch yard. Unit 3 just generates through the, to the 525 kV switch yard.

MEMBER HALNON: Okay. All the emergency power is through 230, right Todd?

MR. GREEN: Yep, that's correct.

MEMBER HALNON: Okay, thank you.

MR. SNIDER: All right, next slide. Some of this was previously covered, but you can see there where we currently are with our licenses. We also have a fuel storage facility, and the current license expires for Unit 1 and Unit 2 in 2033, and for Unit 3 in 2034. We did submit our subsequent license renewal application in June 2021. I don't have to say that. That's why we're here today.

Okay, we'll go to the next slide. Overall performance. I would rate Oconee's performance as very good. Each unit operates on a 24 month refueling cycle. We did have breaker to breaker runs for the last full cycle that we completed for each one of the units. You see the plant capacity factors listed there for the last three years, and on average, the three-year average for each of the units is greater than 95 percent capacity factor.

And then from a regulatory status, we are in Action Column 1, and all of our ROP indicators are currently green.

DR. SCHULTZ: Steve, this is Steve Schultz. The power uprate that was approved in 2021, that was the measurement uncertainty recapture. Is that -- how much was achieved there?

MR. SNIDER: We are still implementing that. We're anticipating about 14 megawatts per unit between implementation and the leading edge flow meters and the actual upgrade.

DR. SCHULTZ: So on this slide, you note that each unit's on a 24-month refueling cycle. Are there any other operational improvements or uprates that are anticipated over the period of subsequent operation?

MR. SNIDER: We do not currently have any planned uprates beyond the measurement uprate.

DR. SCHULTZ: So Rowley's doing studies --

MR. SNIDER: Right, in the future. But right now we don't have any actual projects to do.

DR. SCHULTZ: Nothing is planned, and If anything did change in that regard, you'd need to come back in and --

MR. SNIDER: Absolutely.

DR. SCHULTZ: --make modifications, have those approved?

MR. SNIDER: We are planning to do studies along those, what would be required, whether or not it's even feasible related to doing upgrades. But If we did decide to move forward with any of those yes, it would -- it would require licensing actions.

DR. SCHULTZ: But not part of this application?

MR. SNIDER: No, certainly not part of this application.

DR. SCHULTZ: Thank you.

MR. SNIDER: Okay, next slide. We have done a significant number of plant modifications since initial license renewal. I will highlight a couple. The first two we have replaced the once-through steam generators on all three units. We have replaced the reactor vessel heads for all three units. We also invest in modernizing Keowee as well. We've replaced the rotors and the stators associated with both Keowee units.

There's a number listed here and there's a lot that aren't listed that we've just done, we've done significant capital investments, both to improve reliability and also to improve risk improvement

related to nuclear safety for the units as well.

MEMBER SUNSERI: Steve, I've got a couple of -- oh, go ahead Greg.

MEMBER HALNON: Oh okay, I was going to ask -- So a number of years ago you had from the Keowee issues, some cables, cabling issues with the NRC. Did that get modification to resolve that, or was that a --

MR. SNIDER: That has been resolved. There were some follow-up commitments that we made associated with that, and those have all been implemented.

MEMBER HALNON: So it's testing and evaluation basically? Is that --

MR. SNIDER: I didn't fully hear the question. The questions were related to the cable separation issue and how that was resolved?

MEMBER HALNON: Yeah. The question was how was that resolved? Did you -- Steve mentioned some commitments. What were those? Are those ongoing commitments, or are they all completed?

MR. GREEN: Well, the commitments are complete.

MEMBER HALNON: Is there -- so I think you need to come to the microphone.

CHAIRMAN REMPE: And state your name.

MEMBER HALNON: State your name.

CHAIRMAN REMPE: All that stuff.

MR. GREEN: Okay. I'm Todd Green. I'm the general manager at Oconee Engineering.

(Simultaneous speaking.)

CHAIRMAN REMPE: There's no mic up there. So he's doing the right thing, but he just --

MR. GREEN: Talk to the green light.

CHAIRMAN REMPE: Yeah.

MR. GREEN: Any time. That issue has been understood and has been resolved. There's no open commitments associated with it. We did do modifications to improve the separation for the cables that were in question.

MEMBER HALNON: Okay. So that's behind you and everyone's --

MR. GREEN: Yes sir.

MEMBER HALNON: Okay. Great, thanks.

MEMBER SUNSERI: I had a question about Keowee also. The replacement of the rotor poles and the stator, I guess that's for the electrical generator part. What is the output of those generators, and are there -- is there any, I guess, why was that done and is there any life limiting

components on there?

MR. SNIDER: We are constantly maintaining those units. I mean we very much have the long view in line in terms of being able to maintain those units. So it -- considering the -- a lot of that was time-based in terms of just making the units reliable. We consider all of Keowee in terms of what's needed to maintain those generation assets, whether it's control systems or the generating components. We are continuing to make major upgrades to Keowee for the life of the station.

MEMBER SUNSERI: Okay, and while we're on this table, I don't want to get into a digital I&C meeting here, but what was the scope of the safeguards and reactor protection system upgrades?

MR. SNIDER: We completely replaced the reactor protection and ES system with a digital system.

MEMBER SUNSERI: The whole, everything?

MR. SNIDER: Complete upgrade.

MEMBER BROWN: That was actually reviewed here. When I got here in 2008, that one was run past us, although we did not have a specific meeting when I was here. It might have occurred right before me.

MEMBER SUNSERI: Okay. Can you just tell

us a little bit about what a protected service water system is?

MR. SNIDER: The protected service water was a rather significant risk improvement action. It installed an additional power supply, additional cooling water pump, basically did a fairly significant amount of work to -- a different way to get power into Oconee.

As Rounette said before, I came to Oconee in 2021. One of the things that really impressed me about Oconee is the number of different ways we can get power in to be able to support managing the units. The protected service water project is largely another way to get power to be able to support the safety systems. It's additional power supply for the HPI pumps, an additional cooling water pump.

MEMBER SUNSERI: I guess I'm losing the connection there. Protected service water power on it?

MR. SNIDER: The cooling water is a secondary cooling water pump.

MEMBER SUNSERI: Right. So that doesn't have anything to do with power supply though?

MR. SNIDER: There was additional power supply as in a power line that came in as part of that

project.

MEMBER SUNSERI: Okay. That's not -- that modification is not listed in this list, right?

MS. NADER: This is Rounette Nader. We typically have just called this entire project a protected service water project, but yeah, it was bigger than just service water, as Steve mentioned.

MEMBER SUNSERI: Okay.

MS. NADER: So maybe a bit of a misnomer, and that's because that's just typically what we've called it. It was a very large multi-year project.

MEMBER SUNSERI: Okay, yeah. I'm just trying sort out what protected and, you know, so I get it. I understand what you're saying now. I think that's all I have for now.

MEMBER HALNON: Yeah, and just one more question. Back on the reactor vessel heads, the 2003-ish replacement, is that the proactive replacement based on the MRP projects that said it's probably good to get replacing, or are they reactive from the standpoint that you actually had some cracking in the CRDMs?

MR. SNIDER: It was, it was both. I mean we were seeing indications and had to respond to those, and it was obvious the best thing to do in

terms of nuclear safety was just to replace the heads. I mean we continued to do inspections going forward just --

(Simultaneous speaking.)

MEMBER HALNON: Any issues with the new heads? No leakage, no indications or anything?

MR. SNIDER: No sir.

MEMBER HALNON: Thanks.

MEMBER BROWN: You know, this is Charlie Brown. Just to turn this into a digital I&C meeting again, I just wanted to refresh my memory that when you say it was a digital system (audio interference), my memory was that was a software-based, microprocessor-based digital I&C replacement. I remember some words like triple modular redundance and a bunch of stuff like that --

MR. SNIDER: That's correct.

MEMBER BROWN: I just wanted to make sure that was the one --

MR. SNIDER: That's it.

MEMBER BROWN: --I was informed was being installed so --

MR. SNIDER: Correct.

MEMBER BROWN: And it had -- I presume it's worked satisfactorily over the last 11-12 years?

MR. SNIDER: Very much so. It was a tremendous reliability and safety improvement related to that situation.

MEMBER BROWN: Okay. Just wanted to confirm that our expectations were met.

MR. SNIDER: It was one of the -- I want to say it's one of the smarter decisions we made, to launch off and do that and work through that.

MEMBER BROWN: A lot of analog stuff doesn't have to vary. The software-based systems are much more reliable for that kind of thing.

MR. SNIDER: That's correct.

MEMBER BROWN: All right, thank you.

MEMBER BALLINGER: This is Ron Ballinger. To be clear, when you did the head replacement, you went from 80 to 182 weld material and 600 to 52 and 152 and 690?

MR. SNIDER: I'm going to --

MR. TERRELL: This is Joe Terrell, and the answer is that is correct.

MEMBER BALLINGER: Okay.

MR. TERRELL: They're all, those nickel-based materials are all stress corrosion crack-resistant materials.

MEMBER BALLINGER: That's what I thought.

MR. SNIDER: All right. If there are no other questions, I'll turn it back over to Rounette.

MS. NADER: Thank you Steve. Next slide. Thank you. Before we move on, any other questions on the plant and the upgrades? Okay, thank you. Next up is Greg Robison. As I mentioned, Greg will mention that -- Greg will discuss the Duke subsequent license renewal process.

Greg has over 40 years' experience at Duke Energy with work in nuclear design, construction, programs and licensing. In the 1980's, Greg was involved in the development of license renewal concepts, and in the 90's the regulatory design, including the development of the first rule and what we then referred to as "the new rule," which is the rule that governs our license renewal process today.

He went on to lead the successful Oconee, McGuire and Catawba initial license renewal efforts, and then spent the next almost 20 years leading a number of high profile efforts for Duke, before returning to his license renewal roots to lead the Oconee subsequent license renewal project. We're fortunate to have Greg's license renewal experience and leadership on this project. Greg.

MR. ROBISON: Thank you, Rounette. Good

morning. Yes, Greg Robison here. Nice to be able to share a few thoughts with you this morning. Next slide, please. I thought I would start with an object lesson this morning. We had taken this picture. I guess this is the stack of paper representing the application, 4,010 pages, 19 inches tall. Glad we didn't have to bring 40 copies this time to Washington.

MEMBER BALLINGER: Was it three-hole punched?

MR. ROBISON: It had to be, yes, because we put it in the Seneca public reading room, yes. So I'm going to take a few minutes and talk about the, do a little overview of the development of the application, and then talk about final results, programmatic results.

MEMBER HALNON: So how does that compare to the first one you did?

MR. ROBISON: It's about another third larger than the first one.

MEMBER HALNON: Not too bad.

MR. ROBISON: Simpler in there, and maybe that fits into the discussion of the standards here. So we did have an in-house development team pull this together. We had about 20 people on the core team

pulling this together. The idea was -- you see many of them here with us today. We had technical, project management, legal and licensing support and expertise there on the team, many of which had previous license renewal experience, and a number of which had pervious Oconee experience.

So we had a nice blend of historical perspective as well as working on the new perspective, as we worked part of the team. We had key vendor support with Framatome, Structural Integrity and Enercon. Enercon helped us put our environmental work together. So we had, we reached out to the industry strengths and added them to the Duke team. So I feel like we had a really strong people side effort here.

Talk a little bit about contemporary guidance. We did use all of the current guidance. Yes, as Brian introduced, we were a pre-GALL plant. I'm going to speak a little bit more about that in a few minutes. I just was very impressed with the guidance that we have available today, compared to what we had back in the 90's. It's coming along very mature. It worked. I came in as a skeptic and I'm going out a believer, and that's probably the strongest testimony I can give.

We used the contemporary guidance for

scoping and screening, aging management, time-limited aging analysis work, as well as the programmatic aging management program work.

Next slide, please. The other thing we added to the recipe to build the application was lessons learned and experience. We reached out to the industry. I want to say a thank you to the lead plants for guidance interpretation, SLR GALL guidance and SRP interpretation.

Issue resolution, we followed them right along, made sure we understand what they were working on. They were more than gracious to provide that guidance to us, so we could apply it to Oconee, and then that ended up resulting in a license renewal application that I believe was very readable and structured in that way.

The License Renewal team at Duke participated at the industry level. We were around in the development of SRL, the GALL SLR. That helped shape our perspectives there. We supported other applicants during peer reviews and they supported us, which built quality into our work.

From there, we actually reached out to our current program owners at Oconee, to understand where we are on the initial licensing programs. We knew

that was our starting line. So we wanted to go and very much immerse ourselves in that and understand that starting line, as we looked towards 80 years of building programs that would work through the subsequent period.

We also worked with them when they had their -- and I believe we'll talk a little bit about that. The NRC will talk about that later this morning.

MEMBER HALNON: So Greg, you mentioned you reached out to the program owners. Was the first license renewal, commitments and program changes and all those, were those just integrated into the normal way of doing business, or did you have a separate license renewal type person that's tracking these commitments?

MR. ROBISON: When we left, we actually had a separate person for a good long, and we do still now. We have a fleet level person that's doing that for us now, and that was something that we felt was important at the end of initial license renewal, when the team turned over the commitments to the site. We wrote them down and we felt like we needed to leave someone there that could help with the interpretation, and as the implementation and procedures and things

were written.

We just didn't hand it to the site and let them figure it out on their own, and that person helped guide the development of the programs. That trend has continued. So we've had a person there helping do that interpretation and, you know, again for subsequent renewal when we looked back, we have many program owners who very much understand how the programs work and what their responsibilities are. So we've seen that grow as well.

MEMBER HALNON: Any intent to keep that person in place in the subsequent part?

MR. ROBISON: Yes, yes. We will keep that person in place for the fleet. We have that person very actively involved. In fact, they were in there leading the site efforts, the fleet person was leading the site efforts for the Phase 4 inspection.

MEMBER HALNON: Okay.

MR. ROBISON: And we're cross-pollinating our younger generation now.

MEMBER SUNSERI: Yeah, okay. I have somewhat of a leading question, but I don't know to how to ask it anyway, otherwise. But I imagine you tracked some of these activities through your corrective action program, and you must have some kind

of commitment tracking program, and then you take all that and update your UFSAR as necessary. Is that accurate or can you describe how that --

MR. ROBISON: Your description is very accurate, and it's a dynamic process. It's not just static, we leave the procedures and don't really look at it. We're following the results.

The programs as we designed them were learning programs, and they have that feedback mechanism too, and we use the corrective action system and we let that feedback, both from the industry experience as well as plant experience and fleet experience, grow those programs, and they continue to mature over time.

MEMBER SUNSERI: Thank you.

DR. SCHULTZ: So Greg, the peer review for Oconee. Could you expand on that a bit? Who participated in that review and what were, what were the findings that improved the application?

MR. ROBISON: I'm going to have to ask Heather. Heather, do you recall who did the peer reviews for Oconee application, the other utilities that we had?

MS. GALLOWAY: I have to look.

CHAIRMAN REMPE: So your name, excuse me.

You need to say your name and speak loudly.

MS. GALLOWAY: This is Heather Galloway with Oconee License Renewal, and I can look it up really quickly and let you know who our peer reviewers were.

CHAIRMAN REMPE: Great, thank you.

MR. ROBISON: Yeah, thank you Heather. Sorry Steve, I'm just drawing a blank.

DR. SCHULTZ: Any comments related -- I'm just curious on how that process works. You participated in the reviews and had this done for this application, and what are the general findings that come out of that review?

MR. ROBISON: Let us get that answer for you. I can tell you that for the peer reviews more recently that we've done across the industry, we've been a little more selective about -- rather than trying to do a broad 4,000-page review for someone, we pick key areas that we had expertise in, so that we could provide that quality feedback and not just give them general editorials. Let us, let us get that answer on Oconee specifically. Sorry, I'm drawing a blank this morning.

DR. SCHULTZ: We have time. Thank you.

MR. ROBISON: Yeah.

MEMBER KIRCHNER: Greg, this is Walt Kirchner. I'm doing this virtually, so I'm sorry I'm not there. My question is do any of these AMPs, did they factor in that rather extensive list of plant upgrades that you'd made over the years?

MR. ROBISON: Yes, very much so. The programmatic oversight is of the plant as it exists. So If we've added to the plant, to the extent that it touched the program, we've applied that -- the new population into that program. We don't just leave the programs focused like they were 20-odd years ago. They continue to be expanded as the scope needs to be expanded.

DR. SCHULTZ: Thank you.

MR. ROBISON: Next slide, please. So that was the development side. I'm going to talk a little bit about process advancement, picking up on the things Brian said this morning about the fact we were pre-GALL, and I'm going to do a little compare and contrast just to sort of give us a feel for what I consider the evolution toward a very mature standard that we have in the industry today.

The initial license renewal, we were the second plant in the country to get licensed in May of 2000 as you said. GALL was still in the formative

stages. We actually were working with the NRC staff to try to frame up, as part of the industry efforts, what the big technical areas were and how we would go about putting our arms around that.

The ten elements that we came up with for programs was all vetted during that period of time, and we applied those lessons at Oconee based on good engineering, good science and the structure that we thought best at the time, you know. We didn't have any written guidance, so we did the best we could to come up with a good engineered way to do things.

What I can see today is the maturity of those programs. Even though you look back and say well, they're not lining up perhaps with GALL over time. We were the prototype, If you will, of those early days. Ten elements, the way those -- the way the programs were structured.

The implementation of those programs over the last 20 years, it's the maturity of those that I think has really advanced, giving us a good foundation to build subsequent renewals on. The pieces of the work that we have here for scoping and screening you see on the slide did follow GALL SLR and the standard review plan today. We had a couple of changes from initial license renewal that was a reinterpretation of

10 C.F.R. 54(a)(2).

It's not wrong what we did before, but we've enhanced it. We broadened that view and defined it and understood it a little better as a good debate, a good understanding would be. So we've actually added scope to the subsequent renewal programs that will manage the aging of a little broader population. An example could be piping in the turbine building, where we've had some pipelines that are safety-related coming through that area.

We expanded the non-safety piping in the area and equipment in the area that we're going to manage the aging of, so that we don't impact. Should a failure occur of the non-safety, there won't be any impact on safety. We did that before. We just broadened the scope today. It's -- and it really just adds more population to an existing program.

It wasn't like we had a deficiency or something new had to add. We just had to broaden the population. Another area where we've made a change is NFPA 805. We've moved from the old Appendix R standards to a very structured NFPA 805. What that did in the redefinition of fire protection, it ended up adding a few new features to the plant to the fire protection program, and we picked that up.

That was a licensing change made since 20 years ago, and we were able to just flow that right into the programmatic actions for subsequent renewal. So there are two examples of the growth of things.

DR. SCHULTZ: Greg, on the 54 alpha 2 changes, does that affect all the AMPs or just the new AMPs that are associated with subsequent --

MR. ROBISON: It affects all the AMPs.

DR. SCHULTZ: Okay.

MR. ROBISON: Yeah. For example If we had an airline or non-safety potable water line that happened to be somewhere and we judged very conservatively let's worry about that. We added that or made sure that was included, and even If a current AMP covered it, we expanded the population --

DR. SCHULTZ: It's noted in your long table of AMP reviews that a number have -- a number of the current ones have been expanded. And so it's pretty much due to this?

MR. ROBISON: It was somewhat -- well, it was somewhat due to this, but a lot of it was to bring those programs up to current standards. So there were enhancements today, and I think this is a very positive. There were enhancements to the today programs as the GALL SLR gave us additional insights

and maturity on the way the programs could be conducted for the future.

It just allowed us to make them better. So that's what you'll see. I'm going to cover that in a just a second.

DR. SCHULTZ: Thank you.

(Simultaneous speaking.)

MEMBER HALNON: Sorry, I'm going to turn your words around. You had programs out there that were not up to current standards?

DR. SCHULTZ: That was my next question.

MR. ROBISON: We do not have -- we have programs in the plant that meet the program standards of the plant, the licensing basis of the plant.

MEMBER HALNON: Okay, I think. So this applied --

MEMBER SUNSERI: So I was going to ask the question a little differently. I was just using his words. I imagine, and I could get over my head real quick on this because I'm not a PRA expert. I imagine NFPA 805 is going. So you did a fire PRA or something as a result of that, and that identified components that are more important and maybe they were given before.

So now those get looked at, they're

important to safety. So they get amplified to them and you manage it that way, right? That's -- it's not because there's an AMP that you do it. It's because you identify important equipment that needs aging management?

MR. ROBISON: That's right.

MEMBER SUNSERI: So there's other areas in your performance improvement and oversight of performance where you're going to identify, you know, things that are important that may not have been in the past, based on whatever lessons learned in the industry or whatever, right?

MR. ROBISON: Yes. In the case of NFPA 805, when you go through the license renewal process, they scoped in additional things that were not scoped in in initial license renewal. So it was the application of NFPA 805 that added these additional important safety items that we picked up in the programs.

And now that, you know, that -- we had picked them up informally, you know. If it's a wetted carbon steel system, we were looking at all the wetted carbon steel systems for aging issues. But now for subsequent renewal, they were very much more formally involved in the programs, because they came with this

licensing change.

MEMBER SUNSERI: Thank you.

MR. ROBISON: So real quickly to get through the rest of this, and then we'll go talk to some programs. Scoping and screening was done to contemporary standards. Aging management reviews, I had some wow statistics for you. 93.3 percent, that doesn't even tell the story. It's 13,676 AMR lines in the application, aligned with GALL Notes A through E.

There are 72 lines that don't align with A through E. So that'll give you a feel for how we were able to meet the contemporary standards with the design of the actions that are for subsequent renewal. A pretty significant use of the guidance, the mature guidance that's there.

Applying GALL gives us that enhanced feel, that enhanced programmatic foundation to stand on for subsequent renewal. We feel very good about that, how it's helped us see how to mature the programs. We're in good shape there. Next slide, please.

MEMBER SUNSERI: And just for continuity, then a question. Those 70 whatever lines that didn't, what would you say correspond or I forget what the word is, are those the exceptions and enhancements that you made?

MR. ROBISON: Yes, they're the exceptions, and I'll give you a couple of examples.

MEMBER SUNSERI: Okay, perfect.

MR. ROBISON: Where was it, where we are. 48 subsequent license renewal programs that I'll speak to, we had 26 programs pre-GALL in initial license renewal, plus a number of preventive maintenance activities, proceduralized activities. We didn't know in the mid-90's exactly how to capture the actions that were already being taken in maintenance procedures that were aging management techniques.

And we were still inventing the ten elements of a program and all. So what we credited initial license renewal was preventive maintenance activities. It's hard to count all of that. So they don't -- the numbers 26 and the 48 don't line up exactly.

I'll give you a couple of examples. Same action, different program. In today, in the license renewal efforts today, we looked at external surfaces of mechanical -- as part of our structural monitoring program. For subsequent renewal, it's going to be its own program. The same actions are being done. We're just going to call it, bring it out, call it something different today. So if you're doing tally marks,

you're going to do a tally mark today compared to what we did in initial renewal.

Another area that's a little different is our FERC/NRC jurisdictional boundary area at Keowee. The GALL SLR and standard review plan did a very nice job on water control structures of being very clear where the FERC aging management responsibilities fit, and the NRC aging management responsibilities.

Now what does this mean? It means that the water control features at Keowee are part of the component set for license renewal for Oconee. The aging management program for those is the FERC programs. We didn't have to re-review those. There was an acceptance of the FERC five year inspection work that is already going on. We're committed to that.

We've just renewed the license of Keowee with FERC, and all of that work will continue on into the future. They just don't have to be fully investigated as part of the aging management work like we're looking at other parts of Keowee, that produce the power Steve has mentioned. For those, we use the structural monitoring program. We're actually in the plant looking at the structures, looking at the features of the plant that we can do as a part of the

Oconee Engineering team.

So that jurisdictional boundary definition that didn't exist back in the 90's, is much clearer in the standards today. We were able to take credit for that in the tally, the tally mark on the number of program changes for that.

So just a couple of examples of how things have changed, and I hope you get a sense that they didn't -- we didn't regress or go differently. They're just advancements that we were able to explain a little bit clearer today versus 1995-1996.

MEMBER SUNSERI: So you mentioned something that I just wanted for clarity to follow up on. Your first example for the Keowee was that you had some maintenance activity you were doing for the initial license renewal that in the subsequent you're going to pull those activities out and do them as a separate program?

MR. ROBISON: Yes.

MEMBER SUNSERI: So looking ahead, I mean we've reviewed all the post-license renewal inspection reports. I think there's four or five of them and there was an integrated Phase 4 report also. You demonstrate very -- you have demonstrated very good compliance. No findings in any of that. That's good.

How are you going to ensure that that shift in the way you're doing that is going to -- you can keep compliance there?

MR. ROBISON: We'll do it in a couple of ways. One is we'll update the UFSAR based on the results of subsequent renewal. Number two, as we were discussing about having the fleet oversight person there, they will make sure that those commitments get addressed. If it means taking credit for a procedure and transitioning it to a more structured program, we'll have somebody there with the knowledge to make sure that gets done.

We won't just turn it over and hope that the plant can figure it out. We'll actually walk them into it and then the plant will have the program and the program owner name, and that person will continue to carry forward the responsibilities. So we very much have a transition plan.

MEMBER SUNSERI: Okay. Well, that's good. I mean I would just -- this isn't a negative criticism or anything. But I would just say sometimes the old way of doing business has proven to be good and you could enhance yourself in a more difficult way. I'll leave it at that.

MR. ROBISON: One of the things that we

were discussing, and I forget who I was discussing with, the transition to a new generation, and part of the value of doing this in a structured way, to transition in a structured way, is the education process for the next generation of owners. So we are very keen on that as well, and so that's why I'm emphasizing the transitions.

We're not, we're not going to leave a 25 year-old to go figure out what we wrote in a pile of paper years before. We're going to work to make sure that that gets done, and we did that with initial license renewal. We wrote some post-renewal specs that detailed procedural level changes that had to be made in order to implement the commitments.

So we went to that level of detail, to make sure we were ready to implement the commitments.

MEMBER HALNON: Yeah. Well, this is not to put words in your mouth, but the way I'm looking at in my head is that you're kind of -- you're weeding it into the normal way of business, in addition to supplementing it with the historical aspect of why it's there and why it has to be important.

So that to me is a good, a really good foundation for keeping that compliance in the future. A new generation will come in and it's a combination

of here's the procedure, here's the established way of doing things, and here's why it's very important. So it's to me a very good mixture.

MR. ROBISON: It was important to me back in the 90's that we wrote specifications, technical documents as basis documents. Just like we had the design basis program in the early 90's, late 80's-early 90's, we wrote license renewal basis documents that capture that history, provided that foundation, and then we were able to build forward from that.

So we had the person and a document, and we're doing the same thing here. Technical basis documents that will be a part of the record, that will be readable and they're like study-able, and then we'll have people involved with that transition.

HH Yeah. So the key question is do you have an app yet that can --

MR. ROBISON: You're onto something, and one of my pet peeves.

MS. NADER: Greg's favorite word, there's an app for that. This is Rounette Nader. I was just going to expand a little bit on that, because I do lead the efforts for implementation, the implementation for the commitments for license renewal. So what we've -- the Duke model is when we

get a renewed license, initial or now subsequent renewed license, as we get closer to the period of extended operation or the subsequent period of extended operation, we put a team together to implement those specific commitments that are necessary before entering into that PEO or SPEO.

So that project team is put together to specifically work on implementation of those commitments. What they do, in addition to ensure the commitments get met, is they also write the AMP basis documents and they work with the program owners at the site, and they leave them with those AMP basis documents.

So they manage that transition, so that the site and the fleet program owners can own that when they move to the next plant, to manage that, the implementation of the next plant. So that's the Duke model. As Greg said, when the application team, you know, goes away, we actually bring in a second team to implement the next commitments, and then that team transitions.

MEMBER HALNON: So then to -- for context, when is the SPEO for Units 1, 2 and 3? Do you have that off the top of your head?

MS. NADER: 2033 for Units 1 and 2.

MEMBER HALNON: Okay, so a decade from now. So there's going to be some education needed, self-education probably because many of us won't be around to even talk about it.

MS. NADER: That's right, and that's -- and that's been the case even for initial license renewal. You know, Oconee was an early initial license renewal plant, so the PEO was even further away than it is this time. So that's why we bring in the project team, because some time has passed.

We leave, the application team leaves a good legacy, but the implementation team, comes in, picks up that information to make sure that it gets disseminated out to the program owners.

DR. SCHULTZ: Thanks. You have some do AMPs that will start, that the programmatic portion of those are going to start before, well before SLR? In other words, five years before you need to start gathering data and monitoring overall performance, in anticipation of moving into the subsequent operations?

MS. NADER: That's correct. We will put the implementation team in place shortly. Even though it's a decade away, yeah. That work takes several years.

MR. ROBISON: We're actually already

discussing that, and I'll hit the last point and I'm going to hurry on through my stuff. We're not doing anything, we're not making any promises that we don't give the program owners today at the site, to help temper and understand. You know, we can't promise we can do something and then can't help them out.

So we went to the experts, you know. We made them part of the team, and that was part of the maturity that we -- they gave us the quality, the feedback on the programs. We walked the plant with them. We talked about it. Before we wrote it in the application, we had it checked and tempered by the program owners.

I thought that was a nice addition, you know. You can make promises. You can make all the promises you want. But keeping the promises becomes very difficult If you don't do that right. So we wanted to make sure that we did that right, and that involved our fleet and our plant program owners. Even on the new programs, we would ask their opinion, we would get their insights as we were proposing actions so --

Next slide, please. Now let's talk some numbers. I mentioned there were 48 programs. You see they're in Column 1 to the left. There's 48 total

programs, 34 existing, 14 new. Let me walk across pretty quickly here the existing line and the new line, and I'll tell you how the -- I'll give you an example of one or two of these as we go, If that's okay.

I'm going to work across the existing 34 line there. The second box over is consistent with GALL, absolutely consistent with GALL. There were six of these. This is water chemistry, the Stalwart program, things that are just there and we're going to use forecasting corrosion, steam generator inspections. They don't change. They're there. GALL describes them very well. It's what we're doing today, many of them industry-based.

Column 3, 20 programs with enhancements. So this is almost half of the program, half of the 48 were existing programs that were good, but they could be better and enhanced with insights from GALL SLR. This is where my skepticism was. Are we going to really get anything out of this? When I got there, we got into it. Yes, we do.

The industry's in really good shape with the guidance documents that we have today, because it's captured. It's the basis document. It's captured those lessons learned, and we were able to

apply those with the 20 existing AMPs here. We did have a couple of exceptions here in Column 4. Just to give you an example, the concrete containment pre-stress monitoring.

Early in plant life, we were collecting data in a certain manner. We discovered somewhere in the 90's that we weren't really getting the right data. We were not using random tendons. We were using sample tendons. This was something we made up in the 70's and said we'll go and just go into the test bite, kind of we'll see.

Well what we -- what it dawned on us was because you -- it's just like any system where you -- If you put your hand in a system, you influence a system and now you become part of the system. Well, we were doing sample tendons and we were collecting data on the same tendons over and over, and realizing we weren't getting the health of the building. We were getting the health of a modified sample tendon.

So somewhere in the 90's we changed that technique. GALL comes along and GALL SLR says use the total lifetime set of data. I don't want to use the total lifetime set of data. I want to use the last 25 years' worth of really good data on the health of the building. So I had to take exception to GALL to be

able to do that, but I'm -- the exception I'm taking is because I don't, I can't use that early data.

But I do have a wonderful set of data for the last 25 plus years, that tells me the health of the building. We've applied it, we can draw it. We've drawn graphs. I believe we had some of that information in the application, to really have a good feel for where the building is in its life, If you will, based on this later data.

So it required us to take almost a procedural kind of exception, but didn't impact the program at all. So that's an example of where we had to make a modification to the standard, but we did it in a very thoughtful and mindful way to make sure we're in good shape going forward.

Let's see, that's Column 4. Column 5 with exception and enhancement. Here's a fire water testing example. We have dry pipes with a deluge valve. The GALL would ask us to go and do a pressure test on dry pipe. We would do the pressure test on wet pipe, the system, the system kind of pressure test. We don't have water in the system. It's dry.

We took exception to the standard wording there because of the system configuration. The enhancement, however, is going to ask us to go do an

internal inspection. Find a way to get a camera or something into the dry portion of the pipe, to take a visual. So we had to modify the standard in GALL to get the answer that we, you know, that we felt were the proper aging steps. It made perfectly good sense to do that.

So you see it showing up. There's five of these, but we were again very mindful and thoughtful about how we did that. We just didn't dismiss it out of hand because we didn't want to do it. We found other ways to do it that didn't match up to the standards.

MEMBER HALNON: So Greg on that dry pipe/wet pipe, is the program deep enough to If it's called to duty and is used, that there's an inspection post-actuation so you check it then, or is it just this one inspection of the dry?

MR. ROBISON: It will do -- we will do the inspection periodically. It will be over the remaining life of the plant, you know.

(Simultaneous speaking.)

MEMBER HALNON: So there's no specific thing that --

MR. ROBISON: It wouldn't be triggered by -- no, it wouldn't be triggered by an action, because

what we would want to make sure is the system is ready if called upon. And so we will have a periodicity to those --

MEMBER HALNON: Right, and the point is is that if it's called upon, it's been put through a cycle, it's wet now, is that an opportunity to see did our inspections reveal everything that we expected them to reveal?

MR. ROBISON: Right.

MEMBER HALNON: So the question is would the program trigger the system engineer or the owner to go out and take a look at that?

MR. ROBISON: We had to flood that pipe and use sprinklers. We had other things to inspect. We would have to -- we would have to do a larger inspection to put the plant back in condition, to go back into operation specifically. We would -- we probably would have had a fire and needed that system to actuate.

MEMBER HALNON: It could have been inadvertent. It could have been inadvertent.

MR. ROBISON: And then, you know, then you would do -- you would re-inspect it as part of a broader inspection.

MEMBER HALNON: Okay.

MR. ROBISON: The last thing we had was the plant-specific. We have a design feature inside containment. We have a secondary shield wall and the panels -- and the panels are connected by the tendons. I don't know If other people in the industry have this design, but the tendon needs -- we need to go inspect these tendons periodically. I think there's 14 of them or something like that that connect these panels.

So we have a plant-specific program. It's not described in GALL. This is a part of initial license renewal. The ten elements are all defined. We've got data. We had a really interesting, good discussion with the staff about the aspects of the program as a part of subsequent renewal and that's been captured in the SC as well. So that's the existing programs, okay. We're good with that.

Quickly then, the new programs. We have the -- 11 of the 14 are consistent with GALL. We just use the aspects of GALL, walked through the plant, looked at the features of the plant. They line up perfectly with that. You obviously can't -- the next column. In the third column, you can't enhance a new program because it's new.

So we did have -- we did have three programs that took exception to GALL that were new

programs. Example here was selective leaching. Rather than doing it on a unit basis for a three unit plant, we said we would have a bigger population. If we did it on a site, we'd take exception to GALL. We said let's do it on a site basis, have a bigger population.

If there is a trend, If there is something showing up, we want the program to be looking across the site, all three units. So we said that made more sense, and so we proposed that change and that's been accepted. So a little, a little tweak, a little maturity on a plant-specific aspect to make it make sense to us.

And so they weren't significant exceptions. They were just we hope wise exceptions. That way we're going to leave it. We had no, no exceptions, enhancements in the plant-specific new programs, and that's the 48. Let me stop for a second. Any questions on -- I had to go kind of quickly on that.

MEMBER KIRCHNER: Greg, this is Walt Kirchner again. As you did all this, did you find any -- this makes for a very comprehensive examination of the physical health of the plant. Did you find anything that is not identified in the GALL SLR, the

NUREG reports, or did you find anything that surprised you as you went through the plant to prepare for this, that might not have been identified in, you know, the GALL framework?

What I'm asking, I guess, is you know, were there any surprises or things that in the course of doing all this that might not have been identified in a GALL program?

MR. ROBISON: Thinking about it no, I don't know that anything came across as a real surprise. When we put together license renewal back in the late 80's and early 90's, we reverse-engineered root cause studies back on those days. It turns out there's five things that happen to mechanical systems, thin, crack, deform and brittle or leak-altered joints.

So that's the end point of all of the work, and If you take that and go into the standards and you look for that and make sure that we're hitting one of those end points, and we are. So I didn't find any surprises because I found the end point that we were after, that we had thought about when we were doing all the academic work many, many years ago.

And that's why I think the GALL standards as they're written today are really a good compilation

of all of that experience over the last 30 plus years, to pull that together.

MEMBER KIRCHNER: That's good, because what I'm -- where I was going was, you know, just having a different set of eyes on things and making sure it's just not a compliance exercise. It's really more than that, and it sounds like that's what you've done. Thank you.

CHAIRMAN REMPE: So I have a question, if that's okay Matt?

MEMBER SUNSERI: Yeah.

CHAIRMAN REMPE: I've really appreciated this overview of the whole program and the perspective you've provided today, and I'm just wondering, I keep thinking about that picture of 19 inches of paper. Is there something that could further improve, or do you have any thoughts now on this process? Is there something that you thought well this really wasn't worth our effort?

MR. ROBISON: No, I can't think of anything to improve it. I mean our -- again, I'm thinking back many, many years when all this design. The scoping makes sense, the screening -- aspects makes sense. The aging management review makes sense. The techniques and the way we documented in the big

tables now, the 13,000 plus items make sense.

I mean it's a little rote, hand over hand kind of things, but it's necessary. We need to do that.

CHAIRMAN REMPE: Thanks for the perspective. Thank you.

MR. ROBISON: I'm going to stop here and turn it back over to Rounette.

MEMBER SUNSERI: Yeah. I'm just going to note we have about 20 minutes allocated for this session and we've got the three technical topics, and we probably will get more questions. It's not your fault, but we're going long here since we're asking a lot of questions, so it's a good interaction. If we go a little longer, that's okay. I think we have time to make it up. I just want to be mindful of the staff's time and they have 45 minutes as well.

MS. NADER: Okay, and I think we're also -- Heather Galloway is ready with the answer to the question about the peer review.

MS. GALLOWAY: This is Heather Galloway again, and the question asked earlier was who participated in the Duke Energy industry peer reviews. We had Excelon, Dominion, NextEra and Entergy participating in those, as well as members of our own

License Renewal Implementation team, who are also very knowledgeable on license renewal and the process, also participated in our peer reviews.

As far as what did we -- what were our learnings from the peer reviews? That was the follow-up question. We had about 375 comments from the peer reviews, and we incorporated all but three comments. So If we could bucket those findings, one of the biggest areas was in electrical scoping methodology.

We took an all-in approach to electrical scoping, and we had to go and refine that, because that all-in approach would have included -- would have had us including all buildings on site, all structures on site. So by refining that methodology, we were able to, you know, pull back the scope of license renewal a little bit in that area.

We also did -- they did very focused reviews on specific aspects of Chapters 2-3, and then a very specific TLAAs in Chapter 4 that we asked them to look at, mainly the Class 1 type, the thermal or the metal fatigue, the reactor vessel type work, as well as our tendons. So they provided us feedback in those categories as well, as well as the AMPs.

And then separate from that industry peer review, we also had Excelon go in and do I'll call it

a deep dive into each one of our AMPs, where they went and looked at the ten elements and compared the ten elements as we had identified them compared to GALL. So they did that relationship for us, to see how aligned we were. We took some learnings from that and improved our programs, to be better aligned with GALL as well.

DR. SCHULTZ: Great response. Thank you.

MEMBER BROWN: I want to ask -- can I ask a question before on your 19 inch stack? I'm not sure this got asked before, that so it was about a third bigger than what you did for the initial SLR, initial license renewal some years ago. Could you pinpoint what drove the additional, 33 percent additional paper?

MR. ROBISON: A lot of it was just the inclusion of a lot of information this time the staff felt they needed to review. As the example, I mentioned the basis documents we wrote back in the 90's. Those documents received a lot of review at the site. We did several site inspections, and some of the materials that we had kept at home last time we put in the application this time. So that ended up adding materials to the document.

MEMBER BROWN: So it wasn't a specific set

of requirements that staff imposed? It was more your inclusion of previous information, that then they requested information to complete their review of it?

MR. ROBISON: It was, yeah.

MEMBER BROWN: Did I say that properly?

MR. ROBISON: That's a good characterization, yes.

MEMBER BROWN: That's a lot of paper, particularly after you completed one.

MR. ROBISON: So here's another wow statistic. I think I did this. My wife got mad, because I had it stacked in the corner of the dining room. We produced about ten feet of technical paper for the initial license renewal application of 14 or 15 inches or whatever it was.

So you know, just order of magnitude kind of thing. This time, we probably produced on the order of ten feet of paper, and a big chunk of that went into the application, because electronically it's easier than hauling it up here by van like we had to do last time. We were able -- by that, and I think, you know, the staff can corroborate, but they needed that as part of their review.

Last time we had 400 and something RAIs that pulled that information out of the technical

basis. We didn't have to have that many this time, because we had provided it with the application materials.

MEMBER SUNSERI: It's probably insignificant compared to licensing a 2,300 megawatt brand new plant though.

DR. SCHULTZ: These days.

MEMBER BROWN: I guess the other question I had, the adjunct question that I think goes along with -- this is Charlie Brown by the way, If nobody doesn't know who I am -- is you got all the extra paper. But on a time, on the initial license renewal you had X amount of findings. I presume you had some idea of how much manpower and stuff you expended on that. Did that change significantly for the SLR?

MR. ROBISON: It did change because part of what we had to do, we're training new staff. So we had a level of experience this time and a level of new this time that we didn't have last time. We were all brand new last time and inventing the process. We had probably twice as many people this time than our initial License Renewal team.

But we were very much more focused this time. Last time we were coming out of the research world and writing basis documents and then extracting

from that, and trying to figure out a good way to communicate our understanding of the aging basis of the plant. This time with GALL and the structure that was there, it was very easy to apply the people to the tasks that were there, and go ahead and begin to train the next generation.

MEMBER BROWN: So the refinement of the GALL actually helped the process?

MR. ROBISON: Yes sir, it did.

MEMBER BROWN: That's what I'm taking away from. We went through that years ago, so all right. Thank you very much.

MEMBER BIER: Excuse me. I just want to kind of try reinterpreting what you said about whether the volume of the analysis and paperwork was worthwhile. It sounds like you said yes, it was very voluminous, but If the goal was to catch every possible problem that was necessary. Is that a fair description?

MR. ROBISON: It is, it is. Going in as an engineer, you don't go in to kind of do two out of three or five out of seven. You do all seven and you document it. You might pull four out of the seven and put in the application, but we're going to do seven out of seven and have it in our records. So it was a

complete review and then we would work to meet the standard review plan to present it.

MEMBER BIER: So it's not like the 80/20 rule, like ahh, good enough. We'll skip the rest because it's low probability?

MR. ROBISON: No ma'am.

MEMBER BIER: Okay, perfect. Thank you.

MS. NADER: Thank you for those questions. Next slide. Okay. We're going to move on to the technical topics. Joe Terrell is going to discuss the technical topics with the Committee today. These topics have historically been of interest in the licensure proceedings, and they were of interest in the Oconee review as well.

Joe is a materials engineer with a background in aluminum and powdered metal industry before joining the energy sector almost 20 years ago. In his time with Duke Energy, he has focused on materials-related programs, and was also involved in initial license renewal projects for the Crystal River and Harris nuclear power plants. Next slide, please. Joe?

MR. TERRELL: Okay. Thank you Rounette. Thank you ACRS. We're going to cover three technical topics here, the reactor vessel internals, the reactor

vessel supports and concrete embrittlement.

Next slide. So PWR vessel internals. The scope of this program included reactor internals component items that were identified within MRP-227-A, and the gap analysis which uses MRP-227-Rev1A as the starting point. The gap analysis we used incorporates the screening, categorization and ranking results from MRP-189-Rev3, which covers all of the B&W plant designs, and the engineering evaluation and assessment of age-related degradation from MRP-229.

So we performed an Oconee-specific fluence TIG evaluations for SLR, to ensure that Oconee was bounded by MRP-189 Rev 3, relative to the assessment of time-dependent aging effects such as reduction of fracture, toughness by radiation embrittlement and cracking by fatigue.

The gap analysis identified new primary and expansion items. New primary items include core barrel cylinder, hot flange, circumferential weld and the center circumferential weld in Unit 2, and this would require inspection or analytical evaluation prior to entering the SPEO.

New expansion items linked to these new primary items include all of the remaining core barrel cylinder welds for Units 1, 2 and 3, and the new

primary items included the lower grid rib section for Units 1, 2 and 3, and the new expansion items linked to this primary item includes the upper grid assembly for Units 1, 2 and 3.

Duke will manage vessel internals fluence projections for the reactor internals consistent with the neutron fluence monitoring program, and will manage vessel internals exams consistent with the PWR vessel internals program, including recent NRC guidance, changes noted in the recently-issued ISG and the gap analysis. PWR vessel internals program will be enhanced to provide guidance implementing changes in primary and expansion items, and acceptance and expansion criteria in MRP-227-Rev1A as modified by the gap analysis.

MEMBER BALLINGER: Do you folks anticipate changing the capsule removal schedule for the license renewal?

MR. TERRELL: Yes. Oconee is part of the integrated master reactor vessel surveillance program. So this includes lots of capsules from the B&W design vessels, and currently there are no capsules in the vessel. But we use the integrated program to manage the aging. And we have done our analysis and we, you know, we meet the fluence requirements for --

You're supposed to determine a post-fluent capsule when the fluence is between one and two times the SPEO life. We have -- we've already done that.

MEMBER BALLINGER: I don't remember that any of the Oconee plants were at any kind of risk at the end of 80 years.

MR. TERRELL: That is correct.

MEMBER BALLINGER: Thank you.

DR. SCHULTZ: Joe, you have monitoring outside the reactor vessel? Do you have monitoring outside the reactor vessel?

MR. TERRELL: We, yeah. We have X vessel dosimetry that we utilize in Unit 2, and so we do periodically, you know, examine that dosimetry to ensure that our fluence projections are on track, and to characterize the uncertainty in the fluence projections.

DR. SCHULTZ: Given the similarity between the units, you can apply that to all three units?

MR. TERRELL: That is correct.

DR. SCHULTZ: The fluence evaluation that Framatome did for these programs, that includes the power uprate?

MR. TERRELL: Yes. The power uprate itself was 1.6 percent, and we conservatively assume

the two percent increase for the fluence evaluations, to add a little additional conservatism into the projections.

Okay, next slide. Next topic is reactor vessel supports. As with all 177 fuel assembly lower loop B&W designs, the Oconee reactor vessel utilizes a welded steel support skirt assembly that consists of a support skirt, support flange, anchor bolts and associated embedment items such as side plate, vertical-bearing plate and Nelson studs. You can see those components in those two diagrams there.

So the upper portion of the support skirt is welded to the reactor vessel lower transition forging, and that is identified in the top figure over there to the left. You can see where it says "weld." The lower portion of the support skirt is welded to the support flange, which is secured to the reactor vessel pedestal concrete, with anchor bolts embedded into the concrete.

That weld is not actually shown here, but If you look at the lower figure, you see the item "support flange," and then you could see the reactor vessel support skirt vertically going down to the horizontal flange, and that weld is right there.

The support skirts, support flange, --

plate -- yes. Thank you. So the support skirt, support flange, -- plate, vertical-bearing plate are all made of carbon steel. The anchor bolts and associated fasteners are made from high strength alloy steel.

It is important to note here that, you know, in comparison or in contrast to let's say a Westinghouse type design, in the B&W design there is no structural support provided by the reactor vessels to the nozzles.

All of the support is through the support skirt steel assembly and the concrete pedestal. So the primary shield wall serves one function, that is a biological shield and it does not support the reactor coolant system in, for a B&W plant.

Okay, next slide. So the support skirt in the embedment, carbon and low alloy steel items were evaluated for susceptibility to irradiation embrittlement using the process documented in NUREG 1509, Radiation Effects on Reactor Pressure Vessel Supports.

For those items in which NUREG 1509 evaluation found potential susceptibility to irradiation embrittlement, and that would include the Units 1, 2 and 3 support flange and Nelson studs, and

the Units 1 and 2 support flange welds, further evaluation was completed to demonstrated that intended function will be maintained throughout the SPEO.

So based on that analysis, reactor vessel support intended function will be maintained consistent with the COB during the SPEO when considering damage due to irradiation, and Duke will manage the aging of the reactor vessel supports with the ASV Section 11, subsection IWF program, the boric acid corrosion program and the fatigue monitoring program.

MEMBER PETTI: Why don't you want the flange welds in Unit 3 on the list? Is there something about the configuration that --

MR. TERRELL: Yes. The weld process that happened to be used for Unit 3 was different, and that resulted in different initial material properties. So that's why the -- let's say the adjusted reference temperature for that material was different than for Units 1 and 2. So that resulted in -- there could be potential embrittlement impacts to that weld. But not for that weld. That weld actually was better than Units 1 and 2, excuse me.

MEMBER SUNSERI: Those floor plates on the floor, do you have any challenges with any water and

corrosion or anything on those?

MR. TERRELL: Those components get inspected on a regular basis, and we so far all of the inspection results have shown that there are no signs of material degradation on those that's part of the structure.

MEMBER SUNSERI: Are they coated?

MR. TERRELL: They do have a coating of concrete on those.

MEMBER SUNSERI: Okay, thanks.

MEMBER BALLINGER: A Nelson stud is just a giant thread of rock --

MR. TERRELL: It's probably, probably correct.

CHAIRMAN REMPE: I don't know if I have to remind you to turn your mic or not. Probably we'll just let it go. Go ahead.

MR. TERRELL: Okay, next slide. The last technical topic is going to be on the subject of concrete embrittlement. The key topic of concrete embrittlement focused on the primary shield in the reactor vessel pedestal concrete, which supports the reactor vessel support skirt as we have just discussed.

The primary shield wall does not provide

a support function for the reactor coolant system, as previously discussed. The projected maximum exposure on the inner surface of the primary shield wall in the 80 years is less than the GALL SLR thresholds above which radiation damage is a potential concern for irradiation embrittlement.

Thermal embrittlement of the primary shield wall concrete is also not a concern. We confirm through thermal analysis that the primary shield wall uses updated gamma heating rates generated for SLR. The general area and localized area concrete temperatures will be below 150 degrees Fahrenheit and 250 degrees Fahrenheit, respectively. So it's not an issue.

Next slide. So for the reactor vessel pedestal concrete, again the pedestal concrete provides a support function for the reactor coolant system. Maximum exposures for the reactor vessel pedestal concrete are bounded by the maximum fluence and gamma dose for the reactor vessel support skirt weld, which is 71 centimeters above the reactor vessel embedment pedestal concrete.

And so therefore they are less than thresholds above which radiation damage is a potential concern for concrete embrittlement. The general

concrete temperatures would be below 150 degrees Fahrenheit, as confirmed through thermal analysis of pedestal support and using the updated gamma heating rates generated for SLR.

Now for local, localized concrete areas directly below the reactor vessel support flange at the shear pin locations, are conservatively predicted to have localized temperatures slightly higher than 200 degrees Fahrenheit. However, considering the large number of conservatisms used in this analysis, the risk that actual temperatures would exceed 200 degrees Fahrenheit is minimal. Therefore, concrete thermal embrittlement is not a concern for the pedestal concrete.

DR. SCHULTZ: Joe, could you give us an example of the conservatisms that make you feel comfortable?

MR. TERRELL: Yes.

DR. SCHULTZ: Thank you.

(Pause.)

MR. TERRELL: There are several. Heat transfer calculations were performed on the most thermally stressed areas of the concrete. Conservative gamma heating rates, fluence in gamma dose projections were used.

Gamma heat well, and we assumed a minimum cavity air flow, which would assume our temperature. Conservative air temperatures from the highest measured summer measurements were used, and there was no azimuthal heat transfer assumed in the thermal analysis models that we used.

DR. SCHULTZ: Thank you.

MEMBER BALLINGER: The thing is, the shield wall is like five feet thick, and so the neutron dose through that wall is gone after the first four inches, so you don't need to worry there. The pedestal's in compression always, and so that temperature drops off very quick as you go in there. So I mean those are not factored in, but they make a huge difference.

MEMBER PETTI: -- not being an expert on concrete, is the fact that it's in compression, reasonable stress affects the embrittlement, or are they really independent?

MEMBER BALLINGER: It won't even map. I mean it's not intentional.

MEMBER PETTI: Okay I know, yeah.

MEMBER BALLINGER: So if it's in compression and when you talk about --

MEMBER PETTI: Stress corrosion cracking,

you have to have the stress depth that has --

(Simultaneous speaking.)

MEMBER BALLINGER: Right. There's not an analogy there.

MEMBER PETTI: No.

MEMBER BALLINGER: Okay. That's all I wanted to know.

MEMBER HALNON: So Joe, I assume that all these assumptions are -- I assume that the insulation is in good shape, your insulation around the vessel and pipes and what-not. Is there a program to lock it down after a shutdown for a refueling outage and then lock it down prior to starting up, to make sure that the assumptions in those thermal analyses stay stable?

MR. TERRELL: Yes, there is a program where the -- there's three programs actually that we use. So they, they will assure that the intended function would be maintained in the condition. Yes, we ensure that there's a program, or it's actually in scope for SLR, the insulations surrounding the reactor vessel.

MEMBER HALNON: Okay, and Steve, I assume that your expectation is that if something is found on a walkdown, that it goes in corrective action program, and these thermal analyses would be revisited based

on, you know, bounding conditions that it could have seen?

MR. SNIDER: That's correct, and at the beginning of every refueling outage, we immediately do walkdowns, review the results of those as a management team, make sure condition reports -- are written to address each one.

MEMBER HALNON: Thank you.

MEMBER SUNSERI: I have one last question. But are the temperatures able to be monitored and vented in these areas?

MR. TERRELL: We do have temperature monitoring in the reactor air cavity, and so yes, that's correct.

MEMBER SUNSERI: Anything else?

MR. TERRELL: That's all I have. Thank you.

MEMBER SUNSERI: Anything else, Rounette?

MS. NADER: Next slide. I just had some closing remarks on the next slide. Thank you. So I hope that the remarks that we've provided today have left you with a few sentiments, and first that Duke utilizes a team of highly capable individuals, with both license renewal experience and familiarity with the Oconee systems and programs.

Of the approximately 20-person team that Greg mentioned, nearly every member of that team has either previous license renewal experience or Oconee experience or both. And so when I was provided the opportunity to assemble a subsequent license renewal team for Oconee, I was very fortunate to be able to get just about anyone who had licensure on their resume on the team.

So and secondly, hopefully that what you saw from the numbers that Greg presented and the greater than 95 percent alignment with GALL SLR and the Oconee aging management reviews, and the fact that we can incorporate many of the current license renewal commitments across the subsequent license renewal aging management programs, that that also is an important factor in just the overall high quality application that Duke was able to put together, and the fact that we were able to benefit from the insights of lessons learned from the early SLR applicants.

Then as Steve mentioned earlier and with the list he showed, Duke Energy will continue to invest in Oconee now and in the future, to ensure the continued safe and reliable operation for 80 years. So in closing, I also want to commend the staff on

their efforts in reviewing the application over the past year and a half. The staff conducted a thorough and rigorous review that included a comprehensive audit and several follow-up public meetings on various technical topics.

They've engaged with the Duke staff appropriately and we've addressed many of their questions and comments through this process.

Next slide. That ends our remarks.

MEMBER SUNSERI: All right. Well thank you all very much for a very good presentation, very robust discussion. Members, thank you for your input. We don't have it on the agenda, but we do take breaks at the discretion of the Chairman. So I'm going to turn it over to the Chairman for discussion please.

CHAIRMAN REMPE: The staff we have to be considerate. I have checked with them and they said that that would be fine, and again If I look at the whole agenda for the subcommittee meeting, we'll -- I'm confident we'll make up some of the time later. I'd like to give everyone a ten minute break and ask them to come back at 10:20 on the east coast, and we're recessed until 10:20.

(Whereupon at 10:10 a.m., the above-entitled matter went off the record, and resumed at

10:20 a.m.)

CHAIRMAN REMPE: Okay. It's 10:20, we're back in session, and I will turn it back over to Matt.

MEMBER SUNSERI: Thank you Chairman. We're ready to continue, so this is the staff presentation, and I'll turn it over to Mark Yoo. Thank you, Mark.

MR. YOO: Good morning and members of the ACRS. My name is Mark Yoo. I'm one of the senior license renewal project managers in NRR. And lead project manager for the Oconee SLRC. We're here today to discuss the staff safety review of the Oconee Nuclear Station SLR application, as documented in the safety evaluation or SE. Joining me today at the table is Lauren Gibson, Chief of the License Renewal Projects Branch.

(Pause.)

MR. YOO: Dr. Allen Hiser, senior technical advisor for Aging Management; and Jared Nadel, senior resident inspector at Oconee. We also have joining us both in the audience and virtually members of the Technical and Regional staff.

Next slide, please. We'll begin today's presentation with an overview of the Oconee licensing history before moving on to the Oconee aging

management programs. We will then discuss selected technical areas that we believe are of interest to the ACRS, and hear from Region 2 on inspections and plant material conditions, before sharing the conclusions of the staff's safety review.

Next slide, please. Oconee Units 1, 2 and 3 were initially licensed on February 6, 1973, October 6, 1973 and July 19th, 1974 respectively. In July 1998, the applicant submitted the initial license renewal application. The initial renewed licenses were issued in May of 2000, extending the expiration dates by 20 years to the dates indicated on the slide.

On June 7th, 2021, Duke Energy submitted an SLR application for Oconee Units 1, 2 and 3. The application was accepted for review on July 28th, 2021, and the safety evaluation was issued on December 19th, 2022 with no open or confirmatory items.

Next slide, please. Slide 4. The Oconee SLR application described a total of 48 aging management programs or AMPs, consisting of 34 existing programs and 14 new programs. This slide identifies the applicant's original disposition of these AMPs as initially submitted in the application in the left column, and the final disposition as documented in the staff's SE in the right column.

All of the AMPs except one were evaluated for consistency with the GALL SLR report, and ultimately all of the AMPs were found to be consistent with acceptable enhancements or exceptions. The applicant included one plant-specific aging management program, the secondary shield wall tendon surveillance program, which was reviewed in accordance with our standard review plan for subsequent license renewal, and was also found to be acceptable.

I'd like to add a bit about the work we did to review the aging management activities and the other technical information in the application. As part of our review, the staff conducted an aging management audit to review operating experience, the aging management programs and time-limited aging analyses or TLAAs.

This audit spent 11 weeks, included both on-site and virtual activities, and leveraged the ePortal and breakout sessions between the staff and the applicant. There was also an additional limited scope audit for the PWR and vessel internals programs, which was conducted virtually using the ePortal and which I'll discuss a little further on the next slide. We had 77 RAIs and 15 second line RAIs from this review.

The applicant submitted four SLR application supplements, plus one annual update. We had seven public meetings which were conducted to discuss a variety of responses to RAIs that were issued by the NRC staff, including topics related to PWR vessel internals and irradiated concrete.

Based on our review of the SLR application, the results of the audits and additional information provided by the applicant, the staff concluded that the applicant's aging management program activities were consistent with the criteria of the standard review plan for SLR and the requirements of 10 C.F.R. Part 54.

Next slide, please. So this slide represents certain specific areas of the SLR application review. The first four bullets are those referred to in our staff requirements manual for SECY 140016 titled "Ongoing Staff Activities to Assess Regulatory Considerations for a Power Reactor Subsequent License."

Those four items are reactor pressure vessel neutron embrittlement, irradiated -- and cracking of reactor vessel internals, irradiated concrete -- containment, and electrical cable qualification and condition assessment. For each of

these four areas, the applicant provided information in the application and throughout the staff's review, which the staff dispositioned using the guidance in the GALL SLR report and the standard review plan for SLR.

The staff's review of the reactor vessel internals focused on the applicant's existing PWR and vessel internals program, which was based upon MRP-227-A report and the applicant's gap analysis that identifies the programmatic changes to address 80 years of operation. In the limited scope audit I mentioned on the previous page, the staff reviewed the applicant's bases as specific core barrel weld components did not screen in for stress corroding cracking or fatigue cracking mechanisms.

Ultimately, the applicant modified the application to change relevant components from the new additional measures inspection category to the expansion inspection category. Based upon the staff's review of the application and RAI responses, the staff concluded that the applicant's PWR vessel internals program will be adequate to manage the applicable aging effects in the subsequent period of extended operation.

The staff's review of irradiated concrete

included the reactor pressure vessel primary shield wall or PSW and the pedestal concretes. The staff reviewed the applicant's fluence methodology and found that the applicant demonstrated that the analyses were based on conservative models that would produce results higher than reflected in plant operation.

The staff also reviewed the integrity of the RPV PSW and pedestal concretes. The staff reviewed analyses and plant-specific operating experience related to the effects of irradiation on the mechanical properties of these structures and components. Based on its review of the application and the RAI responses, the staff concluded that there is reasonable assurance that the concrete in these areas will continue to fulfill its intended function throughout the subsequent period of extended operation.

The last bullet here, the Keowee Hydro Station is included because this review involved a unique situation for Oconee. The Keowee Hydro Station serves as the emergency power source and is licensed by the Federal Energy Regulatory Commission or FERC. In the subsequent period of extended operation, the aging effects will be managed for continued compliance with FERC regulations, including inspections conducted

by FERC instead of the NRC.

The NRC did conduct walkdowns of the Keowee Hydro Station during its reviewing and found that relying on the FERC inspections provides reasonable assurance that the Keowee Hydro Station will maintain its intended function throughout the subsequent period of extended operation.

MEMBER HALNON: Real quick question. Does the FERC inspections have the same level of public transparency as the NRC inspections? In other words, will the surrounding public understand the condition of the hydro station going forward?

MR. NADEL: I do not know that. I don't know the level of public release of their reports.

MEMBER HALNON: Okay.

CHAIRMAN REMPE: You still have to say your name.

MR. NADEL: Sorry, Jared Nadel.

MR. YOO: Is there any staff on the structural technical staff that could maybe speak to those FERC inspections, at least the transparency aspect of those inspections?

MEMBER HALNON: You've got some folks.

MR. STARR: Dave Starr, NRC, structural engineer. FERC is under Title 18, I think Part 12 as

well as Subpart D, is an acceptable way of inspecting the existing structures. So that's --

MEMBER HALNON: Yes, I get that technically it's acceptable and probably regulatory-wise it's acceptable. But part of the equation of the acceptance of the community is to have transparency of inspections and to, especially with Keowee, it's being unique. If the public doesn't have the information on how often is that being inspected and is safe, there's not an opportunity for engagement or anything else.

So the curiosity is beyond just, you know, can I go to find it. Is it really available and as transparent as the NRC inspections, which are very transparent, very available.

MR. YOO: Yeah. I believe the member of the licensee can respond to that question.

MR. ROBISON: There's a certified dam inspection report written in -- written and PE stamped by --

CHAIRMAN REMPE: Greg, you have to say your name really loud.

MR. ROBISON: Greg Robison, Duke Energy. There's a certified dam inspection report written and PE stamped and submitted by FERC as a public document after the dam inspections are done. So there is a

public record of the dam's safety, and that's all a part of the hydro FERC rules. But it's a comprehensive report and, you know, as the inspections are done five years or every so often, that report is written and it is submitted and it is public.

MEMBER HALNON: When you say "public," is it easy to get to? Is it actually an inspection report where you just are able to get on a website and click it?

MR. ROBISON: I suppose you can Google it. I haven't, you know, it's that kind of public. It's there, you know, and really the issue with hydro and dam safety is community, communication to community and the confidence that the hydro facilities are safe, because there's, you know, part of the FERC license is recreation and aesthetics and those types of things for the lake and the river.

And so the reports are the certification that we're meeting the FERC rules.

MEMBER HALNON: Okay. Well, it sounds like an interested party can find it. It may be as easy as going to the NRC website. Thank you Greg.

MEMBER SUNSERI: I just Googled it, it pulls up.

(Simultaneous speaking.)

MEMBER HALNON: But anyway, so I had another kind of question, following up on this. I had not realized that there was a different entity providing oversight of the Keowee. So are there technical specifications involved? It's emergency AC power, right? Are there other technical specifications for its availability?

MR. NADEL: This is Jared Nadel. Yeah, that's correct. The Keowee, the hydro generators are in tech specs for --

MEMBER HALNON: So and you as an inspector have authority to go there and look and --

MR. NADEL: That's correct. We go over there periodically and as you'll see on a slide that's coming up, I have also gone into the -- at Keowee with a FERC inspector on that five year inspection.

MEMBER HALNON: Okay. Well, we may have further questions when you get that point.

MR. NADEL: I imagine so.

MR. YOO: Are there any other questions related to the safety review?

(No response.)

MR. YOO: Okay. At this time, I will turn it over to Jared Nadel, the senior resident inspector a Oconee, and he will discuss inspections and the

plant material condition.

MR. NADEL: Good morning everyone. I'm Jared Nadel, senior resident inspector at Oconee Nuclear Station. I've been a resident inspector for the past 15 years at three different sites, and I've transferred to Oconee in 2009. Also joining me virtually on behalf of the region is Paula Cooper, senior reactor inspector.

My role here today is to present the inspector's perspective on the material condition of the plant, and the adequacy of the site's performance on managing the effects of aging. These insights are gained from those region-based inspections and those performed by me and my other two resident inspectors on site.

This table represents the inspections that were performed through the license renewal inspection program, specifically by the 71003 inspection procedure, which is a series of inspections that are performed after the license is renewed, including both before and after entering the period of extended operation.

Each of the three units received a Phase 1 inspection. This phase occurs prior to the period of extended operation during an outage, where the

inspectors can walk down normally inaccessible areas such as containment to observe the implementation of the aging management programs.

For Unit 1, the inspector observed the inspections of the pressurizer internal cladding, spray line and spray head. For Unit 2, the inspector observed ultrasonic exams on the lower core barrel, bolting and flow distributor bolting, while also reviewing the reactor building coatings program. (audio interference) and the eddy current testing of the main condenser tubes.

The Phase 2 was a two-week inspection performed by a team of six inspectors prior to entering the period of extended operation, to verify the license renewal activities were completed. The inspectors reviewed a combination of 24 aging management programs and commitments, and determined that there were a couple of activities outstanding.

In this case, a Phase 3 would normally be performed to finalize the review of the remaining items, but as you can see the Unit 3 Phase 1 was performed after the Phase 2. Thus, we were able to close out those items during that inspection. The Phase 4 was the most recent inspection performed last year. Paula Cooper was the lead for this inspection

and its purpose was to verify that the licensee was adequately managing the effects of aging.

This is a one week inspection that was performed by a team of three inspectors and one technical reviewer. The team reviewed over 50 systems, structures and components associated with 13 aging management programs. The inspections did not identify any findings or concerns with how the licensee implements their aging management programs. Next slide.

DR. SCHULTZ: I'll just remark before you leave that Jared that was a very comprehensive, both inspection and report associated with that. Well done and you briefly described the 50 elements of the inspection. Well documented. Thank you.

MR. NADEL: In addition to the inspections mandated by the license renewal inspection program, inspectors used several ROP baseline inspection procedures to evaluate the implementation of aging management activities. One example is 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 heat

sink inspection, which provides the inspectors an opportunity to review the service water system, as well as the ultimate heat sink. All of these activities are within the scope of license renewal.

Also of note, the triennial fire protection procedure has recently been updated to review aging management of the fire protection equipment.

Next slide. I will now speak to the material condition of Oconee from a regional viewpoint. As a senior resident inspector, we perform routine walkdowns of the plant as an independent means of verifying the structures, systems and components are maintaining their intended function. This includes systems that are normally accessible at power, those accessible only during outages and those that are even more infrequent, such as the photo in this slide.

This photo is of me performing the inspection with a FERC inspector and licensee civil engineers of the penstock at the Keowee hydroelectric plant. As you may have heard, Keowee serves as an emergency backup source for power for the Oconee Nuclear Station. In general, we have no concerns with the overall material condition of the plant beyond the

baseline reactor oversight process.

The licensee has been successful at completing large capital improvement projects that maintain or improve the material condition of its structures, systems and components. The inspectors will continue to inspect and assess the licensee's ability to manage the effects of aging through the baseline inspections. Are there any questions?

DR. SCHULTZ: I have one question that -- but I'll ask it of either Mark or Laura. Duke had the opportunity to describe their level of effort and the number of personnel that were involved in their application development and interactions with the NRC. I know we've got some representatives of the NRC staff here.

But could you describe the numbers of folks and types of folks that have participated in the review of the application?

MS. GIBSON: I'm Lauren Gibson. Lots and varied. On a typical review, we have over 58 technical reviewers who look at the various different aspects. We also have environmental reviewers who do the other side. Altogether, we usually spend about 23,000 hours working on reviews like this, including ACRS meetings, and we had a number of project managers

due to staff turnover.

So Mark, I believe you're number four in the past three months? Yes. So it's a wide swath of people in various different areas.

DR. SCHULTZ: I think I counted 64 when I looked down the roster in the documentation, and the pile of paper that you assembled, and I don't mean that in any derogatory way. But it's quite extensive as well in terms of your safety evaluation of the application.

MS. GIBSON: Yes, thank you.

MEMBER SUNSERI: I have a question for Jared. We don't obviously get to go to the stations to see, so you're kind of our eyes and ears at the station. We rely a lot on your perspectives and I know sometimes our questions are challenging because we go beyond what I would call the regulatory threshold and it's used for things that, you know, direct observations of things like this.

So with that introduction, sometimes you go to nuclear stations and what I'll call the farther away you get from the nuclear island of more degraded standards, be it housekeeping, material condition, etcetera, from the drawing that was put up there, it looks like the Keowee station is pretty far away from

that. Can you just share with us your direct observations of the material condition, corrosion, coatings, housekeeping?

MR. NADEL: Yeah sure. I'll be glad to. Yeah, you mentioned the Keowee station is a good distance from the nuclear island, and you typically would drive there from where we would normally park to get there. But I would say that the material condition at Keowee is good. Housekeeping is excellent. There's just not that many areas or significant amount, you know.

When work is going on, obviously it's a different story. But after that, there's not any stray material or anything like that hanging around, you know. When I got to Oconee, as I imagine most inspectors, I don't typically see a hydro facility like Keowee in my normal duties. So everything there was different.

As you go deeper into the facility at Keowee and you get below the level where the turbines are, there is continual water leakage that exists, and that's not abnormal for this type of facility, and it's managed and it is not, you know, gross by any means. But that was a new thing for me when I got there, to see that kind of, you know, that kind of

condition, and that's the reason why I was interested in actually taking an opportunity like that to go inside the penstock, which you know, most of the people even on site don't get an opportunity to do.

MEMBER SUNSERI: And so the people that maintain that station, are they the same craft that maintain the Oconee station? I mean so say electrical maintenance would do this maintenance on the switch gears and the breakers and everything up there?

MR. NADEL: Oh. So it's a mixed bag. From an operations standpoint, there are -- the operators that are at Keowee are Oconee nuclear operators, and they are part of that organization. That wasn't always the case, but that's the way that it is now. In terms of the electrical components that are out there, when I've been out there most of those I've seen there are fleet teams that have specialized in some of those type of components that will come and do the work.

But there is also people from the station in electrical that go out there, depending on what type of work it is. Engineers from the station have a responsibility for Keowee and will always be out there when there's significant electrical work going on.

MEMBER SUNSERI: So a lot of times -- so it sounds similar to this. A lot of times at a station you'll see the switch yard is the similar example, right? So you'll have people from the parent company doing some work out there, and then some from the site doing some work out there, and there's a clear, kind of a clear line of demarcation. Is that -- they're pretty clear there?

So what I worry about is, you know, either overlapping things and making mistakes that could cause unavailability or missing something that could cause unavailability.

MR. NADEL: Yeah, I understand. I think it is very clear, and it's not as defined as in a switch yard. It's all Duke, and even the hydro-specific groups which will go out to Keowee to do things like this type of inspection, they do that at every hydro facility, and Keowee is another one that they do it at. But they all recognize the special place that Keowee has compared to the other ones.

MEMBER SUNSERI: Okay, so just one more question, and I hate to keep putting you on the spot, because I didn't think about all this because I wasn't realizing the situation. But so a lot of times in that switch yard plant relationship there's, I'll call

it for lack of better words, a contract between the switch yard company and the parent utility?

I mean they all work for the same place, right, but you know, somewhat of a contract. This is your responsibilities and obligations, this is our responsibilities and obligations. Do they have something similar to that with the Keowee station?

MR. NADEL: I don't know if I can speak to that specifically, but I'll let, you know, I'll let Steve talk if he wants.

MR. SNIDER: This is Steve Snider -- This is Steve Snider for Oconee. Everything that Jared said is accurate. For the Keowee Hydro Station, for the switch yard, Oconee personnel provide oversight. We are all one company. We work very closely together.

We do rely very much on the expertise of all areas of the company for the work we're doing, whether it's associated with hydro station or the distribution system on the switch yard. But the Oconee site is responsible for the oversight and the quality of the work.

MEMBER SUNSERI: Yeah. I don't, I'm not challenging either. I'm just seeking to understand because you, I know you're aware that industry

experience says that at least in the switch yards, there's been some discoordination from time to time.

MR. SNIDER: Right, and we have service level agreements that documents clearly what the responsibilities are for each one of the business units on how that responsibility and functionality works.

MEMBER SUNSERI: Perfect, yeah. That's the timed service level agreement. Thanks. I appreciate that, thank you.

MEMBER HALNON: I have a quick question on the managing interface with FERC. Clearly it looks like, you know, you're the -- you're the interface with the inspectors from FERC coming. I assume that, you said you were with the inspectors and what-not. If they found something that would rise to the level of a concern for the NRC, would you open a parallel finding to follow that, or would you just rely on FERC through their processes to follow up on it?

MR. NADEL: So I think that in the case that something like that happened, we would follow up independently, because as has been mentioned, you know, the inspection that I went on, it was only because of FERC that it was happening, and there was no hard requirement necessarily for me to participate.

I just took advantage basically of that access to do an independent walkdown of the material condition of that part of Keowee, and If there were any issues that FERC identified, you know, civilly and structurally, or that I identified on that inspection, we would follow up on that through our authority over the emergency power source requirements at Keowee.

MEMBER HALNON: Okay. So they're obligated to talk to you after their inspections or -- I mean you don't have to Google their report, right?

MR. NADEL: No, no. They're not obligated to talk to us. I don't think, you know, there are memorandums of understanding between the NRC and FERC. But for this type of inspection, it was independent in terms of my decision to participate. We weren't notified and I requested the report, which is generated after this inspection.

I'm not sure If it was the same as the public report, because it included a lot of detailed pictures of the inside of this penstock. But as part of my review, I did request that the licensee maintains that. So I got that from them.

MEMBER HALNON: Just my opinion. It feels a little on the informal side from that perspective, and not knowing all the details I would -- If I was in

the position of being an inspector at the site, I would want to be a little bit more formally notified If there is a finding of some type, whatever meets their threshold, whatever they call it.

MR. NADEL: Yeah, I think it's -- your assessment is accurate. It is a little bit more informal, and but from the NRC side, there's probably things we can do to make that more formalized, since it is once in a five years type of --

MEMBER HALNON: Yeah, and you may not be there next time, in five years.

MR. NADEL: Right.

CHAIRMAN REMPE: So can I pull the thread? Let's talk about what could be done to make it more formal? Is it something where there's some document that's passed to the next inspector, that says hey, beware of this and be sure you get the report?

MR. NADEL: Yeah. I think for the turnover process, that would be the best opportunity to make new inspectors aware of this as an inspection that occurs, and it's an opportunity for us to go out and assess an area of the plant that we can't frequently access. But just to be clear, as part of our baseline inspection process as residents, there is no requirement to do this particular inspection. It's

at our option, and based on this.

MEMBER SUNSERI: Chairman, there's a Duke employee.

MS. GALLOWAY: Yes, hi. This is Heather Galloway, again with Duke. I just wanted to also point out that the FERC inspections are not done in a vacuum necessarily. Our engineers are tied in directly with FERC. They actually participate in many of these walkdowns too.

So any adverse findings that FERC were to find, our engineers would take that and it would be put into the corrective action program, and then we'd follow up on it from there too. So that's another way that the NRC would become aware of it, would be the daily review of the corrective action program.

CHAIRMAN REMPE: So there's a requirement that a FERC finding gets put in the ROP?

MS. GALLOWAY: I don't know that there's a requirement, but if there's a degraded condition, we will, we will put it in the corrective action. We'll put it in our corrective action program.

CHAIRMAN REMPE: Okay. So I thought I heard you say the ROP, but it's your corrective action program?

MS. GALLOWAY: Our corrective action,

yeah. Our corrective action.

(Simultaneous speaking.)

CHAIRMAN REMPE: And do the inspectors take your corrective action --

MS. GALLOWAY: The NRC inspectors?

CHAIRMAN REMPE: Yeah.

MS. GALLOWAY: They reviewed it daily, I believe.

CHAIRMAN REMPE: Okay.

MEMBER SUNSERI: But it's emergency AC power, right? So there's a ROP performance indicator for that, isn't there?

MR. NADEL: Yes. This is Jared Nadel, yeah. That's correct. So it's --

CHAIRMAN REMPE: It should be in that --

MR. NADEL: Right, it is. I mean it's monitored and --

MEMBER BROWN: Yes, I wanted to -- off this one, just a slightly different pitch, because I was -- this is the first time I've not seen diesel generator emergency backup systems and anything, you know, anything I've participated in in the past. I don't have you all's plant experience.

And yet the formalities seem to be a little bit less than what we would expect on a normal

facility. You've been a resident and an inspector at other facilities other than this one, where we've had the standard backup diesel generator setups with switch yard operations, etcetera. Do you get a feeling that the maintenance and the care for this Keowee setup is worse than or not as good as what you see in the more formally monitored plants? I mean you're -- interesting you said this is not a requirement for you as a resident inspector to go out there. Did I misinterpret that statement?

MR. NADEL: Yeah, this is Jared Nadel. Yeah. Just to make sure I'm being clear --

MEMBER BROWN: I'm not criticizing you about it.

MR. NADEL: No, no.

MEMBER BROWN: That's not the point.

MR. NADEL: So that I was talking specifically about the FERC inspection aspect that occurs out at Keowee. I would say in terms of comparison to a diesel generator at a normal plant, it's exactly the same level of oversight and importance.

(Simultaneous speaking.)

MR. NADEL: That's correct, by us as well, in terms of the inspections that we do. There are

inspections we do that are, you know, not associated with the FERC oversight aspects, but wholly within the NRC's regulatory purview associated with the electrical capability of the units, the testing of them. So that works very much like it would at any plant with diesel generators. It's just a very different system obviously that --

MEMBER BROWN: So you, you had no dependence -- you don't depend on FERC doing your validation that this emergency power source is suitable for running a nuclear power plant If it loses its, you know, general capability from the main switch yards and everything else?

MR. NADEL: Yes. Yeah, that's correct, and it's much more often that there will be issues with the other aspects of the Keowee design and control system, breakers, electrical aspects, things like that that we would be getting involved in than the stuff associated with the dam itself, the spillway or the internal components like the penstock, which really are more on the FERC side.

MEMBER BROWN: Okay. A separate question based on experience out in the west, was dams and the unavailability of water, to trap water through hydroelectric systems. Is there any history of the

Keowee backup water system ever approaching levels that would lead you to be apprehensive, or that couldn't provide the power necessary?

MR. NADEL: So the level of the lake at Keowee itself is also something specifically controlled by the nuclear power plant. It's also in technical specifications, and Duke manages the entire watershed with Lake Joccasee above Lake Keowee, and then Lake Hartwell below it, with that in mind. So they would divert water from sources upstream and starve sources downstream as needed in order to maintain that level for nuclear safety and I'm not aware of any times, certainly in the recent past, where they've ever had a challenge with Lake Keowee in terms of the availability of water or the level of the lake.

MEMBER BROWN: I guess the point is that there is a process to control that, such that you don't have a problem based on controlling downstream message that would deplete the water systems in Keowee? Okay.

MR. NADEL: Yeah, that's exactly right.

MEMBER BROWN: I don't know whether I missed anything --

MEMBER SUNSERI: Yeah, no. No, that's

good questions and we have -- mic.

MR. SNIDER: This is Steve Snider. I was going to say I think Jared covered it well, but we do manage the entire waterstream there. We are near the top of the waterstream If you will, and all the climate projections, If anything we're going to get wetter, not drier, you know, in the future.

So and we manage that to make sure we have ample water supply there for Oconee and Keowee proper. Then back to the comments related to the emergency AC piece so the -- of Keowee. I was licensed and grew up with emergency diesels, so that's very familiar to me. But as far as maintenance rule inspections, tech specs, all that is what you would expect for emergency power supply.

FERC comes in more of the structural, the physical part of the dam, and that piece of it is more what their focus is. That's the -- it's more of the uniqueness part where they come into play. And just to plug for that real quick, hydro stations are a lot simpler. Gravity works, no sequencer. I don't know why everybody doesn't have one.

MEMBER BROWN: No, I don't -- I understand that point.

MR. SNIDER: Yeah, no.

MEMBER BROWN: It's just after looking at what's going on, you know, with the various lakes and everybody screaming for water on the west coast, and not having adequate reservoirs, it just triggered my thought process.

(Simultaneous speaking.)

MEMBER BROWN: --asking that question. I'm like you.

MEMBER SUNSERI: No. I think a lot of us agree, it's probably more reliable. But you know, since it is different and we're just seeking a lot of questions to seek information.

(Simultaneous speaking.)

MEMBER SUNSERI: To me, it almost sounds like, and maybe I'll get into trouble by saying this, but you know, the transmission lines themselves are governed by FERC, right, but the plant depends on those for the offsite power, right.

So your first line of defense is having offsite power by having so many transmission lines, and it comes into the switch yard and there's a demarcation and somebody's responsible for this and somebody's responsible for that. But you know, my experience is that the utilities that own that, you know, maybe not physically but you know, make a lot of

ownership for overseeing that, to make sure those relationships support the plant, and it sounds like you all have all that in place. So I'm satisfied.

MEMBER HALNON: So just to close out my thought process on the managing and interface with FERC and NRC, and I mentioned it seems kind of informal. I was trying to think well what would be, in my mind, acceptable, and I would think that when the inspection is done, that your procedures drives you to summarize that into your quarterly inspection report, such that it's transparent and all in one place.

And no, there's no question that it has been considered in the ROP perspective and it also provides the references to get to, so you don't just have to Google a report title. That would be, in my mind, the right thing to do. So just maybe take that and consider it, and go forward so that it's pretty wrapped up, because it's very unique. There's not many places, if any, that we take credit for another organization's inspection.

I mean even from a OSHA perspective, even the OSHA inspections, unless there's something that happens and you bring the OSHA inspector in. But this, it sounds like we're kind of handing it to FERC

and there's really no formal lines of communication. Everyone's doing the right thing. It's just a matter of --

MS. COOPER: This is Paula Cooper, senior reactor inspector. Can I just add a comment to that if I could?

MEMBER HALNON: Sure.

MS. COOPER: So I just wanted to kind of communicate that. So FERC and NRC, the Dam Safety Group, you have a I guess formal collaboration upward, and I can't say that it's specific to Oconee because a lot of the dams that we're dealing with on that collaboration front is associated with dams that are not under FERC authority and are solely under NRC authority.

But there's a Congressional decision that was made many decades ago, recognizing that FERC is the authority for knowledge, experience, etcetera on those dam safeties. So for that reason, FERC actually does the inspections on our behalf for those specific dams.

So in terms of is there an easy pathway to connect this inspection report to the NRC, yes. I mean that pathway exists. That collaboration already exists between FERC, but I think it would be a really

easy value add for them to just request that they add providing this documentation to NRC when it's performed.

MEMBER SUNSERI: Okay, thank you. That would be helpful. Thanks for the comments. Anybody else? We don't get the resident inspectors here at our desk very often.

MS. GIBSON: May I make one more comment about the FERC inspections?

MEMBER SUNSERI: Sure.

MS. GIBSON: This is Lauren Gibson, branch chief for License Renewal. I think we may have started down this path because we said that we don't do the FERC inspections and FERC does aging management programs. I wanted to clarify from the perspective of license renewal. What we mean is that FERC handles the aging management part of the plant, like the individuals from the plant said.

The structural things like that that are not directly related to the operational issues that maybe dealt with for the NRC with the emergency AC power. So what we did is we went out to the site and we did a walkdown there, and we clarified which parts of -- which system as we moved from our system to their system, would be under NRC aging management and

which would be under FERC management.

We didn't want to duplicate anything that FERC was doing, because they are, you know, a valued federal agency as well, and we ended up being good with what we saw and what is happening there. So from an aging management perspective, FERC handles parts of the dam. But from an overall perspective, it seems much complicated than that.

MEMBER HALNON: And my question would just be If FERC said no, we're not going to do it, then you'd be doing it; correct?

MS. GIBSON: I think If FERC said no, we're not going to do it, we would have a broader national problem. But yeah, at the site we would probably pick up the slack.

MEMBER HALNON: That's sort of just a technique to say If they weren't there, you would fill that gap. So now you are crediting portion of your responsibility to FERC, and that's the line of questioning and how you manage that interface. It's not a criticism of allowing FERC to do it. I'm perfectly happy with that.

MEMBER SUNSERI: But I think the telling part of all this discussion is that the end of the day, there was not a plant-specific aging management

plan for this AC power. It all fit in the scope of the generic stuff and whether -- I don't know If there was an exception or not. I didn't remember seeing it, but you know. So on a system level, this is just like any other AC power at any other nuclear power plant as far as aging management and license renewals go.

So you know, there is some nuance here obviously, but it wasn't anything that they had to go create some plant-specific -- plant-specific program, I guess, for license renewals. I think that's -- keep that in mind as kind of an overall conclusion here. Anything else?

(No response.)

MEMBER SUNSERI: All right. Well, you can continue.

MR. NADEL: I'll turn it back over to Mark.

MR. YOO: Next slide, please. So in conclusion for the SLR application safety review, the staff finds the requirements of 10 C.F.R. 5429(a) have been met for the subsequent license renewal for Oconee Nuclear Station Units 1, 2 and 3, and we'll be happy to answer any additional questions you might have. Thank you.

MEMBER SUNSERI: Members, anything else?

DR. SCHULTZ: I have one additional process question. It seemed -- this is Steve Schultz. It seemed like in this review, that the interaction between the NRC and the applicant, as it was associated with their request for additional information and responses back, ran very smoothly. Were there any particular changes for this review in that regard? It seemed like you were bundling together the requests for information in certain ways that were making it more -- the process more efficient?

MS. GIBSON: At one point in our review in our back and forth with the RAIs, we determined that it would be more efficient for us to have public meetings during the RAI response development phase, to minimize the paper work back and forth between the licensee and us. Hence the seven public meetings we had on that RAI process, and we found that to be a faster way for issue resolution in this case.

DR. SCHULTZ: Those meeting were held over a day period, two day period? I mean how did that interaction go for each of the, each of those interactions?

MS. GIBSON: It was staggered, based on when information became available, to be able to

discuss. Some of them I believe were bundled, but some were separate.

MEMBER HALNON: So you permitted some of your technical questions to be answered in the public meetings, which made them go -- either go away or --

MS. GIBSON: No, it wasn't that it --

MEMBER HALNON: I'd just say, how would it make it faster to have a public meeting, because it seems like that bogs things down?

MS. GIBSON: So the way the RAI process normally goes, is the NRC creates the question, has a clarification call with the licensee saying do you understand what we need, everybody's okay with it, we issue it, and then we get something back from the licensee. If the licensee completely missed the mark, you know, if we did not communicate clearly and everyone thought we had communicated clearly, then that means we need another round.

So if we have this intermediate public meeting in the middle, where they can say here's what we're thinking of responding; is this what you're looking for, then we can have a more substantive discussion and get to the final answer faster.

MEMBER HALNON: And I think we're kind of saying the same thing, but I understand now.

MEMBER BROWN: This is -- oh I'm sorry, Steve. Go ahead.

DR. SCHULTZ: Go ahead --

MEMBER BROWN: If you found that beneficial, let me backtrack, which I always do. It means a problem. I like the idea of meetings, but in my old program there was no such thing as a public meeting at the Naval. You just couldn't put it out. It was just too convoluted.

But when you're trying to ensure that the applicant or a vendor understands your questions, face to face back and forth as opposed to paper Q and A's are far superior to ensuring you're going to get an answer back with the question you really intended to ask. So you say that was successful, and based on looking at the time it has taken to do other interactions with RAIs, is there some way you all are trying to move this process that you used to improve the NRC's process in other areas on RAIs?

MS. GIBSON: I can't speak beyond my division. We have spoken about this with the New Reactors Group, because we're in the Division of New and Renewed Reactors. I will say this is -- this was a good way to approach the issues that were not resolved in the first round in RAIs and the second

round. It would have been inefficient to do it for all 77 RAIs that went out at the beginning.

MEMBER BROWN: Some are simple and some are not?

MS. GIBSON: Right. So there's a point at which we're like okay, let's move into this process.

MEMBER BROWN: Okay. I just like face to face, as you can obviously see.

MS. GIBSON: As do we. We're very happy to see Oconee here today, yes.

MEMBER SUNSERI: Anything else?

MEMBER BROWN: Nope, that's it. Thank you.

MEMBER SUNSERI: Any other members? Vice Chair Kirchner, are you on the line? Do you have anything?

MEMBER KIRCHNER: Thank you, Matt. No, no. Thanks to all the presenters. Very useful.

MEMBER SUNSERI: Okay, all right. So I guess then we are at the end of the formal presentations here. The path forward will be we'll take the information that we've received from both these presentations. We'll put together a letter report that will -- we will -- prior to deliberating and reviewing with the full Committee at two o'clock

today in this room and --

CHAIRMAN REMPE: We need to open the line for public comments.

MEMBER SUNSERI: Oh yeah, sure. I always forget that part. That's not pushing the button. There's two requirements that an ACRS member has, call for public comments, push the button. I failed on one of them. So at this point, we will turn to the public line here and ask If there are any comments. If you're on the phone, *6 on mute. If not, If you're on the teams, just state your name and make your comment.

(Pause.)

MEMBER SUNSERI: All right. So we have none, and thank you.

CHAIRMAN REMPE: Thank you.

MEMBER SUNSERI: And I will turn it back to the Chair.

CHAIRMAN REMPE: Thank you very much. A very good meeting. I appreciate the applicant's presentations, our licensee's presentations as well as the staff's presentation.

At this point, we are going to go off the record for the entire meeting, and I think I'm correct about that today. I was confused yesterday, but thank you for your support and we'll all return here at 2:00

p.m. and hopefully have another fun letter-writing session, right? Thank you.

(Whereupon at 11:07 a.m., the above-entitled matter went off the record.)

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Advisory Committee on Reactor Safeguards
Oconee Nuclear Station, Units 1, 2, and 3
Subsequent License Renewal Application (SLRA)
Safety Evaluation (SE)

February 2, 2023

Mark Yoo, Senior Project Manager
Jared Nadel, Senior Resident Inspector

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation Outline

- Oconee Nuclear Station (Oconee) Licensing History
- Oconee Aging Management Programs
- Specific Technical Areas of Review
- Inspections and Plant Material Conditions
- Conclusion on Oconee SLRA Review

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Oconee, Units 1, 2, and 3: Licensing History

Initial License Renewal

Unit	Initial License	Initial License Renewal Application	Renewed License	Expiration Date
1	2/6/1973	7/7/1998	5/23/2000	2/6/2033
2	10/6/1973	7/7/1998	5/23/2000	10/6/2033
3	7/19/1974	7/7/1998	5/23/2000	7/19/2034

Subsequent License Renewal

Application Submitted	6/7/2021
Acceptance Determination	7/28/2021
Safety Evaluation	12/19/2022

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Oconee Units 1, 2, and 3 Aging Management Programs

SLRA - Original Disposition of AMPs	SE - Final Disposition of AMPs
○ 48 AMPs in total	○ 48 AMPs in total
○ 34 existing programs	○ 34 existing programs
• 6 consistent with GALL-SLR	• 6 consistent with GALL-SLR
• 27 consistent with enhancements and/or exceptions	• 27 consistent with enhancements and/or exceptions
• 1 plant-specific	• 1 plant-specific
○ 14 new programs	○ 14 new programs
• 12 consistent	• 11 consistent
• 2 consistent with exceptions	• 3 consistent with exceptions

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Specific Areas of SLRA Review

- Reactor Pressure Vessel Neutron Embrittlement
- Reactor Vessel Internals – Irradiation-Assisted Stress Corrosion Cracking
- Irradiated Concrete and Containment
- Electrical Cable Qualification and Condition Assessment
- Keowee Hydro Station

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Region II: AMP Inspections

License Renewal Inspection Program for Initial Period of Extended Operations

Inspection	Dates	Results
U1 IP 71003 Phase 1	April 11–14, 2011 ML111250604	No Findings
U2 IP 71003 Phase 1	November 5-12, 2012 ML12335A243	No Findings
U3 IP 71003 Phase 1	April 21-24, 2014 ML14153A244	No Findings
U1, U2 & U3 IP 71003 Phase 2	August 6 – 23, 2012 ML12277A420	No Findings
U1 & U2 IP 71003 Phase 4	June 6-10, 2022 ML22209A250	No Findings

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Region II: AMP Inspections

ROP Baseline Inspections

Inspection	Date	Aging Management Program
IP71111.08 ISI	Biennial per unit 2022 U1 2021 U2 2022 U3	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	Triennial 2021	Service Water System and Inspection of Water Control Structures
IP71111.21N	Triennial 2022	Fire Protection
IP71152 PI&R	Biennial 2021	Ensure activities in the licensee's aging management program are adequate to identify the aging effect prior to loss of SSC intended function, and whether the licensee's corrective actions address the adequacy of the aging management program.

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United States Nuclear Regulatory Commission
Protecting People and the Environment

Region II: Plant Material Condition and Conclusion

- Plant material condition 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

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 Oconee Nuclear Station, Units 1, 2, and 3.

Oconee Nuclear Station

Units 1, 2, and 3

Subsequent License Renewal Application

Advisory Committee on Reactor Safeguards

February 2, 2023

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Introductions

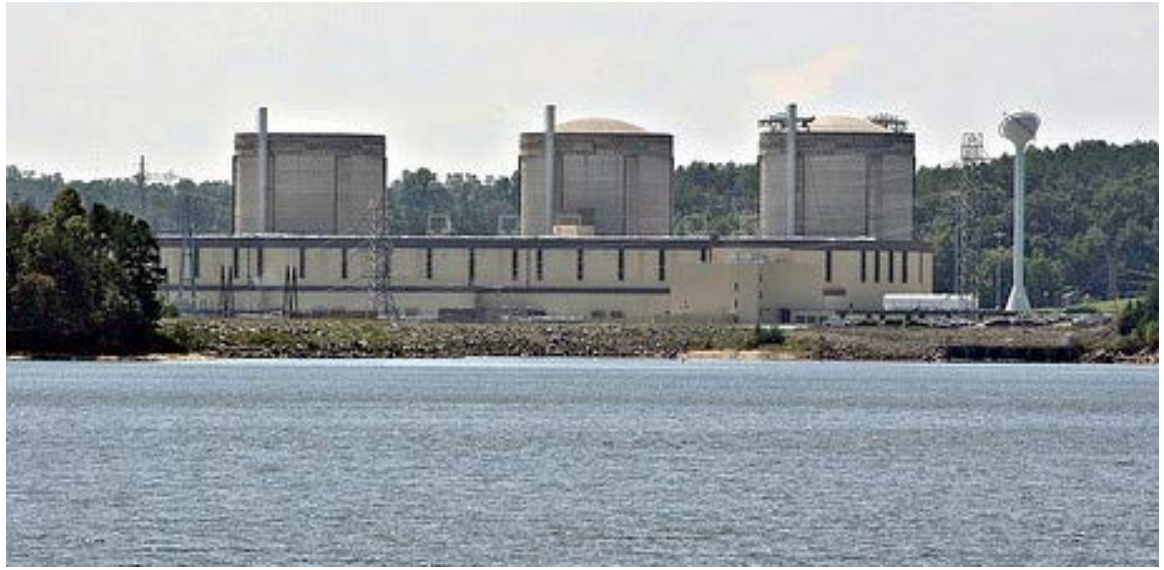
Rounette Nader – Duke Energy License Renewal Director

Steve Snider – Oconee Nuclear Station Vice President

Greg Robison – Duke Energy Subsequent License Renewal Manager

Joe Terrell – Duke Energy Subsequent License Renewal Technical Lead

Agenda



- Oconee Nuclear Station
  - Station Overview
  - Licensing Overview
  - Performance
  - Significant Plant Modifications
- Subsequent License Renewal Application
  - Subsequent License Renewal Application Development
  - Process Advancement for Subsequent License Renewal
  - Oconee Subsequent License Renewal Aging Management Program Results
- Key Technical Topics
  - Reactor Vessel Internals
  - Reactor Vessel Supports
  - Concrete Embrittlement
- Closing Remarks

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Oconee Nuclear Station

Steve Snider

Oconee Nuclear Station Overview

- Oconee Nuclear Station (Oconee) is a three-unit, Babcock & Wilcox (B&W) nuclear steam supply system, pressurized water reactor (PWR) plant, using once through cooling
- Oconee produces 2,554 megawatts, enough to power more than 1.9 million homes
- Oconee sits on 510 acres adjacent to Lake Keowee in Seneca, SC
- Emergency AC power for Oconee is supplied by Keowee Hydroelectric Station
- Standby Shutdown Facility is backup to existing safety systems (additional “defense in depth”)

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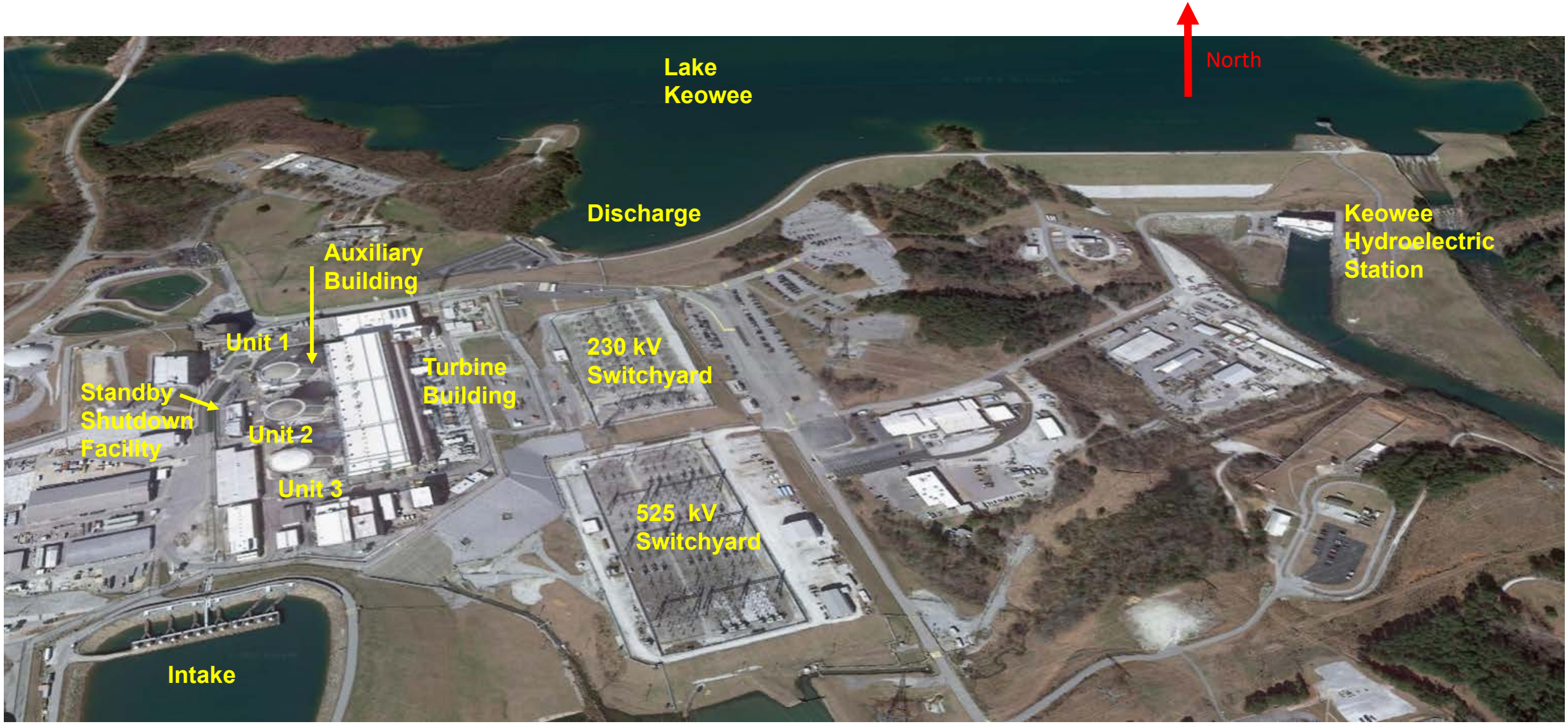
Oconee Nuclear Station Overview



Oconee Nuclear Station Licensing Overview

Licensing Action	Unit 1	Unit 2	Unit 3
Full Power Licenses	February 6, 1973	October 6, 1973	July 19, 1974
Independent Spent Fuel Storage Installations	Site-specific license issued – 1987 Renewed site-specific license issued – 2009 General license issued – 1997		
Power uprate	Approved February 2021		
Initial License Renewal Issued	May 23, 2000		
Entered Period of Extended Operation	February 6, 2013	October 6, 2013	July 19, 2014
Current License Expiration	February 6, 2033	October 6, 2033	July 19, 2034
Subsequent License Renewal Application Submittal	June 7, 2021		

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Oconee Performance

- Each Oconee unit operates on a 24-month refueling frequency
- Breaker-to-breaker runs for each Oconee Unit during the last full cycle of operation
    - Unit 1 – 710 days, Unit 2 – 701 days, Unit 3 – 727 days
- Plant Capacity Factors

Year	Unit 1	Unit 2	Unit 3
2020	92.2	103.0	92.9
2021	102.2	94.0	101.6
2022	94.2	95.9	93.2
3-year average	96.2	97.6	95.9

- Regulatory Status
    - Reactor Oversight Process (ROP) Actions Matrix Column 1
    - All ROP Indicators are Green

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Significant Plant Modifications

Modification	Unit 1	Unit 2	Unit 3
Replaced Once-Through Steam Generators	2003	2004	2004
Replaced Reactor Vessel Heads	2003	2004	2003
Replaced Reactor Protection Systems/Engineered Safeguards	2011	2013	2012
Installed Borated Water Storage Tank Tornado Missile Protection	2012	2012	2012
Replaced Carbon Steel Low Pressure Service Water Inlet/Outlet Piping to Reactor Coolant Pumps with Stainless Steel	2014, 2016, 2022	2011, 2013	2010
Replaced/Upgraded Main Step-up Transformer	2018	2015	2016
Replaced High Pressure Feedwater Heater	2016	2017	2020, 2022
Replaced Low Pressure Turbines Rotors	2020	2019	2020
Installed Protected Service Water	2016		
Adopted NFPA 805 Licensing Basis	2016		
Replaced Turbine Building Roof	2019		
Replaced Keowee Rotor Poles	Keowee Unit 1: 2014 Keowee Unit 2: 2014		
Replaced Keowee Stators	Keowee Unit 1: 2019 Keowee Unit 2: 2020		

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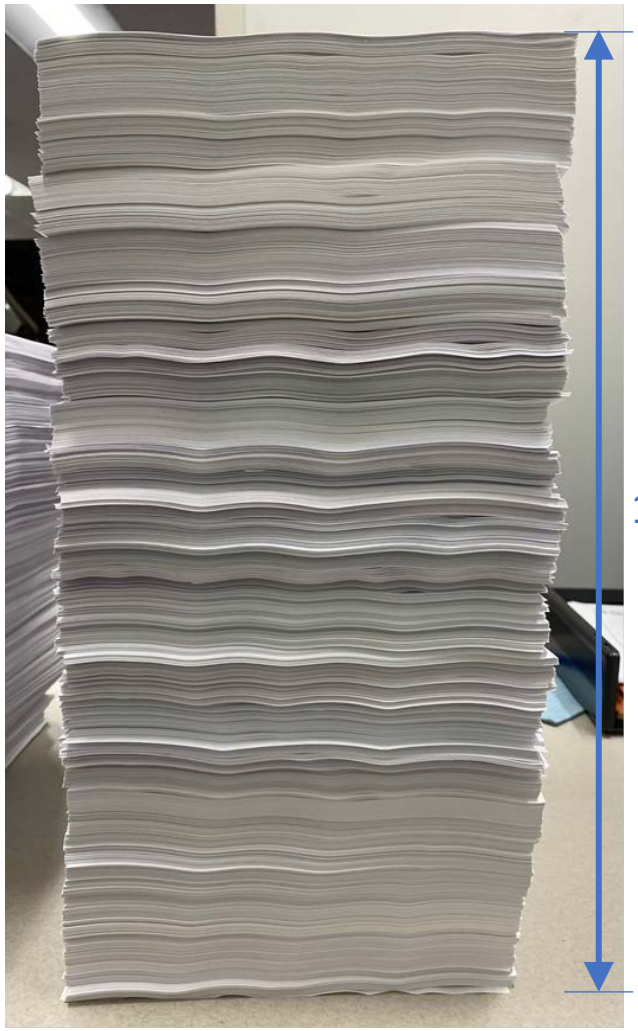
Subsequent License Renewal Application

Greg Robison

Subsequent License Renewal Application Development



Oconee SLR Application printed (4010 pages)

- Developed by
  - In-house Duke Subsequent License Renewal (SLR) team
  - Augmented with key vendor support
- Used Contemporary Guidance
  - Comprehensive Scoping & Screening was performed based on NUREG-2192, NEI 17-01, and Regulatory Guide 1.188
  - Integrated Plant Assessment results presented consistent with contemporary style and detail
  - Time-limited Aging Analysis results addressed for 80 years
  - SLR aging management programs have been harmonized with NUREG-2191

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Subsequent License Renewal Application Development

- Applied Lessons Learned & Experience
  - SLR Lead Plants – Lessons applied in Oconee application development
  - Industry Participation – Duke participated with the industry during the development of the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report (NUREG-2191)
  - Application Peer Reviews – Participated in peer reviews and received a peer review of the Oconee SLR Application
  - License Renewal Aging Management Program Effectiveness Reviews – Initial Oconee license renewal aging management program effectiveness reviews performed using elements of NEI 14-12
  - NRC Staff Review – In June 2022, an IP-71003 Phase 4 inspection was conducted to assess aging management program effectiveness. No issues identified.

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Process Advancement for Subsequent License Renewal

- License Renewal Process Advancement
  - For SLR, process advancements like those captured in GALL-SLR mean even further refined programmatic actions for the subsequent period of extended operation (SPEO)
  - For initial License Renewal, Oconee was a pre-GALL plant (LR Pre-GALL)

- Scoping & Screening
  - SLR Scoping & Screening followed NUREG-2191 (GALL-SLR) and NUREG-2192 Standard Review Plan of SLR Applications (SRP-SLR)
  - Minimal Differences from LR Pre-GALL
    - Scope expansion required to address 10 CFR 54.4(a)(2)
    - Scope expansion due to adoption of NFPA 805 for Fire Protection Program

- Aging Management Review
  - SLR aging management review results had a high consistency (99.3% Notes A thru E) with GALL-SLR
  - LR Pre-GALL used industry-derived aging effects identification tools
  - Applying GALL-SLR allows for enhanced standardization of the Oconee aging management programs

Process Advancement for Subsequent License Renewal

- Aging Management Programs
  - SLR – credited 48 aging management programs
    - Industry and plant-specific operating experience reviewed for a 10-year period
    - Effectiveness of existing aging management programs confirmed by operating experience & no new aging effects were identified
  - LR Pre-GALL – credited 26 aging management programs and numerous preventive maintenance activities

- Site and Fleet Participation
  - Current site and fleet program owners reviewed SLR aging management programs
  - For new SLR aging management programs, these reviewers included their perspectives in the program design and ensured feasibility of the SLR commitments

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Oconee Subsequent License Renewal Aging Management Program Results

Oconee SLR Aging Management Programs	Consistent with GALL-SLR	Consistent with Enhancement	With Exception Only	With Exception and Enhancement	Plant Specific
Existing 34	6	20	2	5	1
New 14	11	0	3	0	0
Total 48					

Key Technical Topics

Joe Terrell

Key Technical Topics

- Reactor Vessel Internals
- Reactor Vessel Supports
- Concrete Embrittlement

Reactor Vessel Internals

- Reactor Vessel Internals component items are consistent with MRP-227-A for the B&W design
- The MRP-227-A Gap Analysis used MRP-227, Revision 1-A as the starting point and identified several new primary and expansion inspection items
- New Primary Items with Expansion
  - Oconee Unit 2 core barrel cylinder top flange circumferential weld and center circumferential weld. Expansion items include all remaining core barrel cylinder welds for Units 1, 2, and 3.
  - Lower grid rib section for Units 1, 2, and 3. Expansion items include the upper grid assembly for Units 1, 2, and 3.

Aging Management Programs

- Neutron Fluence Monitoring Program (X.M2)
- PWR Vessel Internals Program (XI.M16A)

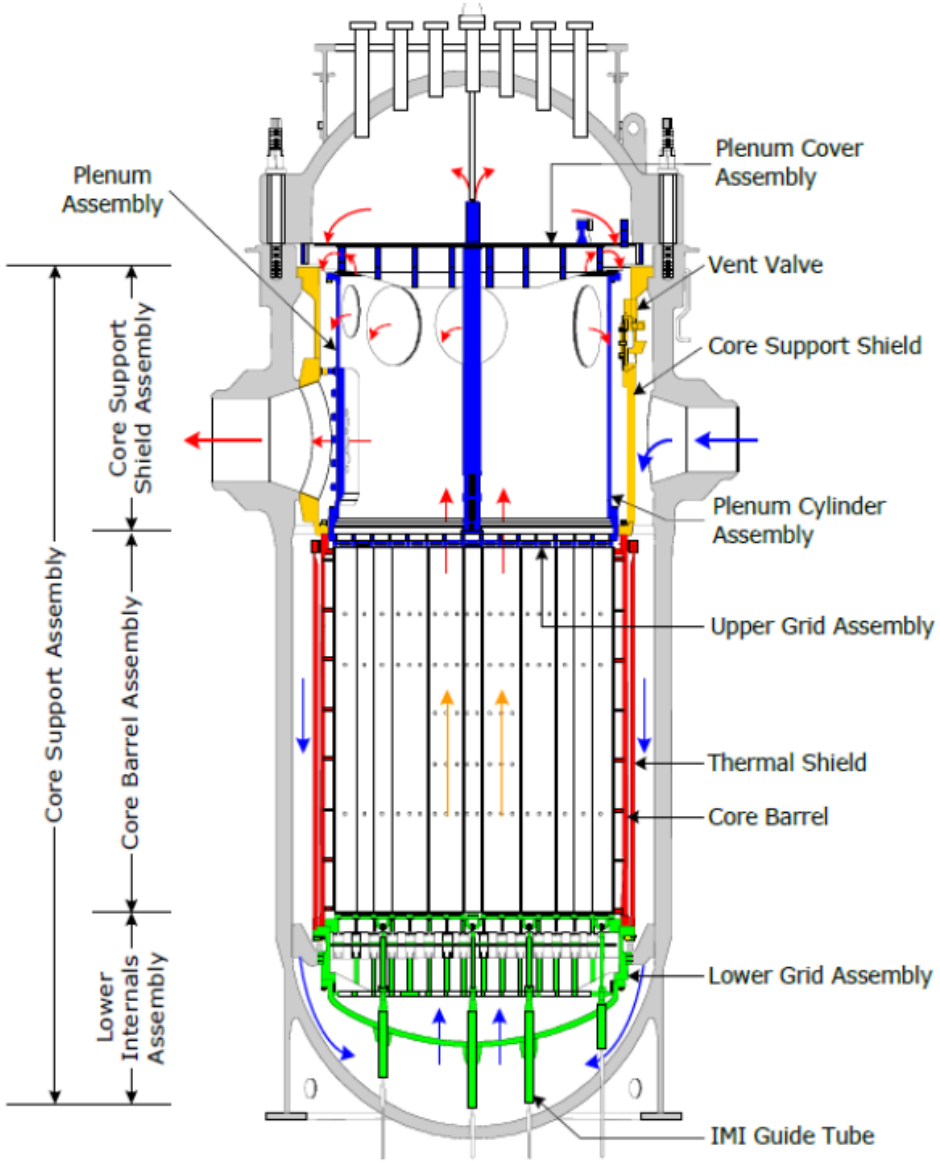
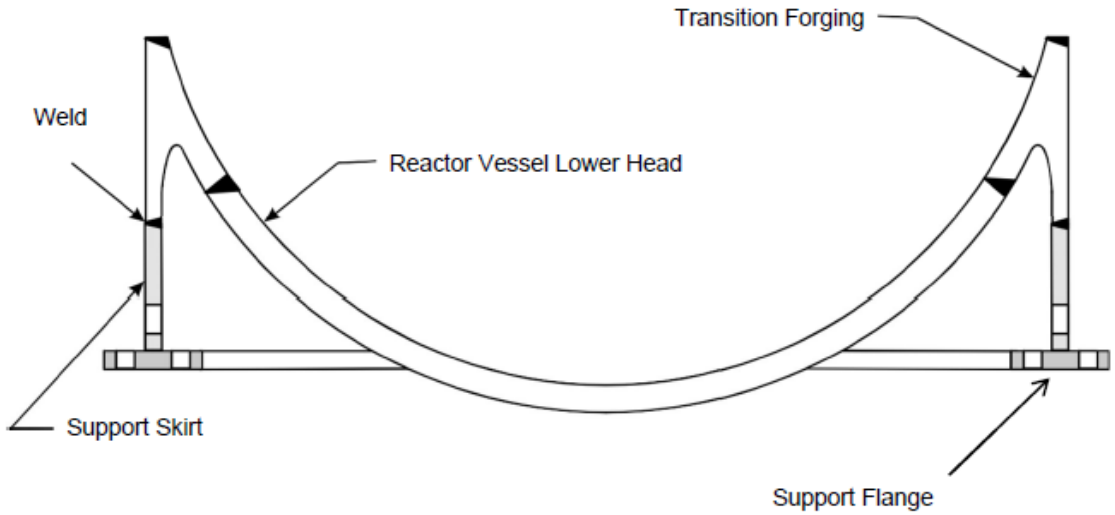
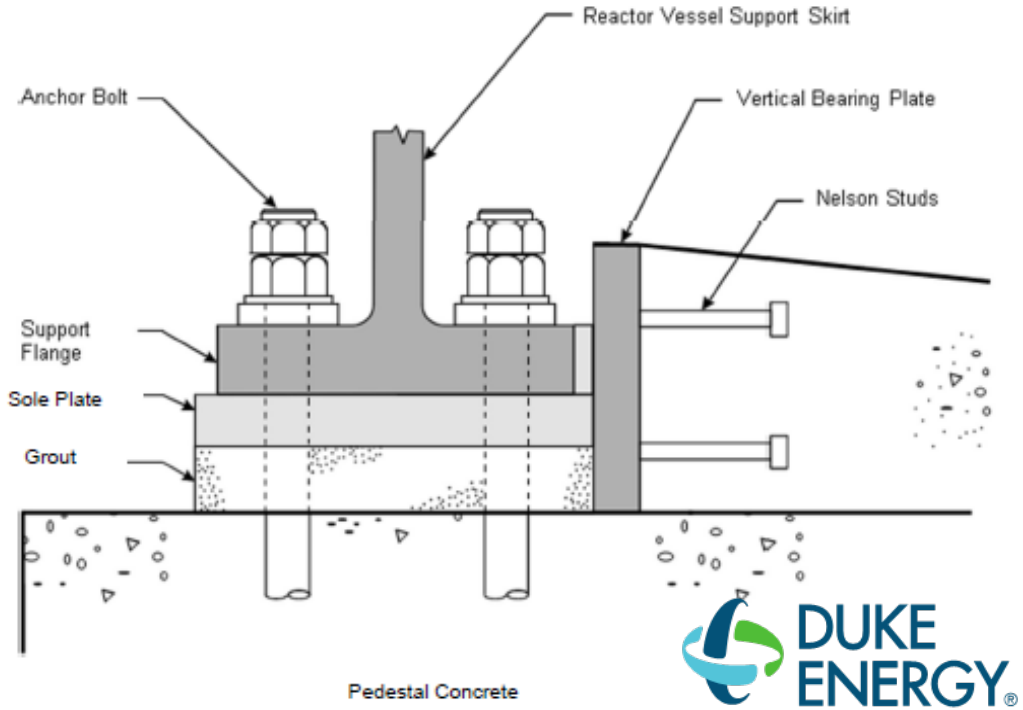


Figure 3-1
Overview of Typical B&W Internals
(Source: ML19339G350)

Reactor Vessel Supports

- As with all 177 fuel assembly (FA) lowered loop B&W designs, the Oconee reactor vessel utilizes a welded steel support skirt assembly that consists of a support skirt, support flange, anchor bolts, and associated embedment items (e.g., sole plate, vertical bearing plate, and nelson studs)
- Support skirt, support flange, sole plate, and vertical bearing plate are all made from carbon steel; anchor bolts and associated fasteners are made from low alloy steel
- No structural support is provided at the reactor vessel nozzles





Reactor Vessel Supports

- Support skirt and embedment carbon and low alloy steel items were evaluated for susceptibility to irradiation embrittlement using the process documented in NUREG-1509, Radiation Effects on Reactor Pressure Vessel Supports

- For those items (i.e., Units 1, 2, and 3 support flange and nelson studs, and Units 1 and 2 support flange welds) in which the NUREG-1509 evaluation found potentially susceptible to irradiation embrittlement, further evaluation was completed to demonstrate that intended function will be maintained throughout the SPEO

- Based on this evaluation of the effects of irradiation embrittlement on component intended function, the reactor vessel supports intended function will be maintained consistent with the current licensing basis throughout the SPEO

Aging Management Programs

- Fatigue Monitoring Program (X.M1)
- Boric Acid Corrosion Program (XI.M10)
- ASME Section XI, Subsection IWF Program (XI.S3)

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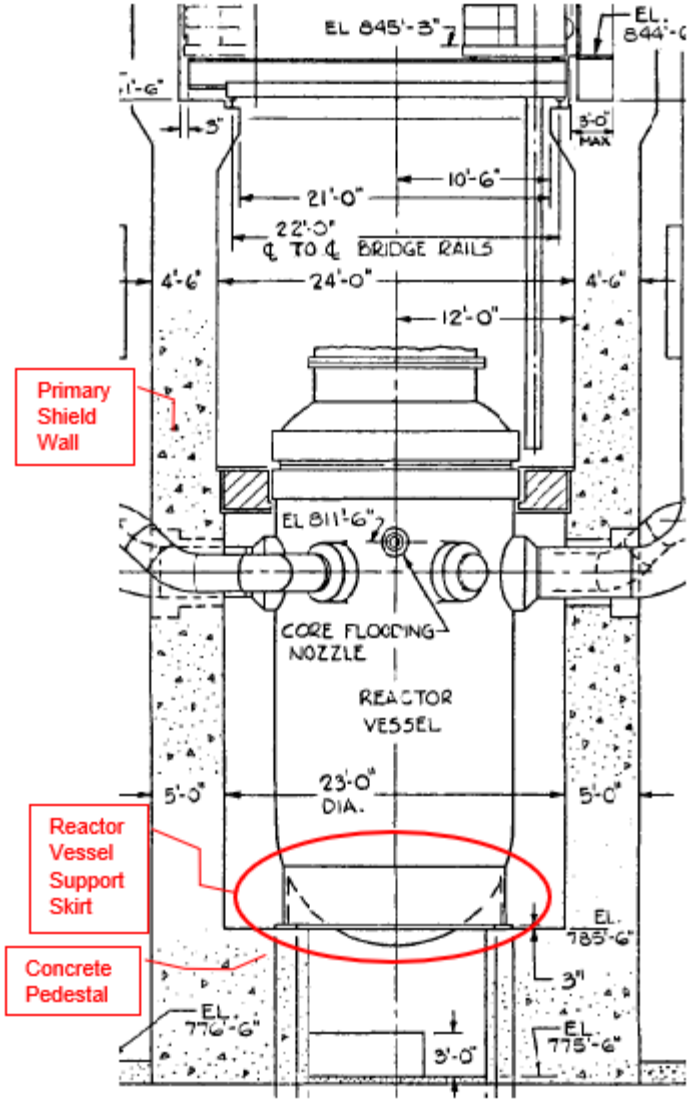
Concrete Embrittlement

- The key topic of concrete embrittlement focused on the primary shield wall and reactor vessel pedestal concrete which supports the reactor vessel support skirt

- Primary Shield Wall
  - The primary shield wall does not provide a support function for the reactor coolant system
  - Projected maximum radiation exposures on the inner surface of the primary shield wall at the end of the SPEO (72 EFPY) are less than GALL-SLR thresholds above which irradiation damage is a potential concern for concrete embrittlement
  - Concrete thermal embrittlement is not a concern. Duke confirmed through thermal analyses of the primary shield wall, using updated gamma heating rates generated for SLR, that general area and localized area concrete temperatures will be below 150°F and 200°F, respectively.



Concrete Embrittlement

- Reactor Vessel Pedestal Concrete
  - The reactor vessel pedestal provides a support function for the reactor coolant system
  - Projected maximum radiation exposures on the reactor vessel pedestal concrete at the end of the SPEO (72 EFPY) are less than GALL-SLR thresholds above which irradiation damage is a potential concern for concrete embrittlement
  - General concrete temperatures will be below 150°F as confirmed through thermal analyses of the pedestal support, using updated gamma heating rates generated for SLR
  - Localized concrete areas directly below the reactor vessel support flange at the shear pin locations are conservatively predicted to have localized temperatures slightly higher than 200°F; considering the conservatisms used in the analysis, the risk that actual temperatures would exceed 200°F is minimal; therefore, concrete thermal embrittlement is not a concern

Aging Management Programs

- ASME Section XI, Subsection IWF Program (XI.S3)
- Structures Monitoring Program (XI.S6)

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Closing Remarks

Rounette Nader

Closing Remarks

- Duke Energy submitted a high-quality Oconee SLR Application
  - Duke Energy team is comprised of individuals experienced with license renewal and familiar with Oconee systems and programs
  - Oconee aging management reviews have a high degree of consistency with GALL-SLR

- Duke Energy will continue to invest in people, program enhancements and equipment modifications, laying the foundation for the SPEO

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Oconee Subsequent License Renewal

Life after 60