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RA-22-0129
April 20, 2022

10 CFR 50.4
10 CFR Part 54

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Oconee Nuclear Station (ONS), Units 1, 2, and 3
Docket Numbers 50-269, 50-270, 50-287
Renewed License Numbers DPR-38, DPR-47, DPR-55
Subsequent License Renewal Application
Response to ONS SLRA 2nd Round RAI B4.1-3

References:

1. Duke Energy Letter (RA-21-0132) dated June 7, 2021, Application for Subsequent Renewed Operating Licenses, (ADAMS Accession Number ML21158A193)
2. NRC Letter dated July 22, 2021, Oconee Nuclear Station, Units 1, 2, and 3 - Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding Duke Energy Carolinas' Application for Subsequent License Renewal (ADAMS Accession Number ML21194A245)
3. NRC E-mail dated September 22, 2021, Oconee SLRA - Request for Additional Information B2.1.27-1 (ADAMS Accession Number ML21271A586)
4. Duke Energy Letter (RA-21-0281) dated October 22, 2021, Subsequent License Renewal Application, Response to Request for Additional Information B2.1.27-1 (ADAMS Accession Number ML21295A035)
5. NRC E-mail dated November 23, 2021, Oconee SLRA – Request for Additional Information - Set 1 and Second Round Request for Additional Information RAI B2.1.27-1a (ADAMS Accession Number ML21327A277)
6. Duke Energy Letter (RA-21-0332) dated January 7, 2022, Subsequent License Renewal Application Responses to NRC Request for Additional Information Set 1 and Second Round Request for Additional Information B2.1.27-1a (ADAMS Accession Number ML22010A129)
7. NRC E-mail dated January 11, 2022, Oconee SLRA – Request for Additional Information - Set 2 (ADAMS Accession Numbers ML22012A043 and ML22012A042)
8. Duke Energy Letter (RA-22-0036) dated February 14, 2022, Subsequent License Renewal Application Responses to NRC Request for Additional Information Set 2 (ADAMS Accession Number ML22045A021)
9. NRC E-mail dated January 18, 2022, Oconee SLRA – Request for Additional Information Set 3 (ADAMS Accession Numbers ML22019A103 and ML22019A104)

10. Duke Energy Letter (RA-22-0040) dated February 21, 2022, Subsequent License Renewal Application Responses to NRC Request for Additional Information Set 3 (ADAMS Accession Numbers ML22052A002)
11. NRC E-mail dated March 21, 2022, Oconee SLRA – 2nd Round RAI B4.1-3 (ADAMS Accession Numbers ML22080A077 and ML22080A079)

By letter dated June 7, 2021 (Reference 1), Duke Energy Carolinas, LLC (Duke Energy) submitted an application for the subsequent license renewal of Renewed Facility Operating License Numbers DPR-38, DPR-47, and DPR-55 for the Oconee Nuclear Station (ONS), Units 1, 2, and 3 to the U.S. Nuclear Regulatory Commission (NRC). On July 22, 2021 (Reference 2), the NRC determined that ONS subsequent license renewal application (SLRA) was acceptable and sufficient for docketing. In emails from Angela X. Wu (NRC) to Steve Snider (Duke Energy) dated September 22, 2021, November 23, 2021, January 11, 2022, and January 18, 2022 (References 3, 5, 7, and 9), the NRC transmitted specific requests for additional information (RAI) to support completion of the Safety Review. The responses were provided to the NRC on October 22, 2021, January 7, 2022, February 14, 2022, and February 21, 2022 (References 4, 6, 8, and 10).

In an email from Angela X. Wu (NRC) to Steve Snider (Duke Energy) dated March 21, 2022 (Reference 11), the NRC transmitted a second round for RAI B4.1-3 also to support completion of the Safety Review. This submittal provides that response.

Enclosure 1 contains the response for RAI B4.1-3. SLRA changes are also provided along with the affected SLRA section(s), SLRA page number(s), and SLRA mark-ups in Enclosure 1. For clarity, deletions are indicated by strikethrough and inserted text by underlined red font.

This submittal contains revisions to Table A6.0-1, Subsequent License Renewal Commitments, #48, Secondary Shield Wall Tendon Surveillance program.

Should you have any questions regarding this submittal, please contact Paul Guill at (704) 382-4753 or by email at paul.guill@duke-energy.com.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 20, 2022.

Sincerely,

Steven M. Snider
Site Vice President
Oconee Nuclear Station

Enclosure:

1. Response to ONS SLRA 2nd Round RAI B4.1-3

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ENCLOSURE 1

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3
SUBSEQUENT LICENSE RENEWAL APPLICATION
RESPONSE TO ONS SLRA 2ND ROUND RAI B4.1-3

Enclosure 1
Response to ONS SLRA 2nd Round RAI B4.1-3

Request for Additional Information (RAI) B4.1-3:

Regulatory Basis:
Title 10 of the *Code of Federal Regulations* (CFR) Section 54.21(a)(3) requires an applicant to demonstrate that the effects of aging for each structure and component identified in 10 CFR 54.21(a)(1) will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the U.S. Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

Background:
In responses to RAIs B4.1-1 and B4.1-2, the applicant revised lift-off testing requirements in Section A5.1, *"Secondary Shield Wall Tendon Surveillance,"* in Appendix A of ONS SLRA as follows: *"Lift-off testing is performed on three tendons, one (1) horizontal, one (1) diagonal, and one (1) vertical, every other refueling outage. These three tendons, per unit, will be selected based on the existing lift-off data and practical access limitations. They will be the common tendons for lift-off testing. Prestressing forces will be trended and projected through the next two operating cycles, i.e. every 48 months. Visual inspections will also be performed on both ends of the common tendons on the same frequency as the lift-off tests."*

Based on review of responses to RAIs B4.1-1 and B4.1-2, staff noted that the applicant will be revising the SLRA from *"lift-off testing on three randomly selected horizontal tendons,"* to *"lift-off testing of common tendons of one (1) horizontal, one (1) diagonal, and one (1) vertical,"* that included all three SSW tendon groups every other refueling outage.

SRP-SLR Section A.1.2.3.4*, "Detection of Aging Effects,"* notes that for a condition monitoring program, when sampling is used to represent a larger population of SCs, applicants provide the basis for the inspection population and sample size.

SRP-SLR Section A.1.2.3.5, *"Monitoring and Trending,"* notes that for sampling-based inspections, results are evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation.

During a March 7, 2022, public meeting, and subsequent email (ADAMS Accession No. ML22074A002), the applicant indicated that the Secondary Shield Wall (SSW) AMP would be revised to perform lift-off testing on the common three (3) horizontal tendons, one (1) diagonal tendon, and one (1) vertical tendon every other refueling outage for the collection of consistent data to trend prestressing tendon losses.

Issue:
Additional technical justification is needed for revising the SSW tendon lift-off testing requirements from *"three randomly selected horizontal tendons,"* to *"common tendons on three (3) horizontal, one (1) diagonal, and one (1) vertical."*

Requests:
1. Confirm that the sample size (i.e., three (3) horizontal, one (1) diagonal, one (1) vertical) discussed in the email will be the sample size for the SSW AMP and provide a technical justification for the sample size.
2. Provide the technical justification(s) of revising the SSW tendon lift-off testing from randomly selected tendons to "common tendons."
3. Provide markups to the SLRA, as appropriate.

Response to RAI B4.1-3:

Request 1:

As discussed in a March 7, 2022, public meeting and subsequent email (ADAMS Accession No. ML22074A002), Oconee confirms that the lift-off testing sample size will be enhanced to three (3) horizontal, one (1) diagonal, one (1) vertical tendon for the Secondary Shield Wall lift-off testing for each Oconee unit. Additionally, Oconee will perform visual inspections on both ends of each tendon selected for Secondary Shield Wall lift-off testing. These inspections will be performed every other refueling outage.

While it is recognized that the Secondary Shield Wall Tendon Aging Management Program is not under the purview of ASME Section XI IWL rules, Subsection IWL-2500 does provide guidance on Tendon Selection Examination Requirements for Unbonded Post-Tensioning Systems. Table IWL-2521-1 provides guidance on the percentage of tendons to be tested after the 10th year of service as 2% of all tendons of each type.

The horizontal tendons in the Secondary Shield Wall are similar in materials, design, environment, and operating conditions. There are 53 horizontal tendons in each Secondary Shield Wall. The three (3) horizontal tendons that will be tested from this subgroup represent approximately 6% of the total horizontal tendon population. This sample size meets the intent of the guidance provided in Table IWL-2521-1 and appropriately represents the larger population of the horizontal tendon subgroup.

The vertical tendons in the Secondary Shield Wall are similar in materials, design, environment, and operating conditions. There are 8 vertical tendons in each Secondary Shield Wall. The one (1) vertical tendon that will be tested from this subgroup represents approximately 13% of the total vertical tendon population. This sample size meets the intent of the guidance provided in Table IWL-2521-1 for percentage of subgroup population to include in the sample population.

The diagonal tendons in the Secondary Shield Wall are similar in materials, design, environment, and operating conditions. There are 16 diagonal tendons in each Secondary Shield Wall. The one (1) diagonal tendon that will be tested from this subgroup represents approximately 6% of the total diagonal tendon population. This sample size meets the intent of the guidance provided in Table IWL-2521-1 for percentage of subgroup population to include in the sample population.

ONS recognizes that Table IWL-2521-1 also provides a value of 3 for the minimum number of required tendons to be tested per subgroup after 10 years of service. These minimum numbers are provided for

containment structures with very large numbers of unbonded tendons. Such minimum values are not relevant for a structure like the Secondary Shield Wall with a smaller number of tendons.

The similarity of materials of construction, fabrication, procurement, design, installation, environment, operating conditions, and aging effects, as well as the guidance provided in Table IWL-2521-1, all ensure that the inspection population is appropriate to align with the SRP-SLR Element 4 criteria. For the subsequent period of extended operation, the tendon lift-off data will be used to trend the prestressing forces and to project tendon prestress losses through the next two operating cycles, i.e. every 48 months. The projections of the tendon prestress losses will be evaluated against acceptance criteria to confirm there will be no loss of intended function of the tendons prior to the next inspection period, which satisfies SRP-SLR Element 5 criteria.

Request 2:

Subsequent to the March 7, 2022, public meeting and email (ADAMS Accession No. ML22074A002), Duke Energy has re-evaluated the program change to the use of common test tendons and will instead revert to utilize the existing Secondary Shield Wall Tendon Surveillance Aging Management Program tendon selection methodology with the enhancement to the sample size as described in the response to Request 1.

Request 3:

The appropriate SLRA sections have been updated to reflect the positions described in responses to Requests 1 and 2.

SLRA Revisions:

Only the affected paragraphs have been included in the below revisions. Previous revisions made in other submittals associated with this RAI remain in effect.

SLRA Appendix A5.1 (page A-72) is revised as follows:

A5.1 Secondary Shield Wall Tendon Surveillance

Program Description

The *Secondary Shield Wall Tendon Surveillance* AMP is an existing condition monitoring program that manages aging effects associated with the tendons and tendon anchorage in the reactor building secondary shield wall. The secondary shield wall tendon system assures the structural adequacy of the secondary concrete shield wall, which provides structural support, shelter and protection to safety related SSCs. There are no preventive or mitigative actions associated with this program. The program manages for loss of material, cracking, and loss of tendon prestress by conducting visual inspections and tendon lift-off tests in accordance with station procedures. Lift-off testing is performed on ~~three~~ **five** tendons**:** ~~one (1)~~ **three (3)** horizontal, one (1) diagonal, and one (1) vertical, every other refueling outage. ~~These three tendons, per unit, will be selected based on the existing lift off data and practical access limitations. They will be the common tendons for lift off testing.~~ Prestressing forces will be trended and projected through the next two refueling cycles, i.e. every 48 months. Visual inspections will also be performed on both ends of the ~~common~~ **selected** tendons on the same frequency as the lift off tests.

Enhancements

The *Secondary Shield Wall Tendon Surveillance* AMP will be enhanced to:

1. Perform lift-off testing on each of the three units on ~~one (1)~~ **three (3)** horizontal, one (1) diagonal, and one (1) vertical tendon, pulled from one end, every second refueling outage, i.e. every 48 months. ~~These three tendons, per unit, will be selected based on the existing lift-off data that is available as well as practical access limitations, and they will be the common tendons for lift off testing.~~

2. Enhance station procedures to include a review of previous visual inspection and lift-off data results for the tendons selected for inspection. Revise station procedures to use the ~~common~~ tendon lift-off data to trend the prestressing forces and to project tendon prestress losses through the next two operating cycles, i.e. every 48 months.

3. Perform a visual inspection on both ends of the ~~common~~ tendons **selected for lift-off testing** every other refueling outage, i.e. 48 months, during the same outage as the lift off tests.

SLRA Table A6.0-1 (page A-115) is revised as follows:

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
48	*Secondary Shield Wall Tendon Surveillance* program	The *Secondary Shield Wall Tendon Surveillance* AMP is an existing program that will be enhanced to: 1. Perform lift-off testing on each of the three units on ~~one (1)~~**three (3)** horizontal, one (1) diagonal, and one (1) vertical tendon, pulled from one end, every second refueling cycle, i.e. every 48 months. ~~These three tendons, per unit, will be selected based on the existing lift off data that is available as well as practical access limitations, and they will be the common tendons for lift off testing.~~ 2. Enhance station procedures to include a review of previous visual inspection and lift-off data results for the tendons selected for inspection. Revise station procedures to use the ~~common~~ tendon lift-off data to trend the prestressing forces and to project tendon prestress losses through the next two operating cycles, i.e. every 48 months. 3. Perform a visual inspection on both ends of the ~~common~~ tendons **selected for lift-off testing** every other refueling outage, i.e. 48 months, during the same outage as the lift off tests.	B4.1	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

SLRA Appendix B.4.1 (page B-307) is revised as follows:

B4.1 Secondary Shield Wall Tendon Surveillance

Program Description

The *Secondary Shield Wall Tendon Surveillance* AMP is an existing condition monitoring program that manages aging effects associated with the tendons and tendon anchorage in the reactor building secondary shield wall. The secondary shield wall tendon system assures the structural adequacy of the secondary concrete shield wall, which provides structural support, shelter and protection to safety related systems, structures, and components. There are no preventive or mitigative actions associated with this program. The program manages for loss of material, cracking, and loss of tendon prestress by conducting visual inspections and tendon liftoff tests in accordance with station procedures. Lift-off testing will be performed on ~~three~~ **five** tendons**:** ~~one (1)~~**three (3)** horizontal, one (1) diagonal, and one (1) vertical, every other refueling outage. ~~These three tendons, per unit, will be selected based on the existing lift off data and practical access limitations. They will be the common tendons for lift off testing.~~ Prestressing forces will be trended and projected through the next two refueling cycles, i.e. every 48 months. Visual inspections will also be performed on both ends of the ~~common~~ **selected** tendons on the same frequency as the lift off tests.

SLRA Appendix B.4.1 (page B-308) is revised as follows:

Aging Management Program Elements

Parameters Monitored or Inspected – Element 3

Oconee performs visual inspections and lift-off tests on three randomly selected horizontal tendons every other refueling outage. The program will be enhanced to perform lift off tests on ~~three~~ **five** tendons**:** ~~one (1)~~ **three (3)** horizontal, one (1) diagonal, and one (1) vertical tendon every other refueling outage, i.e. every 48 months. ~~These three tendons, per unit, will be selected based on the existing lift off data and practical access limitations. They will be the common tendons for lift off testing.~~ Visual inspections will also be performed on both ends of the ~~common~~ **selected** tendons on the same frequency as the lift off tests.

Additional enhancements include performing visual inspections on the tendon caps and stressing hardware on both ends of the following randomly selected tendons**:** one (1) upper horizontal, one (1) middle horizontal, one (1) lower horizontal, one (1) diagonal, and one (1) vertical, per unit, every other refueling outage, i.e.**,** every 48 months, occurring on alternate outages from the lift off tests.

Detection of Aging Effects – Element 4

Visual inspections and lift-off tests are performed on three randomly selected horizontal tendons every other refueling outage. The program will be enhanced to perform lift off tests on ~~three~~ **five** tendons**:** ~~one (1)~~ **three (3)** horizontal, one (1) diagonal, and one (1) vertical tendon every other refueling outage, i.e.**,** every 48 months. ~~These three tendons, per unit, will be selected based on the existing lift off data and practical access limitations. They will be the common tendons for lift off testing.~~ Visual inspections will also be performed on both ends of the ~~common~~ **selected** tendons on the same frequency as the lift off tests.

Additional enhancements include performing visual inspections on the tendon caps and stressing hardware on both ends of the following randomly selected tendons**:** one (1) upper horizontal, one (1) middle horizontal, one (1) lower horizontal, one (1) diagonal, and one (1) vertical, per unit, every other refueling outage, i.e.**,** every 48 months, occurring on alternate outages from the lift off tests.

Monitoring and Trending – Element 5

Condition monitoring for degradation of tendon wires and anchorage is performed by periodic visual inspections, looking for loss of material and cracking. The program also requires monitoring loss of prestress by comparing the measured lift-off forces to the established minimum required force for each tendon group, as specified in station procedures. Station procedures will be enhanced to include reviewing previous visual inspection results for tendon wires and anchorages condition, and lift-off results for the tendons selected for inspection. A programmatic enhancement will use the ~~common~~ tendons **selected for lift-off testing** to trend the prestressing losses and to project the tendons prestress losses through the next two refueling cycles, i.e. every 48 months.

SLRA Appendix B.4.1 (page B-312) is revised as follows:

Enhancements

1. Perform lift-off testing on each of the three units on ~~one (1)~~ **three (3)** horizontal, one (1) diagonal, and one (1) vertical tendon, pulled from one end, every second refueling cycle, i.e.**,** every 48 months. ~~These three tendons, per unit, will be selected based on the existing lift off data that is available as well as practical access limitations, and they will be the common tendons for lift off testing.~~ (Elements 3, 4, and 5)

2. Enhance station procedures to include a review of previous visual inspection and lift-off data results for the tendons selected for inspection. Revise station procedures to use the ~~common~~ tendon lift-off data to trend the prestressing forces and to project tendon prestress losses through the next two operating cycles, i.e. every 48 months. (Element 4 and 5)

3. Perform a visual inspection on both ends of the ~~common~~ tendons **selected for lift-off testing** every other refueling outage, i.e. 48 months, during the same outage as the lift off tests. (Elements 3, 4, and 5)