

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-7, SUB 1229

In the Matter of)
)
Application of Duke Energy Carolinas, LLC)
for Approval of Renewable Energy and)
Energy Efficiency Portfolio Standard (REPS))
Compliance Report and Cost Recovery Rider)
Pursuant to N.C. Gen. Stat. 62-133.8 and)
Commission Rule R8-67)

**DIRECT TESTIMONY OF
MEGAN W. JENNINGS**

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Megan W. Jennings, and my business address is 400 South
3 Tryon Street, Charlotte, North Carolina.

4 **Q. PLEASE STATE YOUR POSITION WITH DUKE ENERGY AND**
5 **DESCRIBE YOUR CURRENT RESPONSIBILITIES.**

6 A. In my capacity as Renewable Compliance Manager, I am responsible for the
7 development and implementation of renewable energy compliance strategies
8 for Duke Energy Carolinas, LLC (“Duke Energy Carolinas,” “DEC” or “the
9 Company”), Duke Energy Progress, LLC (“Duke Energy Progress” or
10 “DEP”) and Duke Energy Ohio, LLC. My responsibilities include
11 compliance with North Carolina’s Renewable Energy and Energy
12 Efficiency Portfolio Standard (“REPS”), compliance with Ohio’s
13 Renewable Portfolio Standard and evaluation of renewable generation
14 initiatives and customer programs that relate to renewable compliance.

15 **Q. PLEASE BRIEFLY SUMMARIZE YOUR EDUCATIONAL**
16 **BACKGROUND.**

17 A. I received a Bachelor of Science in Mathematical Sciences from Clemson
18 University and a Master of Financial Mathematics from North Carolina
19 State University.

20 **Q. PLEASE DESCRIBE YOUR BUSINESS BACKGROUND AND**
21 **EXPERIENCE.**

22 A. I joined Progress Energy, Inc. in 2008, where I held positions in Investor
23 Relations and Regulatory Planning. Following the merger of Progress

1 Energy, Inc. with Duke Energy Corporation, I worked in the Rates and
2 Regulatory Strategy Department until June of 2015, when I moved to my
3 current position as Renewable Compliance Manager in the Distributed
4 Energy Technology Department.

5 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE NORTH**
6 **CAROLINA UTILITIES COMMISSION?**

7 A. Yes, I most recently provided testimony in Docket No. E-7, Sub 1191 on
8 Duke Energy Carolinas' 2018 REPS compliance report and application for
9 approval of its REPS cost recovery rider.

10 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

11 A. The purpose of my testimony is to describe Duke Energy Carolinas'
12 activities and the costs it has incurred, or projects it will incur, in support of
13 compliance with North Carolina's Renewable Energy and Energy
14 Efficiency Portfolio Standard under N.C. Gen. Stat. ("G.S.") § 62-133.8
15 during the twelve months beginning on January 1, 2019 and ending on
16 December 31, 2019 ("Test Period"), as well as during the twelve months
17 beginning on September 1, 2020 and ending on August 31, 2021 ("Billing
18 Period").

19 **Q. PLEASE DESCRIBE THE EXHIBITS TO YOUR TESTIMONY.**

20 A. My testimony includes twenty exhibits: Jennings Confidential Exhibit No.
21 1 is the Company's 2019 REPS Compliance Report, and Jennings
22 Confidential Exhibit No. 2 provides actual and forecasted REPS compliance
23 costs, by resource, that the Company has incurred during the Test Period

1 and projects to incur during the Billing Period in support of compliance with
2 REPS. Jennings Confidential Exhibit No. 3 is a worksheet detailing the
3 other incremental costs included in the DEC REPS filing, listing the labor
4 costs by activity, as directed by the North Carolina Utilities Commission
5 (“Commission”) in its August 17, 2018 Order in Docket No. E-7, Sub 1162.
6 Jennings Exhibit Nos. 4-20 are the results of studies the costs of which the
7 Company is recovering via the REPS Rider.

8 **Q. WERE THESE EXHIBITS PREPARED BY YOU OR AT YOUR**
9 **DIRECTION AND UNDER YOUR SUPERVISION?**

10 A. Jennings Confidential Exhibit Nos. 1-3 were prepared by me or under my
11 supervision. Jennings Exhibit Nos. 4-20 include the results of studies not
12 prepared under my supervision. In my role at Duke Energy, however, I am
13 familiar with the studies.

14 **Compliance with REPS Requirements**

15 **Q. WHAT ARE DUKE ENERGY CAROLINAS’ REPS**
16 **REQUIREMENTS UNDER G.S. § 62-133.8?**

17 A. Pursuant to G.S. § 62-133.8,¹ as an electric power supplier, Duke Energy
18 Carolinas is required to comply with the overall REPS requirement (“Total
19 Requirement”) by submitting for retirement a total volume of RECs
20 equivalent to the following percentages of its North Carolina retail sales in
21 the prior year:

¹ In its *Order Clarifying Electric Power Suppliers’ Annual REPS Requirements*, Docket No. E-100, Sub 113 (November 26, 2008), the Commission clarified that the calculation of these requirements for each year shall be based upon the electric utility’s North Carolina retail sales for the prior year.

- 1 ▪ Beginning in 2012, three percent (3%);
- 2 ▪ In 2015, six percent (6%);
- 3 ▪ In 2018, ten percent (10%); and
- 4 ▪ In 2021 and thereafter, twelve point five percent (12.5%).

5 Furthermore, each electric power supplier must comply with the
6 requirements of G.S. § 62-133.8 (d), (e), and (f) (individually referred to as
7 the “Solar Set-Aside,” “Swine Waste Set-Aside,” and “Poultry Waste Set-
8 Aside,” respectively). That is, within the Total Requirement described
9 above, each electric power supplier is to ensure that specific quantities of
10 qualifying solar RECs, swine waste RECs, and poultry waste RECs are also
11 submitted for retirement. The Company generally refers to its Total
12 Requirement net of the three set-asides as its “General Requirement.”

13 Specifically, each electric power supplier is to comply with the Solar
14 Set-Aside by submitting for retirement a volume of qualifying solar RECs
15 equivalent to the following percentages of its North Carolina retail sales in
16 the prior year:

- 17 ▪ Beginning in 2010, two-hundredths of one percent (0.02%);
- 18 ▪ In 2012, seven-hundredths of one percent (0.07%);
- 19 ▪ In 2015, fourteen-hundredths of one percent (0.14%); and
- 20 ▪ In 2018 and thereafter, two-tenths of one percent (0.2%).

21 Each electric power supplier is also to comply with the Swine Waste
22 Set-Aside by submitting for retirement a volume of qualifying swine waste
23 RECs equivalent to its pro-rata share of total retail electric power sold in

1 North Carolina multiplied by the statewide, aggregate Swine Waste Set-
2 Aside Requirement.² Duke Energy Carolinas' Swine Waste Set-Aside
3 Requirements, as modified by the Commission³, are as follows:

- 4 ▪ In 2018, its pro-rata share of two-hundredths of one percent (0.02%)
5 of the total retail electric power sold in North Carolina in the year
6 prior;
- 7 ▪ In 2019, its pro-rata share of four-hundredths of one percent (0.04%)
8 of the total retail electric power sold in North Carolina in the year
9 prior;
- 10 ▪ In 2020, its pro-rata share of seven-hundredths of one percent
11 (0.07%) of the total retail electric power sold in North Carolina in
12 the year prior;
- 13 ▪ In 2022, its pro-rata share of fourteen-hundredths of one percent
14 (0.14%) of total retail electric power sold in North Carolina in the
15 year prior; and

16

² In its *Order on Pro Rata Allocation of Aggregate Swine and Poultry Waste Set-Aside Requirements and Motion for Clarification* in Docket No. E-100, Sub 113 (March 31, 2010), the Commission approved the electric power suppliers' proposed pro-rata allocation of the statewide aggregate swine and poultry waste set-aside requirements, such that the aggregate requirements will be allocated among the electric power suppliers based on the ratio of each electric power supplier's prior year retail sales to the total statewide retail sales.

³ In its *Order Modifying the Swine and Poultry Waste Set-Aside Requirements And Providing Other Relief* (December 16, 2019) and its *Errata Order* (February 13, 2020) Docket No. E-100, Sub 113, the Commission modified the 2019 Swine Waste Set-Aside Requirement for electric public utilities to 0.04% and delayed by one year the scheduled increases to the requirement. The Commission also modified the 2019 Poultry Waste Set-Aside Requirement to 500,000 MWh, and delayed by one year the scheduled increases in the requirement.

1 A. For the Test Period, the Company has submitted for retirement 6,170,047
2 RECs, which includes 23,822 Senate Bill 886 (“SB 886”) RECs, each of
3 which counts for two poultry waste and one general REC, to meet its Total
4 Requirement of 6,217,691 RECs. Within this total, the Company has
5 submitted for retirement 124,357 RECs to meet the Solar Set-Aside
6 Requirement, 176,285 RECs, along with 23,822 SB 886 RECs (which
7 count as 47,644 Poultry Waste Set-Aside RECs), to meet the Poultry Waste
8 Set-Aside Requirement, and 23,793 RECs to meet the Swine Waste Set-
9 Aside Requirement. During the prospective Billing Period, which spans
10 two calendar years, with different requirements in each year, the Company’s
11 estimated requirements are as follows⁴:

12 In 2020, the Company estimates that it will be required to submit for
13 retirement 6,126,401 RECs to meet its Total Requirement. Within this total,
14 the Company is also required to retire the following: 122,532 solar RECs,
15 42,888 swine waste RECs and 313,499 poultry waste RECs.

16 In 2021, the Company estimates that it will be required to submit for
17 retirement 7,563,137 RECs to meet its Total Requirement. Within this total,
18 the Company estimates that it will be required to retire approximately
19 122,064 solar RECs, 42,725 swine waste RECs and 403,068 poultry waste
20 RECs.

21 **Q. HAS THE COMPANY COMPLIED WITH ITS GENERAL**
22 **REQUIREMENT FOR 2019?**

⁴ The Company’s projected requirements are based upon retail sales estimates and will be subject to change based upon actual prior-year North Carolina retail sales data.

1 A. Yes. The Company has met its 2019 General Requirement of 5,845,612
2 RECs. Specifically, the RECs to be used for 2019 compliance have been
3 transferred from the North Carolina Renewable Energy Tracking System
4 (“NC-RETS”) Duke Energy Electric Power Supplier account to the Duke
5 Energy Compliance Sub-Account and the Sub-Accounts of its Wholesale
6 customers. Upon completion of this regulatory proceeding, the Commission
7 will finalize retirement of the RECs.

8 **Q. WILL THE COMPANY COMPLY WITH ITS GENERAL**
9 **REQUIREMENT IN 2020?**

10 A. Yes, the Company is in a position to comply with its General Requirement
11 in 2020.

12 **Q. WHAT ACTIONS HAS DUKE ENERGY CAROLINAS TAKEN**
13 **DURING THE TEST PERIOD TO SATISFY ITS CURRENT AND**
14 **FUTURE REPS REQUIREMENTS?**

15 A. During the Test Period, Duke Energy Carolinas has continued to produce
16 and procure RECs to satisfy its REPS requirements. Specifically, the
17 Company has taken the following actions: (1) executed and continued
18 negotiations for additional REC purchase agreements with renewable
19 facilities; (2) operated three utility-scale solar projects, the Mocksville,
20 Monroe and Woodleaf Solar Facilities, totaling 76 megawatts (“MW”) and
21 generating RECs for compliance purposes; (3) continued operations of its
22 solar and hydroelectric facilities, including completing the sale of five
23 hydroelectric facilities and subsequently executing contracts to purchase the

1 RECs produced by these facilities, which can now be used by DEC for
2 REPS compliance⁵; (4) enhanced and expanded energy efficiency programs
3 that will generate savings that can be counted towards the Company's REPS
4 requirement; (5) performed research studies, both directly and through
5 strategic partnerships, to enhance the Company's ability to comply with its
6 future REPS requirements; and (6) issued a second Request for Proposals
7 as part of the Competitive Procurement of Renewable Energy ("CPRE")
8 Program of North Carolina House Bill 589 ("NC HB 589"), the RECs from
9 which will be used to meet the Company's future REPS requirements.

10 **Q. IS THE COMPANY ABLE TO USE RECS GENERATED FROM**
11 **NET METERING FACILITIES TO SATISFY ITS FUTURE REPS**
12 **REQUIREMENTS?**

13 A. Yes. Under the current Net Metering for Renewable Energy Facilities Rider
14 offered by DEC (Rider NM), a customer receiving electric service under a
15 schedule other than a time-of-use schedule with demand rates ("NMNTD
16 customer") shall provide any RECs to DEC at no cost. Per the
17 Commission's June 5, 2018 *Order Approving Rider and Granting Waiver*
18 *Request* ("NMNTD Order") in Docket Nos. E-2, Sub 1106 and E-7, Sub
19 1113, for NMNTD customers, DEC may use the PVWattsTM Solar
20 Calculator developed by the National Renewable Energy Laboratory

⁵ On August 16, 2019, DEC sold the Bryson Hydroelectric Station, Franklin Hydroelectric Station, Gaston Shoals Hydroelectric Station, Mission Hydroelectric Station and Tuxedo Hydroelectric Station to Northbrook Carolina Hydro II, LLC and Northbrook Tuxedo, LLC. Following the sale, DEC signed Renewable Purchase Power Agreements to purchase power and RECs from the facilities. These RECs can be used by DEC for REPS compliance as the facilities are now considered New Renewable Energy Facilities.

1 (“NREL”) for estimating the generation from NMNTD customers’ solar
2 facilities, as permitted by Commission Rule R8-67(g)(2). Commission Rule
3 R8-67(g)(2) allows the use of a scalable conversion factor for estimating
4 annual generation from program participants. DEC shall then report the
5 total amount of electricity produced by facilities under the Rider directly
6 into NC-RETS in a separately identified generation project. DEC has
7 complied with these requirements and reported generation from NMNTD
8 customers to NC-RETS. The RECs from these facilities are currently in
9 DEC’s REC inventory and available for use for future compliance
10 requirements.

11 **Q. ARE THERE OTHER COMPLIANCE REQUIREMENTS IN THE**
12 **NMNTD ORDER WITH WHICH DEC MUST COMPLY?**

13 A. Yes. The NMNTD Order also requires that DEC shall provide NC-RETS
14 on a monthly basis with a list of participating customers, including location
15 and the kW capacity of their installations, to be made available on the NC-
16 RETS website. DEC has complied, and continues to comply, with this
17 requirement. In addition, the NMNTD Order requires that for two years,
18 DEC shall verify through site visits to a statistically significant number of
19 participating residences that the solar installations covered by this Rider
20 continue to be operating and shall include the findings of its site visits in its
21 annual REPS compliance filing.

22 **Q: HAS DEC PERFORMED THE SITE VISITS REQUIRED BY THE**
23 **NMNTD ORDER?**

1 **A:** Yes, DEC hired a third-party contractor, Pure Power Contractors, Inc., to
2 perform the required site visits. A total of eighty-five site visits took place
3 between February 18, 2019 and April 23, 2019, with inspections taking
4 place in Charlotte, Durham, Hickory and Salisbury. The inspection process
5 consisted of a visual inspection of the facility equipment, with the following
6 data points collected at each facility:

- 7 • Energy production readings were taken from the inverter displays or
8 monitoring equipment;
- 9 • Equipment make and model numbers;
- 10 • Weather conditions;
- 11 • Array tilt, azimuth and insolation readings; and
- 12 • Meter numbers.

13 **Q. THROUGH THESE SITE VISITS, WAS IT DETERMINED THAT**
14 **PRODUCTION FROM INSTALLED SYSTEMS MET**
15 **EXPECTATIONS?**

16 **A:** Yes, the site visits determined that production from installed systems has
17 met expectations. For the net metering facilities included in the sample, the
18 PVWatts™ Solar Calculator produced an average generation estimate of
19 9.14 MWh/yr. The historical production data collected from inverter
20 readings during the site visits demonstrated an average production for the
21 sample group of 8.85 MWh/yr. This resulted in an overall average
22 realization rate of 96%, which is calculated by dividing the verified annual
23 production by the expected annual production for each customer and taking

1 the sample average. These findings indicate that the PVWatts™ production
2 estimate methodology remains accurate for predicting future MWh/yr. for
3 program participants.

4 **Q. HOW WILL THE CPRE PROGRAM OF NC HB 589 IMPACT**
5 **DEC'S COMPLIANCE WITH ITS GENERAL REQUIREMENT?**

6 A. Under G.S. § 62-110.8(a), DEC and DEP are responsible for procuring
7 renewable energy and capacity through a competitive procurement program
8 with the purpose of adding renewable energy to the state's generation
9 portfolio in a manner that allows DEC and DEP to continue to reliably and
10 cost-effectively serve their customers' future energy needs. To meet the
11 CPRE Program requirements, the Companies must issue requests for
12 proposals to procure energy and capacity from renewable energy facilities
13 in the aggregate amount of 2,660 MW (subject to adjustment in certain
14 circumstances) reasonably allocated over a term of 45 months beginning on
15 February 21, 2018, when the Commission approved the CPRE Program.

16 Renewable energy facilities eligible to participate in the CPRE
17 solicitation(s) include those facilities that use renewable energy resources
18 identified in G. S. § 62-133.8(a)(8), the REPS statute. The renewable energy
19 facilities, to be developed or acquired by the Companies or procured from
20 a third party through a power purchase agreement under the CPRE Program,
21 must also deliver to the Companies the environmental and renewable
22 attributes, or RECs, associated with the power. The Company's annual
23 CPRE Program Plan, filed on September 1, 2019 in Docket No. E-100, Sub

1 157, includes a planned allocation of ~1,230 to ~1,880 MWs between the
2 DEC and DEP service territories, as well as a planned timeline for each
3 solicitation. DEC plans to use the RECs acquired through the CPRE RFP
4 solicitations for its future REPS compliance requirements and has therefore
5 included the planned MW allocation and timeline in its REPS compliance
6 planning process. Because the Company will use the RECs acquired
7 through CPRE for REPS compliance, CPRE program implementation costs
8 could be recovered through the REPS Rider. However, as I noted in my
9 testimony in last year's annual REPS cost-recovery proceeding in Docket
10 No. E-7, Sub 1191, the Company has elected to recover the reasonable and
11 prudent costs incurred to implement the CPRE Program through the CPRE
12 Rider (see Docket No. E-7, Sub 1231), as contemplated under Commission
13 Rule R8-71(j).

14 **Q. HAS THE COMPANY COMPLIED WITH ITS SOLAR SET-ASIDE**
15 **REQUIREMENT FOR 2019?**

16 A. Yes. The Company has met the 2019 Solar Set-Aside Requirement of
17 124,357 solar RECs. Pursuant to the NC-RETS Operating Procedures, the
18 Company has submitted for retirement 124,357 solar RECs. Specifically,
19 the RECs to be used for 2019 compliance have been transferred from the
20 NC-RETS Duke Energy Electric Power Supplier account to the Duke
21 Energy Compliance Sub-Account and the Sub-Accounts of its Wholesale
22 customers. Upon completion of this regulatory proceeding, the Commission
23 will finalize retirement of the RECs.

1 **Q. WILL THE COMPANY COMPLY WITH ITS SOLAR SET-ASIDE**
2 **REQUIREMENT IN 2020?**

3 A. Yes, the Company is well-positioned to comply with its Solar Set-Aside
4 Requirement in 2020.

5 **Q. PLEASE PROVIDE AN UPDATE ON THE COMPANY'S EFFORTS**
6 **TO COMPLY WITH ITS SOLAR SET-ASIDE REQUIREMENT.**

7 A. The Company is well-positioned to comply with its Solar Set-Aside
8 Requirement in 2020 through a diverse and balanced portfolio of solar
9 resources. The Company's efforts to comply with the Solar Set-Aside
10 Requirement include REC generation and procurement from solar
11 renewable energy facilities.

12 As previously noted, the Company constructed three DEC-owned
13 solar photovoltaic ("PV") facilities, which will generate an estimated
14 140,000 RECs per year over the life of the projects. These facilities include
15 the Monroe Solar Facility, 55 MW located in Union County, the Mocksville
16 Solar Facility, 15 MW located in Davie County, and the Woodleaf Solar
17 Facility, 6 MW located in Rowan County.

18 **Q. PLEASE DESCRIBE THE OPERATIONAL STATUS OF THE**
19 **COMPANY'S PV DISTRIBUTED GENERATION ASSETS.**

20 A. The Company's approximately 10 MW-DC of solar PV generation facilities
21 were operational and generating power for the benefit of its customers
22 during the test period. In 2020, the Company plans to complete updates to
23 the monitoring equipment at its nonresidential sites. The Marshall site will

1 be decommissioned in 2020 due to work that needs to be completed on the
2 coal ash storage site where the solar facility is located. Also, in 2020,
3 contracts for the seven residential sites expire with the option to renew. One
4 customer has notified the Company that it does not wish to continue, and
5 the Company plans to contact the other customers to determine their desire
6 to renew their contracts.

7 **Q. HAS THE COMPANY COMPLIED WITH ITS POULTRY WASTE**
8 **SET-ASIDE REQUIREMENT FOR 2019?**

9 A. Yes. The Company has met the 2019 Poultry Waste Set-Aside
10 Requirement of 223,929 RECs. Pursuant to NC-RETS Operating
11 Procedures, the Company has submitted for retirement 176,285 poultry
12 RECs and 23,822 SB 886 RECs (which count as 47,644 Poultry Waste Set-
13 Aside RECs). Accordingly, the Company has submitted the equivalent of
14 223,929 poultry RECs for compliance. Specifically, the RECs to be used
15 for 2019 compliance have been transferred from the NC-RETS Duke
16 Energy Electric Power Supplier account to the Duke Energy Compliance
17 Sub-Account and the Sub-Accounts of its Wholesale customers. Upon
18 completion of this regulatory proceeding, the Commission will finalize
19 retirement of the RECs.

20 **Q. WILL THE COMPANY COMPLY WITH ITS POULTRY WASTE**
21 **SET-ASIDE REQUIREMENT IN 2020?**

22 A. The Company's ability to comply with its Poultry Waste Set-Aside
23 Requirement in 2020 is dependent on the performance of current poultry

1 waste-to-energy contracts, several of which are ramping up production
2 during 2020. To help meet future requirements of the poultry waste set-
3 aside, four new poultry waste-to-energy facilities are currently scheduled to
4 come online in 2021, two of which are gas injection facilities.

5 **Q. WHAT ACTIONS HAS THE COMPANY TAKEN DURING THE**
6 **TEST PERIOD TO PROCURE OR DEVELOP POULTRY WASTE-**
7 **TO-ENERGY RESOURCES TO SATISFY ITS POULTRY WASTE**
8 **SET-ASIDE REQUIREMENTS?**

9 A. In the Test Period, the Company (1) continued direct negotiations for
10 additional supplies of both in-state and out-of-state resources with multiple
11 counterparties; (2) secured contracts for additional poultry waste-to-energy
12 resources; (3) worked diligently to understand the technological, permitting,
13 and operational risks associated with various methods of producing
14 qualifying poultry RECs to aid developers in overcoming those risks; when
15 those risks could not be overcome, the Company worked with developers
16 via contract amendments to adjust for more realistic outcomes; (4) explored
17 leveraging current biomass contracts by working with developers to add
18 poultry waste to their fuel mix; (5) explored adding thermal capabilities to
19 current poultry sites to bolster REC production; (6) explored poultry-
20 derived directed biogas at facilities located in North Carolina and directing
21 such biogas to combined cycle plants for combustion and electric
22 generation; and (7) utilized the Company's REC trader to search the broker
23 market for out-of-state poultry RECs available in the market. Additional

1 information on the Company's compliance with the Poultry Waste Set-
2 Aside requirement can be found in the Company's Joint Semiannual
3 Progress Report, filed on November 20, 2019 in Docket No. E-100, Sub
4 113A.

5 The Company remains committed to satisfying its statutory
6 requirements for the Poultry Waste Set-Aside and will continue to
7 reasonably and prudently pursue procurement of these resources.

8 **Q. HAS THE COMPANY COMPLIED WITH ITS SWINE WASTE**
9 **SET-ASIDE REQUIREMENT FOR 2019?**

10 A. Yes. The Company has met the 2019 Swine Waste Set-Aside Requirement
11 of 23,793 swine RECs. Pursuant to the NC-RETS Operating Procedures,
12 the Company has submitted for retirement 23,793 swine RECs.
13 Specifically, the RECs to be used for 2019 compliance have been
14 transferred from the NC-RETS Duke Energy Electric Power Supplier
15 account to the Duke Energy Compliance Sub-Account. Upon completion of
16 this regulatory proceeding, the Commission will finalize retirement of the
17 RECs.

18 **Q. WILL THE COMPANY COMPLY WITH ITS SWINE WASTE SET-**
19 **ASIDE REQUIREMENT IN 2020?**

20 A. The Company's ability to comply with its Swine Waste Set-Aside
21 Requirement in 2020 is dependent on the performance of swine waste-to-
22 energy developers on current contracts, particularly achievement of
23 projected delivery requirements and commercial operation milestones.

1 The Company understands that current swine waste-to-energy
2 projects have encountered difficulties in achieving the full REC output of
3 their contracts due to issues including local opposition to siting of the
4 facilities, the inability to secure firm and reliable sources of swine waste
5 feedstock from waste producers in North Carolina, difficulties securing
6 project financing and technological challenges encountered when ramping
7 up production.

8 **Q. WHAT ACTIONS HAS DUKE ENERGY CAROLINAS TAKEN**
9 **DURING THE TEST PERIOD TO PROCURE OR DEVELOP**
10 **SWINE WASTE-TO-ENERGY RESOURCES TO MEET ITS SWINE**
11 **WASTE SET-ASIDE REQUIREMENTS?**

12 A. In the Test Period, the Company (1) continued direct negotiations for
13 additional supplies of both in-state and out-of-state resources; (2) continued
14 support of the Loyd Ray Farms research and development project; (3)
15 worked diligently to understand the technological, permitting, and
16 operational risks associated with various methods of producing qualifying
17 swine RECs to aid developers in overcoming those risks; when those risks
18 could not be overcome, the Company worked with developers via contract
19 amendments to adjust for outcomes that the developers believe are
20 achievable based on new experience; (4) explored and is engaging in
21 modification of current biomass and set-asides contracts by working with
22 developers to add swine waste to their fuel mix; (5) continued pursuit of
23 swine-derived directed biogas from North Carolina facilities including

1 continuing discussions with Align Renewable Natural Gas (“RNG”) who
2 has announced that they will deploy millions of dollars in North Carolina,
3 covering swine lagoons and cleaning up the related RNG; (6) utilized the
4 Company’s REC trader to search the broker market for out-of-state swine
5 RECs available in the market; and (7) engaged the North Carolina Pork
6 Council (“NCPC”) in a project evaluation collaboration effort that will
7 allow the Company and the NCPC to discuss project viability, as
8 appropriate, with respect to the Company’s obligations to keep certain
9 sensitive commercial information confidential. Additional information on
10 the Company’s compliance with the Swine Waste Set-Aside requirement
11 can be found in the Company’s Joint Semiannual Progress Report, filed on
12 November 20, 2019 in Docket No. E-100, Sub 113A.

13 The Company remains committed to satisfying its statutory
14 requirements for the Swine Waste Set-Aside and will continue to reasonably
15 and prudently pursue procurement of these resources.

16 **Q. IS DUKE ENERGY CAROLINAS CONTINUING TO EXECUTE**
17 **ADDITIONAL REC PURCHASE AGREEMENTS?**

18 A. Yes. The Company continues to execute additional REC purchase
19 agreements and maintains an open solicitation for proposals from
20 developers of renewable energy resources.

21 **Q. DID THE COMPANY SELL ANY RECS DURING THE TEST**
22 **PERIOD?**

23 A. No, the Company did not sell any RECs during the test period.

1 **Q. HAS THE COMPANY COMPLIED WITH THE COMMISSION’S**
2 **AUGUST 2019 ORDER IN DOCKET NO. E-7, SUB 1191,**
3 **PERTAINING TO REC SALES?**

4 A. The Commission’s August 15, 2019 *Order Approving REPS and REPS*
5 *EMF Riders and 2018 REPS Compliance Report* in Docket. No. E-7, Sub
6 1191, directed the Company and the Public Staff to work together to
7 evaluate sales prices of set-aside RECs sold by DEC and address the five
8 considerations below, as set forth in witness Boswell’s testimony. The
9 Commission further directed the Company to include the results of this
10 evaluation, and any resolution of issues, in its direct testimony in this
11 current DEC cost recovery proceeding.

12 (1) overhead costs associated with obtaining the REC and
13 subsequent sale of the REC;

14 (2) an amount to mitigate the interest DEC may pay ratepayers on
15 any REPS EMF overcollection that results from the sale of set-aside
16 RECs;

17 (3) an amount to ensure that DEC’s customers do not bear any risk
18 of REC contracts not materializing or resulting in lower quantities
19 of RECs being generated;

20 (4) an amount to provide a price signal to other electric power
21 suppliers to encourage them to continue to participate in the
22 development of swine and poultry waste-to-energy resources

1 without relying solely on DEC to provide the needed set-aside
2 RECs; and

3 (5) an amount to encourage DEC to sell RECs, when available, to
4 other North Carolina electric power suppliers for the purpose of
5 assisting with their compliance with the REPS requirements.

6 The Company has submitted its recommendations regarding the
7 above considerations to the Public Staff, which are as follows.

8 The Company proposes that, when selling set-aside RECs to other
9 electric suppliers, the sale price of these RECs will be determined by taking
10 a weighted average price of all contracts in DEC's and DEP's combined
11 portfolio that were executed for compliance with the respective set-aside for
12 which RECs are being sold, which is the same practice the Company has
13 followed for past REC sales. In addition to this weighted average price, the
14 Company proposes two adders to address items (1) through (4) above as
15 suggested in Witness Boswell's testimony. One adder would be to address
16 item (2), an amount to mitigate the interest DEC is required to pay
17 customers on any REPS EMF overcollection that includes the proceeds
18 from the sale of set-aside RECs. This adder would be retained by the
19 Company to mitigate interest paid to customers in the event of an
20 overcollection for the EMF period, and would be credited in full to
21 customers in the REPS rider calculation if the Company is not over
22 collected for the EMF period. The second adder would be charged to REC
23 buyers to address items (1), (3) and (4) and would be credited to customers

1 in the relevant REPS EMF rider calculation. Regarding item (5), the
2 Company does not propose a specific adder to create an incentive to sell
3 RECs.

4 **Q. DOES THE COMPANY HAVE IN ITS INVENTORY ANY RECS**
5 **THAT IT CANNOT USE FOR ITS OWN REPS COMPLIANCE**
6 **REQUIREMENTS?**

7 A. Yes. DEC has RECs in its inventory that it cannot use for its own REPS
8 compliance requirements. The RECs were generated by specific
9 hydroelectric generating facilities owned by the Company, each of which
10 has a generation capacity of 10 MW or less and was placed into service prior
11 to January 1, 2007.

12 **Q. PLEASE EXPLAIN WHY THE COMPANY CANNOT USE THESE**
13 **RECS TO MEET ITS OWN COMPLIANCE REQUIREMENTS.**

14 A. Under G.S. § 62-133.8(b)(2), an electric public utility, such as DEC, may
15 meet its REPS compliance requirement through several methods, including
16 by “generat[ing] electric power at a new renewable energy facility.” The
17 Commission accepted the registration of these DEC-owned hydroelectric
18 facilities as renewable energy facilities, but not as *new* renewable energy
19 facilities, in its July 31, 2009 *Order Accepting Registration of Renewable*
20 *Energy Facilities* in Docket Nos. E-7, Subs 886, 887, 888, 900, 903 and 904
21 (“*June 31, 2009 Registration Order*”) and its December 9, 2010 *Order*
22 *Accepting Registration of Renewable Energy Facilities* in Docket Nos. E-7,
23 Subs 942, 943, 945 and 946 (collectively, “*Registration Orders*”). In the

1 *Registration Orders*, the Commission specifically cited its June 17, 2009
2 *Order on Public Staff's Motion for Clarification* in Docket No. E-100, Sub
3 113, where it concluded that these utility-owned hydroelectric facilities do
4 not meet the delivery requirement of G.S. § 62-133.8(a)(5)(c), which
5 requires the delivery of electric power to an electric power supplier, such as
6 DEC, by an entity other than the electric power supplier to qualify as a *new*
7 renewable energy facility.

8 **Q. WHAT HAS THE COMPANY PROPOSED TO DO WITH THESE**
9 **HYDROELECTRIC RECS THAT IT CANNOT USE FOR ITS OWN**
10 **REPS COMPLIANCE?**

11 A. In the REPS cost recovery proceedings in Docket Nos. E-7, Sub 1162 and
12 E-7, Sub 1191, the Company proposed to exchange a portion of these
13 hydroelectric RECs for RECs within the inventory of the North Carolina
14 Electric Membership Corporation (“NCEMC”). Unlike DEC, NCEMC can
15 use these hydroelectric RECs to comply with its REPS requirements
16 because G.S. § 62-133.8(c)(2)(d) allows electric membership corporations
17 and municipalities to meet their REPS requirements through the purchase
18 of RECs derived from renewable, as opposed to new renewable, energy
19 facilities. Additionally, the Company noted that the REC exchange would
20 benefit DEC’s customers because it would allow DEC to meet part of its
21 general REPS requirements through the RECs exchanged with NCEMC at
22 no cost to DEC’s customers rather than through the purchase of additional
23 RECs from new renewable energy facilities. NCEMC’s customers are held

1 harmless in the transaction as this exchange simply replaces RECs in
2 NCEMC's inventory with different RECs that NCEMC will use to meet its
3 General Requirement. The Public Staff of the North Carolina Utilities
4 Commission supported the Company's proposed REC transfers with
5 NCEMC, and the Commission concluded that the proposed transfer was
6 reasonable and served the public interest in its *Order Approving REPS and*
7 *REPS EMF Riders and 2017 REPS Compliance Report*, issued on August
8 17, 2018 in Docket No. E-7, Sub 1162.

9 **Q. HAS THE COMPANY EXCHANGED ANY OF THESE**
10 **HYDROELECTRIC RECS WITH NCEMC?**

11 A. Yes. The Company has executed contracts with NCEMC exchanging a
12 portion of these hydroelectric RECs for an equal number of General
13 Requirement RECs in NCEMC's inventory that DEC can use for REPS
14 compliance.

15 **Cost of REPS Compliance**

16 **Q. WHAT ARE THE COMPANY'S COSTS ASSOCIATED WITH REPS**
17 **COMPLIANCE DURING THIS TEST PERIOD AND THE**
18 **UPCOMING BILLING PERIOD?**

19 A. Duke Energy Carolinas' costs associated with REPS compliance are
20 reflected in Jennings Confidential Exhibit No. 2 and are categorized by
21 actual costs incurred during the Test Period and projected costs for the
22 Billing Period.

1 **Q. IN ADDITION TO RENEWABLE ENERGY AND REC COSTS,**
2 **WHAT OTHER COSTS OF REPS COMPLIANCE DOES THE**
3 **COMPANY SEEK TO RECOVER IN THIS PROCEEDING?**

4 A. Jennings Confidential Exhibit Nos. 2 and 3 identify “Other Incremental
5 Cost,” “Solar Rebate Program Cost” and “Research Cost” that the Company
6 has incurred, and estimates it will incur, in association with REPS
7 compliance.

8 **Other Incremental Costs and Solar Rebate Program Costs**

9 **Q. PLEASE EXPLAIN THE OTHER INCREMENTAL COSTS**
10 **INCLUDED FOR RECOVERY IN THIS PROCEEDING.**

11 A. Other Incremental Costs include labor costs associated with REPS
12 compliance activities and non-labor costs associated with administration of
13 REPS compliance. Among the non-labor costs associated with REPS
14 compliance are the Company’s subscription to NC-RETS, and accounting
15 and tracking tools related to RECs, reduced by agreed-upon liquidated
16 damages paid by sellers for failure to meet contractual milestones, and
17 amounts paid for administrative contractual amendments requested by
18 sellers.

19 **Q. PLEASE PROVIDE INFORMATION ON THE NC HB 589 SOLAR**
20 **REBATE PROGRAM (“SOLAR REBATE PROGRAM”).**

21 A. As required by G.S. § 62-155(f), DEC developed a Solar Rebate Program
22 offering reasonable incentives to residential and nonresidential customers
23 for the installation of small customer owned or leased solar energy facilities

1 participating in the Company's net metering tariff. The incentive is limited
2 to 10 kilowatts alternating current ("kW AC") for residential solar
3 installations and 100 kW AC for nonresidential solar installations. The
4 program incentive shall be limited to 10,000 kW of installed capacity
5 annually starting January 1, 2018 and continuing until December 31, 2022.

6 Consistent with the Commission's April 3, 2018 order and
7 subsequent orders in Docket Nos. E-7, Sub 1166 and E-2, Sub 1167, the
8 Solar Rebate Program launched on July 9, 2018. In every year since its
9 launch, the Solar Rebate Program's annual participation limits for the
10 residential and non-residential class have been met, although the two
11 thousand five hundred kW of capacity limit for nonprofit organizations has
12 not been met. On January 3, 2020, DEC filed a notice that the 2020 annual
13 participation limits for residential and non-residential customers under the
14 Solar Rebate Program, exclusive of the non-profit participation set-aside,
15 had been reached.

16 Beginning in 2019, for a residential customer who obtains a rebate
17 reservation prior to installation, the installation must be completed no later
18 than December 31 in the year in which the reservation was obtained. For a
19 nonresidential customer, with a project size under 20 kW-AC, who obtains
20 a rebate reservation prior to installation, the installation must be completed
21 no later than 365 days from the date the rebate reservation was obtained.
22 For a nonresidential customer, with a project size over 20kW-AC, who
23 obtains a rebate reservation prior to installation, the installation must be

1 completed no later than 365 days from the date of an executed
2 interconnection agreement. Therefore, rebate payments for the 2018
3 program year continued into 2019, and the same principle will apply for
4 subsequent program years, with payments continuing into 2023 after the
5 final program year of 2022. In accordance with the September 20, 2018
6 Order issued by the Commission in Docket Nos. E-2, Sub 1167 and E-7,
7 Sub 1166, after December 31, 2018, a reallocation was completed to assign
8 capacity and pay rebates to those defined as ‘Affected Customers’ within
9 the Order. This resulted in an increase in rebate payments made at the
10 beginning of 2019.

11 **Q. ARE COSTS RELATED TO THE NC HB 589 SOLAR REBATE**
12 **PROGRAM INCLUDED FOR RECOVERY IN THIS FILING?**

13 A. Yes. Pursuant to G.S. § 62-155(f), each public utility required to offer a
14 solar rebate program “shall be authorized to recover all reasonable and
15 prudent costs of incentives provided to customers and program
16 administrative costs by amortizing the total program incentives distributed
17 during a calendar year and administrative costs over a 20-year period,
18 including a return component adjusted for income taxes at the utility's
19 overall weighted average cost of capital established in its most recent
20 general rate case, which shall be included in the costs recoverable by the
21 public utility pursuant to G.S. 62-133.8(h).” G.S. § 62-133.8(h) provides for
22 an electric power supplier’s cost recovery and customer charges under the
23 REPS statute; NC HB 589 amended it by adding a provision to allow for

1 the recovery of incremental costs incurred to “provide incentives to
2 customers, including program costs, incurred pursuant to G.S. § 62-155(f).”
3 Therefore, DEC has included for recovery in this filing costs incurred
4 during the EMF period, and projected to be incurred in the Billing Period,
5 related to the implementation of the NC HB 589 Solar Rebate Program. As
6 detailed on Jennings Confidential Exhibit No. 3, these costs include the
7 annual amortization of incentives paid to customers and program
8 administration costs, which includes labor, information technology and
9 marketing costs. Projected incentive costs for the Billing Period are within
10 the capacity limits established by G.S. § 62-155(f).

11 **Q. PLEASE PROVIDE DETAIL ON THE INTERNAL LABOR COSTS**
12 **THAT ARE ASSOCIATED WITH REPS COMPLIANCE AND NC**
13 **HB 589 SOLAR REBATE PROGRAM ACTIVITIES THAT ARE**
14 **INCLUDED IN DEC’S CURRENT APPLICATION FOR REPS**
15 **COST RECOVERY.**

16 A. DEC charges only the incremental cost of REPS compliance and the NC
17 HB 589 Solar Rebate Program to the REPS cost recovery rider. Consistent
18 with that policy and DEC’s practices in previous applications for cost
19 recovery for REPS compliance, internal employees that work to comply
20 with G.S. § 62-133.8 and G.S. § 62-155(f) charge only that portion of their
21 labor to REPS. The departments/functions that charged labor to REPS
22 during the Test Period are detailed in Jennings Confidential Exhibit No. 3.

1 **Q. HOW DO EMPLOYEES CHARGE THEIR REPS-RELATED AND**
2 **NC HB 589 SOLAR REBATE PROGRAM-RELATED LABOR**
3 **COSTS TO REPS?**

4 A. Employees positively report their time, which means that each employee is
5 required to submit a timesheet every two weeks in DEC's time reporting
6 system. The hours reported for the period are split according to the
7 accounting entered in the time reporting system for that specific employee.
8 The division of hours is updated for the reporting period as necessary, as
9 the nature of the employee's work changes.

10 To educate employees to account for their time properly, DEC
11 annually provides instructions for charging time to REPS to affected
12 employees and the management of the employee groups performing REPS
13 work. Additionally, every year prior to filing for approval of the DEC REPS
14 Compliance Report and Cost-Recovery Rider, the labor hours charged are
15 carefully reviewed and confirmed.

16 **Q. ARE THERE ANY LABOR AND NON-LABOR**
17 **INTERCONNECTION-RELATED COSTS INCLUDED FOR**
18 **RECOVERY IN THIS FILING?**

19 A. No. As directed by the Commission in Docket No. E-2, Sub 1109, all
20 internal interconnection-related labor costs, such as those related to
21 employees in the Distributed Energy Resources Standard PPAs and
22 Interconnection Team and the Renewables Service Center, contract labor
23 costs, such as those for temporary employees working on interconnection

1 information technology projects and non-labor costs, such as PowerClerk
2 platform costs, have not been included for recovery in this filing.

3 **Research Costs**

4 With respect to Research and Development (“R&D”) activities during the
5 Test Period and projected for the Billing Period, the Company has incurred
6 or projects to incur costs associated with the support of various pilot projects
7 and studies related to distributed energy technology and the Company’s
8 REPS compliance.

9 **Q. THE COMMISSION’S ORDER APPROVING REPS AND REPS EMF**
10 **RIDERS AND 2012 REPS COMPLIANCE REQUIRES DUKE**
11 **ENERGY CAROLINAS TO FILE WITH ITS 2019 REPS RIDER**
12 **APPLICATION STUDY RESULTS FOR ANY STUDIES THE**
13 **COSTS OF WHICH IT HAS RECOVERED VIA THE REPS RIDER.**
14 **IS THE COMPANY SUPPLYING SUCH STUDIES IN THIS**
15 **FILING?**

16 **A.** Yes. The Company’s R&D efforts are an integral part of its REPS
17 Compliance efforts. The following summary outlines efforts undertaken by
18 the Company in the test period and specifies the availability of applicable
19 study results.

- 20 • CAPER Photovoltaic Synchronous Generator (“PVSG”) – Started
21 in 2017, the Company worked with North Carolina State University
22 and Clemson University, through CAPER (Center for Advanced
23 Power Engineering Research), on a project to develop and

1 demonstrate a 40 kW three-phase PVSG system. This project
2 concluded in 2019. The results of this project can be found in
3 Jennings Exhibit No. 4.

4 • Closed Loop Biomass – The Company has completed the closed-
5 loop biomass research project, which was designed to better
6 understand yield potential for various woody crops, including
7 Loblolly Pine, Hybrid Poplar, Hybrid Aspen, Sweetgum, Willow
8 and Cottonwood trees. American Forest Management provided
9 project management support and periodic updates to the Company.
10 While the work on this project concluded in 2018, the final invoice
11 was not paid until 2019, which is why this project is included again
12 in this year’s REPS filing. The final reports from the project were
13 included as Jennings Exhibit Nos. 8-9 in Docket No. E-7, Sub 1191.

14 • Coalition for Renewable Natural Gas – The Company renewed its
15 membership to the Coalition for Renewable Natural Gas in 2019, to
16 add a valuable resource of knowledge and public policy advocacy
17 in this growing sector of potential animal waste supply. The
18 Coalition for Renewable Natural Gas provides its members with
19 exclusive whitepapers, support on model pipeline gas specifications
20 and access to other members for discussions on current and future
21 projects.

22 • DER Risks to Transformers and Transmission – Started in 2018, the
23 Company worked with ABB and Pike Engineering on a project to

1 evaluate the distribution energy resource interconnection impacts to
2 the Transmission to Distribution transformers and the transmission
3 system. While the work on this project concluded in 2018, the final
4 invoice was not paid until 2019, which is why this project is included
5 again in this year's REPS filing. The final report from the project
6 was included as Jennings Exhibit No. 10 in Docket No. E-7, Sub
7 1191.

- 8 • Eos Energy Storage Technology Development – The Company and
9 Eos Services started a collaborative technology development
10 program to validate, demonstrate, and quantify the benefits of an
11 Eos Aurora Battery System that is DC coupled to a PV facility at the
12 McAlpine Creek Substation 50 kW Solar Facility. The installation
13 of the Eos Aurora Battery System was completed in 2019, and
14 operational tests will continue in 2020. The progress report of this
15 project can be found in Jennings Confidential Exhibit No. 5.
- 16 • Electric Power Research Institute (“EPRI”) – In 2019, the Company
17 subscribed to the following EPRI programs, the costs of which were
18 recovered via the REPS rider: Program 174 – Integration of
19 Distributed Energy Resources. The company participated in a
20 supplemental project under this program – “DER Interconnection
21 Standards & Practices.” The company also extended the support of
22 the “EPRI - PV monitoring project” which originally started in
23 2017. EPRI designates such study results as proprietary or as trade

1 secrets and licenses such results to EPRI members,
2 including Duke Energy Carolinas. As such, the Company may not
3 disclose the information publicly. Non-members may access these
4 studies for a fee. Information regarding access to this information
5 can be found at <http://www.epri.com/Pages/Default.aspx>.

- 6 • Emerging Technology Office (“ETO”) – Mitigation of Transformer
7 High Inrush Current – In 2019, the Company continued working
8 with multiple vendors on a project to test and evaluate different
9 options to mitigate the transformer high inrush current.
10 Transformers are very expensive components of the electric power
11 system. The transformers installed in the utility scale solar
12 generating facilities are experiencing high inrush current during
13 energization. Transformer inrush currents are short duration currents
14 that flow into the transformer primary every time the transformer is
15 energized. These currents are typically high magnitude (up to 20
16 times the nominal current), harmonic currents with some DC
17 component. These high inrush currents can cause numerous
18 problems on the electrical system, such as breaker tripping, voltage
19 sags, voltage flicker, mechanical stress on the transformer windings,
20 oscillatory torque in motors and system resonance. The results of
21 this project can be found in Jennings Confidential Exhibit Nos. 6
22 and 7.

- 1 • Institute for Electrical and Electronics Engineers (“IEEE”) 1547
2 Conformity Assessment – The IEEE 1547 Conformity Assessment
3 Steering Committee has been working to develop industry standard
4 tools and methodologies to assure consistent and comprehensive
5 compliance prior to utility grid interconnection sign off. IEEE and
6 the Company share a common goal to accelerate and broaden
7 industry adoption through the development and publication of well-
8 designed and managed conformity assessment and certification
9 programs. In 2019, the Company piloted the IEEE 1547 Conformity
10 Assessment process at a 6 MW utility-scale solar plant located in
11 Duke Energy Carolinas. The results of this project can be found in
12 Jennings Confidential Exhibit No. 8.
- 13 • Loyd Ray Farms – The Company partnered with Duke University
14 to develop a pilot-scale, sixty-five kW swine waste-to-energy
15 facility, which initiated operation and began producing renewable
16 energy in 2011. Jennings Exhibit Nos. 9 and 10 summarize the
17 project’s progress through December 31, 2019.
- 18 • NC State University (“NCSU” or “NC State”) – Adopting DVAR to
19 Mitigate PV Impacts on a Distribution System – In 2019, the
20 Company started a project with NC State to assess the effectiveness
21 of the American Superconductor Corp. Dynamic Volt-Amp
22 Reactive Compensation Solution (“mini-DVAR”) in mitigating
23 various power quality issues on distribution circuits due to

1 increasing penetration of PV. The scope of the project also includes
2 the optimal placement of mini-DVAR and its optimal volt-var
3 control. The project is expected to continue in 2020. The progress
4 report of this project can be found in Jennings Confidential Exhibit
5 No. 11.

6 • NCSU – Feeder Anti-islanding Detection Using HIL Modeling and
7 Simulation – In 2019, the Company started a project with NC State
8 to evaluate the challenge from increasing penetration of PV and
9 installation of mini-DVAR to the islanding protection scheme. The
10 scope of this project is to use a Hardware-in-the-loop (“HIL”) setup
11 to simulate different fault conditions with Schweitzer Engineering
12 Laboratories (“SEL”) relays at PV sites and different operating
13 conditions. The progress report of this project can be found in
14 Jennings Confidential Exhibit No. 12.

15 • NCSU – ETO – Grid-forming Battery Energy Storage System
16 Characterization and Testing – Starting from late 2018, the
17 Company worked with NC State on a project to install and
18 commission a Battery Energy Storage System (“BESS”) and to
19 study the loading capabilities of the BESS operating in grid-forming
20 mode. A BESS may need to power up a microgrid after an outage,
21 thus supplying all of the magnetizing currents to line-start machines
22 as well as isolation transformers in the microgrid. There is a need to
23 understand the capabilities of the state-of-the art BESS inverters to

1 support these loads. Though simulating such behavior is feasible,
2 experimental validation is required to guarantee that the system will
3 operate as expected, and the BESS inverter protection will not trip.
4 The project continued in 2019 and the progress report can be found
5 in Jennings Confidential Exhibit No. 13.

6 • NC State University – Interactions of PV Installations with
7 Distribution Systems – Starting from late 2018, the Company
8 worked with NC State on a project to construct a testbed and
9 analysis framework for investigating how large PV penetration on a
10 feeder affects the operation of the distribution system. The project
11 continued in 2019, and the progress report can be found in Jennings
12 Confidential Exhibit No. 14.

13 • NC State University’s Future Renewable Electric Energy Delivery
14 and Management (“FREEDM”) Systems Center – Duke Energy
15 supports NC State’s FREEDM Center through annual membership
16 dues. The FREEDM partnership provides Duke Energy with the
17 ability to influence and focus research on materials, technology, and
18 products that will enable the utility industry to transform the electric
19 grid into a 2-way power flow system supporting distributed
20 generation.

21 • NREL – Carbon-Free Resource Integration Study – In 2019, the
22 Company contracted with NREL, an industry-respected, leading
23 research institution, to conduct a study of the Carolinas’ system to

1 help us understand the operational impacts, benefits and limitations
2 of solar. The study will also inform other fleet transformation
3 analyses, including how different clean energy technologies can
4 contribute to a carbon-free future. The study will be conducted in
5 two phases. Phase 1 was completed in 2019, and Phase 2 has started
6 and will continue in 2020. The results of the Phase 1 study of this
7 project can be found in Jennings Exhibit Nos. 15-17.

8 • PNNL – Dynamic Var Compensator (“DVC”) Pilot – Started in
9 2018, the Company worked with One-Cycle Control, Inc. and
10 Pacific Northwest National Laboratory (“PNNL”) on a project,
11 which is part of DOE SunAmp Contract: 0000-1714, to install and
12 commission two DVC devices in the Company’s distribution
13 system, and to evaluate its performance in mitigating the voltage
14 variability due to high penetration of distributed photovoltaic on a
15 distribution feeder. The project concluded in 2019, and the results
16 can be found in Jennings Confidential Exhibit No. 18.

17 • Research Triangle Institute – Biogas Utilization in North Carolina –
18 In 2019, the Company continued support of the Research Triangle
19 Institute project for the NC Energy Policy Council to determine the
20 potential bioenergy/biogas resources available in NC, and to
21 identify the most beneficial and optimum utilization of resources to
22 maximize economic, environmental and societal advantages. An

1 overview of the project can be found in Jennings Confidential
2 Exhibit No. 19.

3 • Rocky Mountain Institute (“RMI”) – The Company participates in
4 eLab, a forum sponsored by RMI, composed of several North
5 Carolina and nationally based entities, and organized to overcome
6 barriers to economic deployment of distributed energy resources in
7 the U.S. electric sector. Specifically, the Company seeks to gauge
8 customer desires related to distributed resources and provide ideas
9 of potential long-term solutions for distributed energy resources and
10 microgrids. Please visit RMI’s website at <http://www.rmi.org/elab>
11 for more information on eLab.

12 • Swine Extrusion/Poultry Mortality – The Animal and Poultry Waste
13 Management Center (“APWMC”) at NC State University – In
14 2019, the Company continued support of the various projects being
15 undertaken by the APWMC. This work is centered around drying
16 swine lagoon solids, bagged lagoon sludge and lagoon sludge mixed
17 with agricultural wastes at a farm-based level to create a higher
18 MMBtu fuel that can be safely and easily transported to a central
19 plant for combustion. An update on the project can be found in
20 Jennings Confidential Exhibit No. 20. Note that there are no costs
21 related to this project included in the test period, but the Company
22 continues to support the project and has included projected costs in
23 the billing period.

1 **Q. ARE YOU SATISFIED THAT THE ACTUAL COSTS INCURRED**
2 **IN THE TEST PERIOD HAVE BEEN, AND THAT THE**
3 **PROJECTED COSTS OF THE BILLING PERIOD WILL BE,**
4 **PRUDENTLY INCURRED?**

5 A. Yes. Duke Energy Carolinas believes it has incurred and projects to incur
6 all of these costs associated with REPS compliance in a prudent manner.
7 The Company continues to exercise thorough and rigorous technical and
8 economic analysis to evaluate all options for compliance with its REPS
9 requirements. Duke Energy Carolinas has developed strong foundational
10 market knowledge related to renewable resources. The Company continues
11 to enhance and develop expertise in this field through the Company's
12 various solicitations for renewable energy and the operation of its
13 unsolicited bid process, its implementation of the Duke Energy North
14 Carolina Solar PV Distributed Generation Program, its construction of
15 DEC-owned utility-scale solar facilities, its participation in industry
16 research, and daily interaction with developers of renewable energy
17 facilities. As a result of these efforts, the Company has been able to identify,
18 procure, and develop a diverse portfolio of renewable resources to meet its
19 REPS requirements in a prudent, reasonable and cost-effective manner.

20 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

21 A. Yes.