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RA-22-0111
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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
Follow-up Request for Additional Information Set 2 and 3 Updates

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)

Ladies and Gentlemen:

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 M. 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 (References 4, 6, 8, and 10) were provided to the NRC on October 22, 2021, January 7, 2022, February 14, 2022, and February 21, 2022.

On March 7, 2022, NRC staff held a public meeting with Duke Energy to discuss responses to select RAIs. Specifically, the discussion topics pertained to Duke Energy's responses to RAI B4.1-1 (Secondary Shield Wall Tendon Surveillance), RAI B2.1.9-2 (Bolting Integrity), RAI 4.7.4-1 (Leak Before Break), RAI B2.1.7-3 (PWR Vessels Internals), RAI B2.1.7-4 (PWR Vessels Internals), RAI 3.5.2.2.2.2-3 (Irradiation: Structural), and RAI 3.5.2.2.2.6-1, Request 2(b) (Irradiation: Structural). Duke Energy agreed to provide a supplement for SLRA Section A4.7.4 (Leak Before Break), update the RAI response for RAI B2.1.9-2 (Bolting Integrity), and supplement SLRA Sections A2.9, B2.1.9, and Table A6.0-1 (Bolting Integrity) by March 25, 2022.

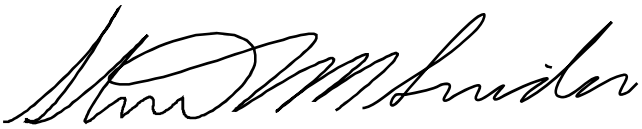
Enclosure 1 provides the supplement for SLRA Appendix A4.7.4 (Leak Before Break), and the revised responses to RAI B2.1.9-2 and associated SLRA Supplements (Appendix A2.9, B2.1.9 and Table A6.0-1). The revised response to RAI B2.1.9-2 supersedes the previous response provided in Reference 8. SLRA changes are provided along with the affected SLRA section(s), SLRA page number(s), and SLRA mark-ups in each affected Enclosure 1 attachment. For clarity, deletions are indicated by strikethrough and inserted text by underlined red font**.**

Commitment 9 (*Bolting Integrity* program) of Appendix A, Table A6.0-1, Subsequent License Renewal Commitments is being revised.

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 March 31, 2022.

Sincerely,



Steven M. Snider
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Enclosure:

1. Revised Response to Requests for Additional Information and Supplement Index

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ENCLOSURE 1

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3
SUBSEQUENT LICENSE RENEWAL APPLICATION
REVISED RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION

Enclosure 1
Revised Response to Requests for Additional Information and Supplement Index

Attachment Number	RAI Number, SLRA Section
1	SLRA Appendix A4.7.4
2	RAI B2.1.9-2, SLRA Appendix A2.9, B2.1.9, and Table A6.0-1

ENCLOSURE 1

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3
SUBSEQUENT LICENSE RENEWAL APPLICATION
REVISED RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION

ATTACHMENT 1
SLRA Appendix A4.7.4

Affected SLRA Sections:

Appendix A4.7.4

Affected SLRA Page Numbers:

A-70

Description of Change:

Since the flaw stability analysis was projected to the end of the period of extended operation, the disposition is in accordance with 10 CFR 54.21(c)(1)(ii).

SLRA Mark-ups:

SLRA Appendix A4.7.4 (page A-70) is revised as follows:

The cast austenitic stainless steel reactor coolant pump inlet and outlet nozzles are susceptible to thermal aging. Thermal aging of cast austenitic stainless steel causes a reduction of fracture toughness. Reduction of fracture toughness of the reactor coolant pump nozzles has been determined to be acceptable for the PEO through a flaw stability analysis. The generic LBB analysis for the B&W operating plants reported in BAW-1847, Revision 1, has been projected to the end of ~~remains valid for~~ the SPEO in accordance with ~~10 CFR 54.21(c)(1)(i)~~ 10 CFR 54.21(c)(1)(ii) for ONS. Reduction of fracture toughness of the reactor coolant pump discharge and suction nozzles was determined to be acceptable for SPEO based on the update to the flaw stability analysis described above. Although the LBB analysis ~~remains valid~~ has been projected to the end of the SPEO, the transient cycles will be monitored and management by the *Fatigue Monitoring* AMP (A3.1) provides additional assurance for the SPEO.

ENCLOSURE 1

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3
SUBSEQUENT LICENSE RENEWAL APPLICATION
REVISED RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION

ATTACHMENT 2
RAI B2.1.9-2, SLRA APPENDIX A2.9, B2.1.9, AND TABLE A6.0-1

Enclosure 1, Attachment 2

This response supersedes the response to RAI B2.1.9-2 provided in 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). The updated version is based on the discussion between the NRC and Duke Energy that occurred at the associated 03/07/2022 Public Meeting.

RAI B2.1.9-2

Regulatory Basis:

Title 10 of the Code of Federal Regulations (CFR) Section 54.21(a)(1) 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 such that their intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. As described in SRP-SLR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL-SLR Report when evaluation of the matter in the GALL-SLR Report applies to the plant.

Background:

SLRA Section B2.1.9, “Bolting Integrity,” states that the Oconee Bolting Integrity AMP, with the enhancements provided in the SLRA, will be consistent with the ten program elements of GALL- SLR Report AMP XI.M18, “Bolting Integrity.” To ensure consistency with the “detection of aging effects” program element, the SLRA included enhancement no. 4 to demonstrate that the program will manage the inspections of closure bolting in locations where the detection of joint leakage is precluded or for which leakage is difficult to detect.

For the “detection of aging effects” program element, the GALL-SLR Report AMP provides, in part, inspection criteria and guidance to demonstrate that submerged closure bolting, closure bolting in systems containing air or gas, and closure bolting in components that are not normally pressurized will be adequately managed by the program. For submerged closure bolting, the GALL-SLR Report recommends the use of visual inspection to detect loss of material during opportunistic maintenance activities (e.g., when made accessible, and when joints are disassembled). The SLRA does not state how integrity of the bolted joints will be maintained (through alternate means of inspections or testing) when opportunistic maintenance activities will not provide access to at least 20 percent of the population, or the applicable sample size for the site, over a 10-year period. In a similar way, for closure bolting in systems containing air or gas, the GALL-SLR Report recommends that the SLRA states how integrity of the bolted joint will be demonstrated through the proposed inspection method, and for the closure bolting in components that are not normally pressurized, it recommends that the SLRA states how the aging effects associated with the closure bolting will be managed based on the proposed inspection method. In addition, for the “acceptance criteria” program element, the GALL-SLR Report AMP also states, in part, that plant-specific acceptance criteria are established when alternative inspections or testing is conducted for submerged closure bolting or closure bolting where the piping systems contains air or gas for which leakage is difficult to detect.

Issue:

During the staff review of the SLRA, the staff noted that the SLRA does not state how the aging effects associated with closure bolting for components that are not normally pressurized will be detected and managed so that the intended function(s) will be maintained consistent with the current licensing basis.

Specifically, the SLRA enhancement no. 4 seems to specifically address the detection of aging effects in submerged closure bolting and in closure bolting where the piping systems containing air or gas. Therefore, it is not clear how closure bolting from systems that are not normally pressurized will be adequately managed, and what alternate means of inspection and acceptance criteria will be implemented (e.g., checking the torque to the extent that the closure bolting is not loose) to ensure that the associated aging effects will be detected before a loss of function.

The staff also noted that SLRA enhancement no. 4 seeks to implement alternate means of inspection and testing when the minimum sample size is not met over a 10-year period.

However, it is not clear what plant-specific acceptance criteria will be established for these alternative means of inspections and testing to demonstrate that these components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the subsequent period of extended operation.

Request:

1. State how the aging effects associated with the closure bolting for components that are not normally pressurized will be detected and adequately managed by the Bolting Integrity program during the subsequent period of extended operation (i.e., inspection methods and acceptance criteria that will be used). Update the SLRA as necessary to include this information.
2. For the alternate inspection and testing methods specified in the SLRA for submerged closure bolting or closure bolting where leakage is difficult to detect, clarify what the plant- specific acceptance criteria are that will be established for the Bolting Integrity program to ensure that the intended function(s) will be maintained consistent with the current licensing basis for the subsequent period of extended operation. Update the SLRA as necessary.

RESPONSE:

Response to Request 1

Closure bolting in systems that are not normally pressurized will be visually inspected during maintenance activities for degradation including loss of material, visible cracking, and loss of preload (loose or missing bolting). Bolt heads will be inspected when made accessible and bolt threads will be inspected when joints are disassembled (opportunistic inspection). A representative sample population for each ONS unit will consist of 20% of the population up to a maximum of 17 bolts for each material / environment combination. Alternative inspections and testing will not be credited in the event a representative sample of bolting is not available for inspection in a 10-year period during the subsequent period of extended operation. If the minimum sample size for inspections is not achieved opportunistically, then additional maintenance activities will be performed to ensure the minimum sample size is met. This strategy is reflected in the SLRA supplement provided with this RAI response.

Response to Request 2

As discussed in the response to request 1, aging management of bolting in systems that are not normally pressurized will rely only on direct visual inspection of bolting and will not rely on alternative inspections or testing. Aging management of submerged closure bolting or closure bolting for systems containing air or gas where leakage is difficult to detect will primarily rely on opportunistic inspections performed when bolted joints are disassembled during maintenance activities. If opportunistic inspections do not provide an adequate sample size, then alternative inspections may be performed for

submerged closure bolting or closure bolting for systems containing air or gas (normally pressurized) where leakage is difficult to detect.

Alternative inspections for submerged bolting include diver inspections and remote video/photo inspections. Submerged bolted connections where diver inspections are performed will include visual inspections for degraded bolts, missing or broken bolts and, where possible, the torque of bolts verified to be hand tight. Remote video and photo inspections may be performed to inspect for degraded, loose, or missing bolts. Evidence of loose or missing bolting and significant loss of material (i.e., appreciable material loss that could adversely affect intended function) identified during inspections is unacceptable and will be entered into the Corrective Action Program, if identified.

Alternative inspections for air or gas filled systems rely on alternative methods for detecting leakage since leakage of these systems cannot be detected visually and include (a) visual inspection for discoloration when leakage from inside the piping system would discolor the external surfaces of the component; (b) monitoring and trending of pressure decay when the bolted connection is located within an isolated boundary; (c) soap bubble testing on the external mating surface of the bolted component; or (d) thermography. The acceptance criteria for these systems is the same as for water, steam, or oil filled systems in that indications of leaking joints is unacceptable and, if identified, will be documented in the Corrective Action Program. For exhaust lines, visual inspections for discoloration will provide indication of bolted joint leakage. For portions of air or gas systems within an isolated boundary, increased pressure decay rate will provide indication of bolted joint leakage. For other portions of air or gas systems, soap bubble testing allows for detection of leakage from bolted joints. Where the system process fluid is a different temperature than the surrounding environment, thermal imaging may be used to detect leaking joints as means to detect degraded bolted connections.

SLRA Revisions:

Affected SLRA Sections:

Appendix A2.9,

Appendix B2.1.9,

Table A6.0-1

Affected SLRA Page Numbers:

A-10, A-11, A-76, B-89

Description of Change:

1. Clarify Program Description in Appendix A
2. Add new Enhancement
3. Update Table A6.0-1 to add new commitment

SLRA Mark-Ups:

SLRA Appendix A2.9, (page A-10) is revised as follows:

Program Description

The program includes periodic visual inspections of closure bolting on pressure-retaining components for indication of loss of preload, cracking, and loss of material as evidenced by pressure-retaining joint leakage. Closure bolting ~~on pressure-retaining components and mechanical bolting that are~~ that is submerged or closure bolting ~~on pressure-retaining components located~~ in piping systems that contain air or gas for which leakage is difficult to detect is inspected or tested by alternative means., ~~such as by sample based periodic inspections~~. The program also includes preventive measures provided in the EPRI guidance documents to preclude or minimize loss of preload and cracking.

SLRA Appendix A2.9, (page A-11) is revised as follows:

Enhancements

8. Perform visual inspections of a representative sample of 20 percent of closure bolting for components that are not normally pressurized or a maximum of 17 bolts for each material and environment population per unit, whichever is less, during each ten year period.

SLRA Appendix B2.1.9, (page B-89) is revised as follows:

Enhancements

8. Perform visual inspections of a representative sample of 20 percent of closure bolting for components that are not normally pressurized or a maximum of 17 bolts for each material and environment population per unit, whichever is less, during each ten year period.

SLRA Table A6.0-1, Commitment Column, (page A-76) is revised as follows:

8. Perform visual inspections of a representative sample of 20 percent of closure bolting for components that are not normally pressurized or a maximum of 17 bolts for each material and environment population per unit, whichever is less, during each ten year period.