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January 30, 2017

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U. S. Nuclear Regulatory Commission
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Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station (ONS)
Docket Numbers 50-269, 50-270, and 50-287
Additional Information Regarding License Amendment Request for Temporary Completion Time for One Keowee Hydro Unit Inoperable for Generator Stator Replacement
License Amendment Request No. 2015-08, Supplement 1

On February 26, 2016, Duke Energy Carolinas, LLC (Duke Energy) submitted a License Amendment Request (LAR) requesting the Nuclear Regulatory Commission (NRC) approve a Technical Specification (TS) change that adds a temporary Completion Time to TS 3.8.1 Required Action C.2.2.5 to allow time to perform major maintenance on each Keowee Hydro Unit (KHU). By email dated December 21, 2016, the NRC requested Duke Energy submit additional information associated with the LAR. The enclosure provides the requested information.

Inquiries on this proposed amendment request should be directed to Boyd Shingleton, ONS Regulatory Affairs Group, at (864) 873-4716.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 30, 2017.

Sincerely,

Thomas D. Ray

Thomas D. Ray
Vice President
Oconee Nuclear Station

Enclosure:
Duke Energy Response to NRC Request for Additional Information

A001
NRR

cc w/enclosure:

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ENCLOSURE

Duke Energy Response to
NRC Request for Additional Information (RAI)

RAI 1

An off-site power system (preferred power) and an onsite power system (KHUs) are provided for each ONS unit to supply power to the unit auxiliaries during normal operation, and to the Reactor Protective System and Engineered Safeguards (ES) Protective System during abnormal and accident conditions. Each ONS unit has multiple available sources of electrical power to the ES Protective System. These include each unit's Main Generator to Auxiliary Transformer (designated as 1T, 2T, and 3T, for Units 1, 2, and 3, respectively), multiple offsite sources to the 230kV Switchyard yellow bus to each unit's Startup Transformer (designated as CT1, CT2, and CT3, for Units 1, 2, and 3, respectively), the Keowee Overhead Power Path to the 230kV Switchyard yellow bus, and the Keowee Underground Power Path through transformer CT-4 to the redundant standby power buses.

In light of the March 6, 2016, main transformer MT1 failure, which lead to the unavailability of the Keowee overhead emergency power path, please provide the following information in order for the staff to better understand the reliability of the ONS power transformers and alternate sources:

A. Confirm and explain how all power transformers, including overhead lines and connections, used for onsite and offsite power systems will be inspected and tested prior (i.e., 3-6 months) to the planned KHU outages in accordance with applicable industry standards.

B. Provide a brief summary of the most recent test results, including preventive maintenance and condition monitoring actions, and surveillances performed to demonstrate that the power sources are reliable and operable.

Response to RAI 1

Power Transformers

Oconee performs routine inspections on all of its large power transformers to ensure proper continuous operation. These tasks are performed in accordance with the Duke Energy nuclear fleet preventative maintenance (PM) guidelines. These tasks include:

- Manual oil sampling for dissolved gas analysis every 3 months,
- Thermographic scans every 6 months (with the exception of CT5 performed every 2 years),
- Electrical (Doble) testing every 2-4 years,
- Oil pump vibration testing every 2 years, and
- PM inspections every 2 years to include (overall visual inspection, bushing inspections, and ancillary device inspections).

Table 1-1 below outlines the last date these PMs were performed on each transformer and the next scheduled date for the PM.

Overhead Lines and Connections

Overhead lines and connections to Oconee's large power transformers are inspected at routine intervals to ensure integrity. The task includes the inspection of overhead buslines from the

switchyard to the transformer yard. This inspection has historically been performed on a 6-year frequency. Due to the CT3 open-phase event that occurred in December of 2015 (Reference Oconee Licensee Event Report (LER) 287/2015-002 dated February 5, 2016, ADAMS Accession Number ML16041A170), detailed inspections were performed on the startup transformers, Keowee main step-up transformer, and Lee Steam Station power path transformer CT5 in the first quarter of 2016 to ensure no other issues were present.

As a result of the Oconee open phase event, the visual inspection frequency of the startup transformer buslines is being increased from 6 years to 2 years (inspections every outage). Duke Energy plans to complete these inspections prior to the first Keowee stator outage with the main transformer buslines and startup transformer buslines inspections being performed in the upcoming outages for each Oconee unit. This means that the overhead lines for each of the startup and main transformers will have a detailed visual inspection during their respective outages prior to the first Keowee Stator outage. Performing the inspections during outages allows additional views of the buslines and connections because the lines are de-energized. Additionally, the connections at the transformer (CT5) for the Lee Steam Station power path will be inspected during a scheduled PM of the transformer in 2018.

In addition to the detailed visual inspections, the following maintenance and monitoring actions are routinely performed:

1) Thermography scans are performed on a 6-month frequency in the transformer yard and the 230/525kV switchyards.
2) Operator rounds are performed daily in the transformer yard and the 230/525kV switchyards. The rounds procedure instructs the operator to verify that there are no failed connections or insulators.
3) Maintenance performs monthly switchyard/transformer rounds. This walkdown of the transformer yards and switchyards includes general equipment inspections where signs of degradation are noted and addressed.

The latest PM results and next scheduled date can be found in Table 1-2.

Table 1-1: Transformer PM Summary

Transformer	PM Activity	Latest Completion Date	Results Summary	Next Scheduled Date
Unit 1 Main	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	Newly identified Ethane gas level	December 2018
	Vibration Testing	9/26/2016	All results satisfactory	9/27/2018
	Doble Testing	11/07/2016	All results satisfactory	HV Bushings-Fall 2018 Transformer - Fall 2020
	Routine Transformer PM	11/07/2016	2 broken standoff lightning arrester insulators replaced. All fans replaced and minor oil leaks repaired.	Fall 2018
1T Aux	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	3/06/2016	All results satisfactory	N/A - Next Scheduled Fall 2020
	Routine Transformer PM	11/6/2016	Swapover circuit timing out of sequence. Timing corrected. All other results satisfactory.	Fall 2018
CT1 Startup	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	3/18/2016	All results satisfactory	HV Bushings-Fall 2018 Transformer - Fall 2020
	Routine Transformer PM	3/18/2016	Chips on lightning arrester sealed to prevent moisture ingress. All other results satisfactory.	Fall 2018

Transformer	PM Activity	Latest Completion Date	Results Summary	Next Scheduled Date
Unit 2 Main	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Vibration Testing	9/17/2015	All results satisfactory	9/17/2017
	Doble Testing	10/28/2015	All results satisfactory	HV Bushings-Fall 2018 Transformer - Fall 2020
	Routine Transformer PM	10/28/2015	New transformer installed. All results satisfactory.	Fall 2017
2T Aux	Thermography Scan	11/30/2016	Hot spot found on 4kV bus coming off of transformer 2T, repaired 1/11/2017	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	10/16/2015	All results satisfactory	N/A - Next Scheduled Fall 2019
	Routine Transformer PM	10/16/2015	All results satisfactory	Fall 2017
CT2 Startup	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	10/22/2013	All results satisfactory	Fall 2017
	Routine Transformer PM	10/22/2015	Chips on lightning arrester sealed to prevent moisture ingress. All other results satisfactory.	Fall 2017

Transformer	PM Activity	Latest Completion Date	Results Summary	Next Scheduled Date
Unit 3X Main	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Vibration Testing	3/14/2016	All results satisfactory	3/15/2018
	Doble Testing	4/29/2016	All results satisfactory	HV Bushings-Spring 2018 Transformer - Spring 2020
	Routine Transformer PM	4/29/2016	All fan motors changed	Spring 2018
Unit 3Y Main	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Vibration Testing	3/14/2016	All results satisfactory	3/15/2018
	Doble Testing	4/25/2016	All results satisfactory	HV Bushings-Spring 2018 Transformer - Spring 2020
	Routine Transformer PM	4/25/2016	Minor oil leak identified and repaired.	Spring 2018
Unit 3Z Main	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Vibration Testing	3/14/2016	All results satisfactory	3/15/2018
	Doble Testing	4/25/2016	All results satisfactory	HV Bushings-Spring 2018 Transformer - Spring 2020
	Routine Transformer PM	4/25/2016	Minor oil leak identified and repaired.	Spring 2018

Transformer	PM Activity	Latest Completion Date	Results Summary	Next Scheduled Date
Unit 3S Main	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Vibration Testing	3/14/2016	All results satisfactory	N/A - Spare Transformer not energized
	Doble Testing	4/25/2016	All results satisfactory	HV Bushings-Spring 2018 Transformer - Spring 2020
	Routine Transformer PM	4/25/2016	Minor oil leak identified and repaired.	Spring 2018
3T Aux	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	4/24/2016	All results satisfactory	Spring 2020
	Routine Transformer PM	4/24/2016	All results satisfactory	Spring 2018
CT3 Startup	Thermography Scan	11/30/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	4/21/2014	All results satisfactory	Spring 2018
	Routine Transformer PM	4/27/2016	Chips on lightning arrester sealed to prevent moisture ingress. All other results satisfactory.	Spring 2018

Transformer	PM Activity	Latest Completion Date	Results Summary	Next Scheduled Date
CT4	Thermography Scan	9/26/2016	All results satisfactory	December 2018
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	8/9/2016	All results satisfactory	1/12/2018
	Routine Transformer PM	1/13/2015	Minor oil leak identified and repaired.	1/12/2018
CT5	Thermography Scan	10/31/2015	All results satisfactory	Fall 2017
	Oil Testing	12/7/2016	All results satisfactory	December 2018
	Doble Testing	1/22/2015	All results satisfactory	1/21/2018
	Routine Transformer PM	9/8/2016	All results satisfactory	1/21/2018

Table 1-2: Transformer Bus Line Inspection PM Summary

Transformer	PM Activity	Latest Completion Date	Results Summary	Next Scheduled Date
Unit 1 MSU	Overhead Line Inspection	11/24/2014	All results satisfactory	Fall 2018
CT1 Startup	Overhead Line Inspection	11/10/2016	Found and replaced damaged cotter pin	Fall 2018
Unit 2 MSU	Overhead Line Inspection	11/9/2013	All results satisfactory	Fall 2017
CT2 Startup	Overhead Line Inspection	10/23/2015	All results satisfactory	Fall 2017
Unit 3X MSU	Overhead Line Inspection	4/28/2014	Found and replaced 3 damaged cotter pins	Spring 2018
Unit 3Y MSU	Overhead Line Inspection	4/28/2014	All results satisfactory	Spring 2018
Unit 3Z MSU	Overhead Line Inspection	4/28/2014	All results satisfactory	Spring 2018
Unit 3S MSU	Overhead Line Inspection	4/28/2014	All results satisfactory	Spring 2018
CT3 Startup	Overhead Line Inspection	4/25/2012	All results satisfactory	Spring 2018
CT5 Startup	Overhead Line Inspection	12/21/2015	All results satisfactory	2018

Periodic testing is performed to ensure the following:

- Surveillance Requirements (SRs) specified in the station's Technical Specifications (TSs) and Updated Final Safety Analysis Report (UFSAR) are satisfied,
- Testing commitments made in accordance with regulatory requirements (e.g. NRC Generic Letters, Significant Operating Experience Reports, and Information Notices) are met,
- Testing commitments to satisfy insurance requirements are met, and
- Testing requirements to satisfy manufacturer's recommendations are satisfied.

Electrical System Weekly Surveillance

This test is used to:

- Verify proper breaker alignments, component voltages and frequency to ensure the electrical system meets Surveillance Requirements of TS 3.8 for required electrical equipment common to all Units or shared by two Units.
- Test satisfies TS SR 3.8.1.1

  SR 3.8.1.1

  "Verify correct breaker alignment and indicated power availability for each required offsite source."

  This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their power source, and that appropriate separation of offsite sources is maintained.

Keowee Operation Test (31-day frequency)

This test is used to:

- Periodically test operation of each Keowee Hydro Unit's (KHU) ability to automatically start and energize the Overhead and Underground Power Paths.
- Test the Keowee Overhead or Underground Power Path(s) as required by performing operability verification of a KHU or Power Path.
- Test satisfies TS SR 3.8.1.3 and 3.8.1.4.

  SR 3.8.1.3

  "Verify the KHU associated with the underground emergency power path starts automatically and energizes the underground emergency power path. Manually close the SK breaker to each de-energized standby bus."

  This SR verifies the availability of the KHU associated with the underground emergency power path to start automatically and energize the underground power path. Utilization of either the auto-start or emergency start sequence assures the control function OPERABILITY by verifying proper speed control and voltage. Power path verification is included to demonstrate breaker OPERABILITY from the KHU onto the standby buses. This is accomplished by closing the Keowee Feeder Breakers (SK) to energize each deenergized standby bus.

SR 3.8.1.4

"Verify the KHU associated with the overhead emergency power path starts automatically and automatically or manually synchronize it to the Yellow bus in 230 kV switchyard. Energize the underground emergency power path after removing the KHU from the overhead emergency power path."

This surveillance verifies the availability of the KHU associated with the overhead emergency power path. Utilization of either the auto-start or emergency start sequence assures the control function OPERABILITY by verifying proper speed control and voltage. The ability to supply the overhead emergency power path is satisfied by demonstrating the ability to synchronize (automatically or manually) the KHU with the grid system. If an automatic start of the KHU is performed and a manual synchronization is desired, the KHU will need to be shutdown and restarted in manual to allow a manual synchronization of the KHU. The SR also requires that the underground power path be energized after removing the KHU from the overhead emergency power path. This surveillance can be satisfied by first demonstrating the ability of the KHU associated with the underground emergency path to energize the underground path then synchronizing the KHU to the overhead emergency power path.

Keowee Emergency Start Test (12-month frequency)

This test is used to:
- Demonstrate operability of each KHU emergency start channel on actual or simulated emergency actuation signal from each Control Room and Cable Room.
- Demonstrate that each KHU achieves frequency ≥ 57 Hz and ≤ 63 Hz and voltage ≥ 13.5kV and ≤ 14.49kV in ≤ 23 seconds of emergency start initiation
- Verify actuation times for time-delay relays for close permissive to ACB-1, ACB-2, ACB-3 and ACB-4.
- Verify KHU Air Circuit Breakers (ACBs) close automatically to the underground path
- Verify each KHU supplies the equivalent of one Unit's maximum safeguard loads plus two Units' hot shutdown loads when synchronized to system grid and loaded at maximum practical rate.

Keowee Over Frequency Protection Functional Test (18-month frequency)

This test is used to:
- Verify upon emergency start signal when generating to the grid, each KHU's overhead and underground generator breakers trip and realign to the correct position from an initial condition of commercial operation.
- Verify upon emergency start signal when generating to the grid, each KHU's frequency reaches ≤ 66 Hz in ≤ 23 seconds from an initial condition of commercial power generation.

Auxiliary Power Transfer Surveillance (18-month frequency)

This test is used to:
- Demonstrate the ability of KHU-1 or KHU-2 600V Auxiliary Load Center 1X or 2X to close its' alternate feeder breaker after time delay (30 seconds) from its' normal feeder breaker opening whether aligned as the underground or overhead power path unit.

- Demonstrate the ability of KHU-1 or KHU-2 600V Auxiliary Load Center 1X or 2X to close its' normal feeder breaker after its' alternate feeder breaker opens whether aligned as the underground or overhead power path unit.

Keowee Out of Tolerance Test (18-month frequency)

This test is used to:

- Demonstrate the ability of the Out of Tolerance (OOT) logic to operate properly. The OOT logic provides voltage and frequency protection for the two Oconee emergency power paths. This protection monitors each Keowee Unit and isolates either unit from its designated power path if an OOT voltage or frequency is detected.

Emergency Power Switching Logic Functional Test (24- month frequency)

This test is used to:

- Verify Emergency Power Switching Logic (EPSL) functions to maintain Main Feeder Busses (MFBs) energized by the most reliable source without operator actions.

Degraded Grid and Switchyard Isolation Test (18-month frequency)

This test is used to:

- Functionally verify Keowee ACB-1, ACB-2, ACB-3, ACB-4 and Switchyard PCB operation during Switchyard Isolation and Keowee Emergency Start.
- Demonstrate operability of Degraded Grid Voltage Protection (DGVP) System.
- Demonstrate ability of Keowee to energize 230KV Yellow Bus, all three Startup Transformers (CT-1, CT-2 and CT-3) and Underground Path (CT-4) after a load rejection.

Power Supply from Lee Steam Station (24-month frequency)

- This test shall be included in the Lee Combustion Turbine (LCT) Testing program to verify a LCT can provide equivalent of one Unit's maximum safeguard loads within one hour through 100 KV line electrically separated from system grid and offsite loads.

RAI 2

The staff understands that ONS has implemented interim corrective actions to manually detect open phase conditions (OPC) until plant modifications are completed by December 2018. Please confirm that OPC modifications will be implemented prior to this scheduled KHU stator replacement maintenance of the onsite power systems.

Response to RAI 2

Duke Energy plans to complete necessary OPC modifications by December 31, 2018. The first Keowee stator replacement maintenance is currently scheduled to begin in mid-January 2019.

RAI 3

Section 2.4 of the LAR, "Keowee Stator Replacement Schedule," under "Schedule Contingency," states that a one-day contingency has been included prior to the start of each dual KHU outage to account for schedule delays caused by delayed entry into each dual KHU outage for severe weather. Three days of contingency have been added to account for schedule delays caused by severe weather (icing, high humidity, rain). Duke Energy has committed to not enter an extended single KHU outage or a dual KHU outage if severe weather is forecast to occur within 2 days.

A. Assuming all the prerequisite planned actions have been completed in readiness for the KHU outage, please explain why a one day contingency prior to each KHU dual outage is needed.

B. Please confirm that, prior to scheduling the maintenance outage, plant staff will review operating experience and historical weather patterns in order to minimize risk to plant power sources due to severe weather.

Response to RAI 3A

As committed in the February 26, 2016, License Amendment Request (LAR) (ADAMS Accession Number ML16064A020), Duke Energy will check the weather forecast prior to entry into the single KHU outage, which starts the Keowee stator maintenance outage and again prior to entry into each dual KHU outage. The first dual KHU outage is planned approximately two days after the start of the overall maintenance outage. While a delay into entry into the start of the overall stator maintenance outage due to severe weather does not impact schedule, once in this outage subsequent severe weather delays for starting a dual KHU outage will effectively extend the overall schedule by the wait time for the severe weather to pass. One day has been allotted for contingency for each of the two planned dual KHU outages. While it is not likely that weather delays would be incurred for both KHU outages (and less likely that a delay would be incurred for the first dual KHU outage due to its closeness to the start of the overall outage), one day contingency for each dual KHU outage is considered appropriate since the delay in entry into a dual KHU outage would likely exceed one day.

The three days of weather contingency is not to accommodate potential delays in entry into the dual KHU outages. This contingency is to account for potential delays in transporting the replacement stator to the Keowee Hydroelectric Station from its temporary location due to severe weather (icing, high humidity, rain).

Response to RAI 3B

Oconee procedures require plant staff to review operating experience and historical weather patterns during the development of critical activity plans for maintenance outages to manage risk during work activities. Prior to the release of work for execution, Operations personnel must consider the effects of severe weather and grid instabilities on plant operations. This qualitative evaluation is an inherent aspect of the duties of the Work Control Center Senior Reactor Operator (WCC SRO). Responses to actual plant risk due to severe weather or grid instabilities are programmatically incorporated into applicable plant emergency or response procedures.