DUKE ENERGY®

Lawrence B. Somers
Deputy General Counsel

Mailing Address:
NCRH 20 / P.O. Box 1551
Raleigh, NC 27602

o: 919.546.6722
f: 919.546.2694

bo.somers@duke-energy.com

January 15, 2020

VIA ELECTRONIC FILING

Ms. Kimberley A. Campbell, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

**Re: Duke Energy Progress, LLC's Revised Semiannual Hot Springs Microgrid Project Progress Report
Docket No. E-2, Sub 1185**

Dear Ms. Campbell:

Pursuant to the Commission's December 6, 2019 *Order Rejecting Progress Report and Requiring Revised Report*, I enclose Duke Energy Progress, LLC's ("DEP") revised semiannual progress report for its Hot Springs Microgrid Solar and Battery Storage Facility (the "Revised Report") for filing in connection with this matter.

DEP renews its request for protection of the projected cost to construct the facility. Public disclosure of such information would impair DEP's ability to negotiate favorable contracts at the lowest reasonable cost for the benefit of its customers. Portions of the Revised Report also contain operational information that is proprietary to Duke Energy Corporation ("Duke Energy"). The microgrid market is still maturing, and Duke Energy would like to protect its investment in this emerging technology. The protected information is being filed under seal pursuant to N.C. Gen. Stat. § 132-1.2 and will be provided to interested parties pursuant to an appropriate confidentiality agreement.

Thank you for your attention to this matter. If you have any questions, please let me know.

Sincerely,

Lawrence B. Somers

Enclosure
cc: Parties of Record

Hot Springs Microgrid Solar and Battery Storage Facility
Revised Progress Update
NCUC Docket No. E-2, Sub 1185
January 15, 2020

Duke Energy Progress will use the Hot Springs Microgrid Facility to establish the following operational and learning goals.

Goals

1) Ensure the safe and efficient operation of a distribution grid-connected Microgrid facility.
2) Use the Distributed Energy Operations & Maintenance (DEOM) team to monitor the distribution grid-connected Distributed Energy Resource (DER) and analyze data (e.g., operational, health, usage).
3) Provide reports for various stakeholders using the sample metrics provided in Table 1.
4) Develop a "transparent and comprehensive plan" to operate and monitor the Hot Springs Microgrid Facility.

Pursuant to the Commission's December 6, 2019 *Order Rejecting Progress Report and Requiring Revised Report*, the attached confidential sample report provides (1) the facility's operations profile during various months of the year; and (2) the amount of energy, capacity, and ancillary services the facility may provide to the grid during typical days during each season.

Note: The attached sample report provides information and conclusions using simulated data. A more comprehensive report will be provided in the May 10, 2020 submittal as required by Condition 3 a-j contained on pages 13-14 of the Commission's May 10, 2019 Order Granting Certificate of Public Convenience and Necessity with Conditions ("CPCN Order").

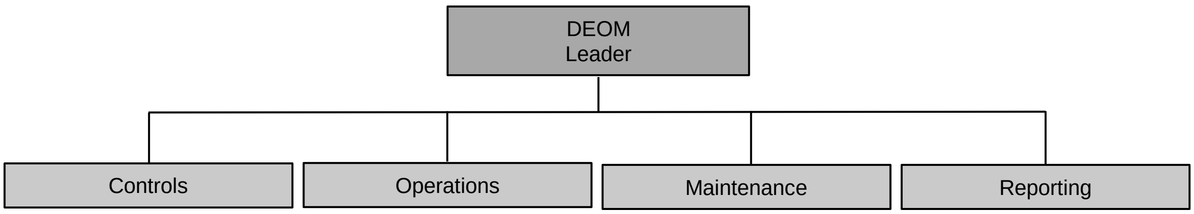
In response to the Commission's request that the revised report include (3) DEP's plan for maintaining a state of charge that will allow the microgrid to serve the Hot Springs community during a night-time power outage, DEP provides the following:

The battery capacity is sized to meet 100% of the Town of Hot Springs peak load, and the duration (hours) of backup power will be dependent on several factors, such as solar availability, battery state of charge, and customer load. The battery will be operated, and the state of charge managed based on the optimal use case for the grid and customers and will not be specific to the time-of-day. However, if inclement weather which could lead to a power outage is expected in the Hot Springs area, the operational plan would be to charge the battery to maximize the amount of backup power it could provide.

Business Plan

The Distributed Energy Operations & Maintenance (DEOM) team is part of the Distributed Energy, Enablement & Storage (DEE&S) Program within Duke Energy's Customer Delivery department. DEOM will assist Duke Energy Progress with safe operation and maintenance of regulated distributed energy assets including the Hot Springs Microgrid Facility beginning Day 1 of operations. The DEOM team consists of 4 major focus areas depicted below;

Distributed Energy Operations & Maintenance (DEOM)



Controls

The control system implemented at Hot Springs will allow DEOM to monitor, analyze, and report operational data, plus provide the ability to troubleshoot potential issues or alarms for the site. The Greensmith Energy Management System (GEMS) will sit within the Duke Energy Control Zone and allow remote operations and monitoring of the microgrid utilizing a single control platform. Ongoing development and deployment of the control system will dovetail with the library of business use cases and operational procedures created.

Operations

DEOM has begun and will continue to build a library of operational documents and is responsible for monitoring the operation of all regulated distribution grid-connected DERs. Emergency Response Plans (ERP), Comprehensive Test & Commissioning Plans, Transition to Operations Checklists, and other Day 1 Operational protocols are in place for the first grid-connected DERs going operational in early 2020.

Maintenance

DEOM will maintain DER's (battery, solar, and microgrid) through contracted service agreements with third party vendors for the foreseeable future. Third party vendor agreements focus on preventative and corrective maintenance activities which will be performed monthly, quarterly, semi-annually, or annually as appropriate. DEOM will project manage these third party vendors' maintenance execution.

Reporting

DEOM will be responsible for collecting and communicating data and reports to a variety of stakeholders. Reports will include, at a minimum: weather adjusted predicted energy production, actual energy production, energy yield, inverter availability, capacity factor, and more. Additional performance metrics can be tracked and reported when requested. The metrics that will be monitored and tracked in GEMS or PI Historian for the Hot Springs Microgrid facility are listed in Table 1.

Table 1: Hot Springs Microgrid Metrics

Level	BESS System Tags	Unit	Precision	Sample Rate
Battery Rack Array/System (Each Rack Array/System)	System Fault Status	bit	1	1sec
	System Alarm Status	bit	1	1sec
	System Current	A	0.1	1min
	System Voltage	V	0.1	1min
	System SoC	%	0.1	1min
	System Mode	bit	1	1min
	Max Cell Temp of System	Deg C	0.001	1min
	Min Cell Temp of System	Deg C	0.001	1min
EACH Rack	Rack Voltage	V	0.1	1min
	Rack Current	A	0.1	1min
	Rack SOC	%	0.1	1min
	Rack SOH	%	0.1	1min
	Rack Fault Status	bit	1	1sec
	Rack Alarm Status	bit	1	1sec
	Maximum Cell Voltage Value	V	0.1	1min
	Maximum Cell Voltage Position	dec	1	1min
	Minimum Cell Voltage Value	V	0.1	1min
	Minimum Cell Voltage Position	dec	1	1min
	Maximum Cell Temperature Value	Deg C	0.001	1min
	Maximum Cell Temperature Position	dec	1	1min
	Minimum Cell Temperature Value	Deg C	0.001	1min
	Minimum Cell Temperature Position	dec	1	1min
	Rack DC Switch Status	bit	1	1min
	Rack DC Switch Position	bit	1	1min
Container	Ambient Tempreture (measured from at least 3 points external to each container)	Deg C	0.001	1min
Inverter	Active Power Setpoint	kW	0.1	1min
	Reactive Power Setpoint	kVAR	0.1	1min
	Measured Active Power Per Phase (Pa,Pb,Pc)	kW	0.1	1min
	Measured Reactive Power Per Phase (Qa,Qb,Qc)	kVAR	0.1	1min
	Measured Apparent Power Per Phase (Sa,Sb,Sc)	kVA	0.1	1min
	AC Phase to line voltage (Van,Vbn,Vcn)	V	0.1	1min
	AC Phase Current (Ian,Ibn,Icn)	A	0.1	1min
	DC Voltage	V	0.1	1min
	DC Current	A	0.1	1min
	Alarms	bit	1	1sec
	Mode of Operation	dec	1	1min
Switchgear	Breaker position for all ways of swgr	bit	1	1sec
	Swgr relay voltage, current and power points	V,A,kW,kVAR, kVA	0.1	1min

Original Cost Estimate	**Current Cost Estimate**

[BEGIN CONFIDENTIAL]

[redacted]

[END CONFIDENTIAL]

*Cost estimates include generation and transmission facilities costs.

Task	**Original CPCN Filing Estimate**	**Current Status/Estimate**
Limited Notice To Proceed	March 2019	July 2019
Interconnection Agreement	August 2019	March 2020
Begin Construction	September 2019	March 2020
Commercial Operation	January 2020	*September 2020

**The delay of the Hot Springs Microgrid project can be attributed to the following reasons:*

- *The project team received the CPCN Order from the Commission approximately 2 months later than originally anticipated. This impacted the limited notice to proceed date with the vendor.*
- *DEP has delayed the original estimated date to execute the Interconnection Agreement*

Energy Storage Engineering & Project Execution
Distributed Energy Technologies
Duke Energy

Hot Springs
Frequency Control Battery Profile
Last Modified January 15, 2020

1. Definitions

Balancing Authority (BA): The responsible entity that integrates resource plans ahead of time, maintains load interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real time. Hot Springs Storage site will be part of a Duke Balancing Authority.

Area Control Error (ACE): The instantaneous difference between a Balancing Authority's net actual and scheduled interchange, taking into account the effects of Frequency Bias, correction for meter error, and Automatic Time Error Correction (ATEC), if operating in the ATEC mode. In simple terms, the Area Control Error refers to the difference between scheduled and actual electricity generation within a control area on the power grid. For example, a –5 MW value of ACE would indicate that a Balancing Authority should be generating 5 MW more to meet its obligation to the Interconnection. A positive value of ACE indicates that the Balancing Authority needs to decrease its generation to meet its interconnection Obligation.

Balancing Authority ACE Limit (BAAL): The Balancing Authority ACE Limits are unique for each Balancing Authority and provide dynamic limits for its Area Control Error value limit as a function of its interconnection frequency. As per NERC STANDARD BAL-001-2 requirement R2, Balancing Authority shall operate such that its clock-minute average of reporting ACE does not exceed its clock-minute BAAL for more than 30 consecutive clock-minutes. This means that the BA needs to closely regulate its ACE value to be close to zero and ensure that it does not exceeds the BAAL. Generation and load need to be balanced continuously to regulate the ACE value. Please refer to NERC STANDARD BAL-001-2 for more details.

Control Performance Score 1 (CPS1): CPS1 is a measure of a Balancing Authority's control performance as it relates to its generation, load management, and interconnection frequency when measured in one-minute averages over a rolling one-year period. A Balancing Authority reports its CPS1 value to its regional entity each month. The value needs to be greater than or equal to 100 percent for the applicable interconnection in which it operates for each 12-month period. Please refer to NERC STANDARD BAL-001-2 for more details.

Battery Energy Storage System (BESS): All components and subsystems needed for charging and discharging of storage, including but not limited to 1) the connection to the energy source, 2) energy storage enclosures, 3) power conditioning (for electricity storage), 4) overall controls (including charge and discharge, rate of discharge, response to initiating signals, others), 5) monitoring, 6) diagnostics, and 7) communication.

2. Frequency Control Algorithm Overview

Duke Energy intends to use the Hot Springs Battery Energy Storage System (BESS) to provide ancillary services to the bulk power system. The battery can provide frequency response as well as regulation services. One of the important tasks of Balancing Authority is to maintain the generation and load balance. The chart in Figure 1 is called Balancing Authority ACE Limit (BAAL) chart which has frequency on the x axis and Area Control Error (ACE) on the y axis. Each Balancing Authority (BA) balances load and generation to ensure its CPS1 score remains within BAAL limits (see Figure 1). If the BAAL limits are exceeded and the ACE is positive, then the balancing authority needs to decrease generation or increase load. And, If the BAAL limits are exceeded and the ACE is negative, then the balancing authority needs to increase generation or decrease load. BESSs have the ability to respond faster according to the changes in the system, and it is used here to provide fast response to ACE, frequency and CPS1 score changes so as to defer the need of other rotating machine generators from providing this same service (which would be done at a higher cost). Also, BESSs can provide primary frequency response whenever frequency goes beyond the specified deadband. If the frequency exceeds the upper limit, the battery charges, and when it goes below the lower limit, the battery discharges. The section below shows the results of the simulation cases run using historical data for four days from four different seasons. These showcase how the battery can help the balancing authority in meeting BAAL limits and provide primary frequency response

PAGES 7-15 ARE CONFIDENTIAL

AND

FILED UNDER SEAL

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Progress, LLC's Hot Springs Microgrid Project Revised Semiannual Progress Report, in Docket No. E-2, Sub 1185, has been served by electronic mail, hand delivery or by depositing a copy in the United States mail, postage prepaid to the following parties:

David T. Drooz, Chief Counsel
Tim Dodge, Staff Attorney
Dianna Downey, Staff Attorney
Public Staff
North Carolina Utilities Commission
4326 Mail Service Center
Raleigh, NC 27699-4300
david.drooz@psncuc.nc.gov
dianna.downey@psncuc.nc.gov

Peter Ledford, General Counsel
Benjamin W. Smith, Regulatory Counsel
NC Sustainable Energy Assoc.
4800 Six Forks Road, Suite 300
Raleigh, NC 27609
peter@energync.org
ben@energync.org

This the 15th day of January, 2020.

By: ______________________
Lawrence B. Somers
Deputy General Counsel
Duke Energy Corporation
P.O. Box 1551/NCRH 20
Raleigh, North Carolina 27602
Tel 919.546.6722
bo.somers@duke-energy.com