

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-7, SUB 1246

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-2, Sub 1251 on
8 Duke Energy Progress' 2019 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, 2020 and ending on
16 December 31, 2020 ("Test Period"), as well as during the twelve months
17 beginning on September 1, 2021 and ending on August 31, 2022 ("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 2020 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 renewable
20 energy certificates (“RECs”) equivalent to the following percentages of its
21 North Carolina retail sales in 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 Commission^{3,4}, 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

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 not only modified the 2019 Swine Waste Set-Aside Requirement for electric public utilities but also delayed by one year the scheduled increases to the requirement to 0.07% in 2020. Similarly, the Commission also modified the 2019 Poultry Waste Set-Aside Requirement and delayed by one year the scheduled increases in the requirement to 700,000 MWh in 2020.

⁴ In its *Order Modifying the Swine Waste Set-Aside Requirements And Providing Other Relief* (December 30, 2020) in Docket No. E-100, Sub 113, the Commission modified the 2020 Swine Waste Set-Aside Requirement for electric membership corporations and municipalities, including those for which DEC performs REPS compliance services, to 0.00% and delayed by one year the scheduled increases to the requirement.

1 ▪ In 2025 and thereafter, its pro-rata share of two-tenths of one percent
2 (0.2%) of total retail electric power sold in North Carolina in the
3 year prior.

4 Finally, each electric power supplier is also to submit for retirement
5 a volume of qualifying poultry waste RECs equivalent to its pro-rata share
6 of the aggregate state-wide Poultry Waste Set-Aside requirement. Duke
7 Energy Carolinas' Poultry Waste Set-Aside Requirements, as modified by
8 the Commission³, are as follows:

- 9 ▪ Beginning in 2014, its pro-rata share of 170,000 megawatt-hours
10 ("MWh");
- 11 ▪ In 2018, its pro-rata share of 300,000 MWh;
- 12 ▪ In 2019, its pro-rata share of 500,000 MWh; and
- 13 ▪ In 2020, its pro-rata share of 700,000 MWh; and
- 14 ▪ In 2021 and thereafter, its pro-rata share of 900,000 MWh.

15 The requirements that are described in this testimony and
16 accompanying exhibits reflect the aggregation of the REPS requirements of
17 Duke Energy Carolinas' retail customers as well as those wholesale
18 customers, specifically Blue Ridge Electric Membership Corporation,
19 Rutherford Electric Membership Corporation, Town of Dallas, Town of
20 Forest City and Town of Highlands (collectively "Wholesale"), for which
21 the Company has been contracted to provide REPS compliance services.

22 **Q. PLEASE DISCUSS DUKE ENERGY CAROLINAS' REPS**
23 **REQUIREMENTS FOR THE TEST AND BILLING PERIODS.**

1 A. For the Test Period, the Company has submitted for retirement 6,112,439
2 RECs, which includes 6,981 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 6,126,401 RECs. Within this total, the Company has
5 submitted for retirement 122,532 RECs to meet the Solar Set-Aside
6 Requirement, 299,536 RECs, along with 6,981 SB 886 RECs (which count
7 as 13,962 Poultry Waste Set-Aside RECs), to meet the Poultry Waste Set-
8 Aside Requirement, and 41,050 RECs to meet the Swine Waste Set-Aside
9 Requirement. During the prospective Billing Period, which spans two
10 calendar years, with different requirements in each year, the Company’s
11 estimated requirements are as follows⁵:

12 In 2021, the Company estimates that it will be required to submit for
13 retirement 7,191,323 RECs to meet its Total Requirement. Within this total,
14 the Company is also required to retire the following: 116,073 solar RECs,
15 40,628 swine waste RECs and 403,068 poultry waste RECs.

16 In 2022, the Company estimates that it will be required to submit for
17 retirement 7,460,763 RECs to meet its Total Requirement. Within this total,
18 the Company estimates that it will be required to retire approximately
19 120,381 solar RECs, 84,267 swine waste RECs and 403,068 poultry waste
20 RECs.

21 **Q. HAS THE COMPANY COMPLIED WITH ITS GENERAL**
22 **REQUIREMENT FOR 2020?**

⁵ 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 2020 General Requirement of 5,649,321
2 RECs. Specifically, the RECs to be used for 2020 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 2021?**

10 A. Yes, the Company is in a position to comply with its General Requirement
11 in 2021.

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) solicited renewable energy proposals of various types; (3)
20 continued operations of its solar and hydroelectric facilities; (4) enhanced
21 and expanded energy efficiency programs that will generate savings that
22 can be counted towards the Company’s REPS requirement; (5) performed
23 research studies, both directly and through strategic partnerships, to

1 enhance the Company's ability to comply with its future REPS
2 requirements; and (6) executed contracts with projects selected in the
3 second Tranche of the Competitive Procurement of Renewable Energy
4 ("CPRE") Program of North Carolina House Bill 589 ("NC HB 589"), the
5 RECs from which will be used to meet the Company's future REPS
6 requirements.

7 **Q. IS THE COMPANY ABLE TO USE RECS GENERATED FROM**
8 **NET METERING FACILITIES TO SATISFY ITS FUTURE REPS**
9 **REQUIREMENTS?**

10 A. Yes. Under the current Net Metering for Renewable Energy Facilities Rider
11 offered by DEC (Rider NM), a customer receiving electric service under a
12 schedule other than a time-of-use schedule with demand rates ("NMNTD
13 customer") shall provide any RECs to DEC at no cost. Per the
14 Commission's June 5, 2018 *Order Approving Rider and Granting Waiver*
15 *Request* ("NMNTD Order") in Docket Nos. E-2, Sub 1106 and E-7, Sub
16 1113, for NMNTD customers, DEC may use the PVWatts™ Solar
17 Calculator developed by the National Renewable Energy Laboratory
18 ("NREL") for estimating the generation from NMNTD customers' solar
19 facilities, as permitted by Commission Rule R8-67(g)(2). Commission Rule
20 R8-67(g)(2) allows the use of a scalable conversion factor for estimating
21 annual generation from program participants. DEC shall then report the
22 total amount of electricity produced by facilities under the Rider directly
23 into NC-RETS in a separately identified generation project. DEC has

1 complied with these requirements and reported generation from NMNTD
2 customers to NC-RETS. The RECs from these facilities are currently in
3 DEC's REC inventory and available for use for future compliance
4 requirements.

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

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

16 **Q. HAS DEC PERFORMED THE SITE VISITS REQUIRED BY THE**
17 **NMNTD ORDER?**

18 A. Yes, DEC hired a third-party contractor, Pure Power Contractors, Inc., to
19 perform the required site visits. A total of eighty-four site visits took place
20 between September and November 2020, with inspections taking place in
21 Charlotte, Durham, Hickory and Salisbury. The inspection process
22 consisted of a visual inspection of the facility equipment, with the following
23 data points collected at each facility:

- 1 • Energy production readings were taken from the inverter displays or
2 monitoring equipment;
- 3 • Equipment make and model numbers;
- 4 • Weather conditions;
- 5 • Array tilt, azimuth and insolation readings; and
- 6 • Meter numbers.

7 **Q. THROUGH THESE SITE VISITS, WAS IT DETERMINED THAT**
8 **PRODUCTION FROM INSTALLED SYSTEMS MET**
9 **EXPECTATIONS?**

10 A. Yes, the site visits determined that production from installed systems has
11 met expectations. For the net metering facilities included in the sample, the
12 PVWatts™ Solar Calculator produced an average generation estimate of
13 8.52 MWh/yr. The historical production data collected from inverter
14 readings during the site visits demonstrated an average production for the
15 sample group of 7.55 MWh/yr. This resulted in an overall average
16 realization rate of 95%, which is calculated by dividing the verified annual
17 production by the expected annual production for each customer and taking
18 the sample average. These findings indicate that the PVWatts™ production
19 estimate methodology remains accurate for predicting future MWh/yr. for
20 program participants.

21 Since the results of the site visits in 2019 (96%) and 2020 (95%)
22 indicate that the production from installed systems met, and continues to
23 meet, expectations, the Company believes the PVWatts™ production

1 estimate methodology remains accurate for predicting future production.
2 Therefore, the Company recommends no changes to the production
3 estimates and that no further site visits are necessary.

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 developed or acquired by the Companies, or the renewable energy
20 procured from a third party through a power purchase agreement under the
21 CPRE Program, must also deliver to the Companies the environmental and
22 renewable attributes, or RECs, associated with the power. The first tranche
23 of CPRE solicitations selected 10 projects for a total of 435 MW in the DEC

1 service territory, and the second tranche selected 10 projects for a total of
2 589 MW in the DEC service territory. In December 2020, two DEC-owned
3 projects from the first tranche started generating power and RECs, and it's
4 estimated that all of the remaining projects from the first tranche, and one
5 project from the second tranche, will be operational by the end of the Billing
6 Period. The NC retail allocated portion of the actual and estimated REC
7 production from these projects during the test and billing periods,
8 respectively can be found in Jennings Exhibit 2. DEC plans to use the RECs
9 acquired through the CPRE RFP solicitations for its future REPS
10 compliance requirements and has therefore included the planned MW
11 allocation and timeline in its REPS compliance planning process.
12 Additional details regarding DEC's CPRE compliance activities for the
13 current Test Period are being filed concurrently with this REPS filing and
14 may be reviewed in Docket No. E-7, Sub 1247.

15 **Q. HAS THE COMPANY COMPLIED WITH ITS SOLAR SET-ASIDE**
16 **REQUIREMENT FOR 2020?**

17 A. Yes. The Company has met the 2020 Solar Set-Aside Requirement of
18 122,532 solar RECs. Pursuant to the NC-RETS Operating Procedures, the
19 Company has submitted for retirement 122,532 solar RECs. Specifically,
20 the RECs to be used for 2020 compliance have been transferred from the
21 NC-RETS Duke Energy Electric Power Supplier account to the Duke
22 Energy Compliance Sub-Account and the Sub-Accounts of its Wholesale

1 customers. Upon completion of this regulatory proceeding, the Commission
2 will finalize retirement of the RECs.

3 **Q. WILL THE COMPANY COMPLY WITH ITS SOLAR SET-ASIDE**
4 **REQUIREMENT IN 2021?**

5 A. Yes, the Company is well-positioned to comply with its Solar Set-Aside
6 Requirement in 2021.

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

9 A. The Company is well-positioned to comply with its Solar Set-Aside
10 Requirement in 2021 through a diverse and balanced portfolio of solar
11 resources. The Company's efforts to comply with the Solar Set-Aside
12 Requirement include REC generation and procurement from solar
13 renewable energy facilities.

14 The Company previously constructed three DEC-owned solar
15 photovoltaic ("PV") facilities, which will generate an estimated 140,000
16 RECs per year over the life of the projects. These facilities include the
17 Monroe Solar Facility, 55 MW located in Union County, the Mocksville
18 Solar Facility, 15 MW located in Davie County, and the Woodleaf Solar
19 Facility, 6 MW located in Rowan County. In 2020, the Company
20 constructed two new DEC-owned solar PV facilities as part of the first
21 tranche of CPRE: the Gaston Solar facility, 25 MW located in Gaston
22 County, declared commercial operation on December 22, 2020, and the

1 Maiden Creek Solar facility, 69 MW located in Catawba County, declared
2 commercial operation on January 12, 2021.

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

5 A. The Company's approximately 8.8 MW-DC of solar PV generation
6 facilities were operational and generating power for the benefit of its
7 customers during the test period. In 2020, the Company updated the
8 monitoring hardware at its nonresidential sites. The Marshall site was taken
9 offline in March 2020, and the solar facility was fully decommissioned in
10 July 2020 due to work that is required for the coal ash storage site where
11 the solar facility was located. Also in 2020, contracts for six of the seven
12 residential sites were renewed until 2025. One customer opted not to renew
13 and requested that the equipment be removed because they were re-roofing
14 and selling the home. In 2021, the Company plans to improve the data
15 monitoring equipment at its nonresidential sites. The suite of sites are at the
16 10-year mark which portends the inverter end of life, so the Company will
17 begin a process of inverter upgrade or replacement to keep the system
18 running in a cost effective, efficient manner.

19 **Q. HAS THE COMPANY COMPLIED WITH ITS POULTRY WASTE**
20 **SET-ASIDE REQUIREMENT FOR 2020?**

21 A. Yes. The Company has met the 2020 Poultry Waste Set-Aside
22 Requirement of 313,498 RECs. Pursuant to NC-RETS Operating
23 Procedures, the Company has submitted for retirement 299,536 poultry

1 RECs and 6,981 SB 886 RECs (which count as 13,962 Poultry Waste Set-
2 Aside RECs). Accordingly, the Company has submitted the equivalent of
3 313,498 poultry RECs for compliance. Specifically, the RECs to be used
4 for 2020 compliance have been transferred from the NC-RETS Duke
5 Energy Electric Power Supplier account to the Duke Energy Compliance
6 Sub-Account and the Sub-Accounts of its Wholesale customers. Upon
7 completion of this regulatory proceeding, the Commission will finalize
8 retirement of the RECs.

9 **Q. WILL THE COMPANY COMPLY WITH ITS POULTRY WASTE**
10 **SET-ASIDE REQUIREMENT IN 2021?**

11 A. The Company's ability to comply with its Poultry Waste Set-Aside
12 Requirement in 2021 is dependent on the performance of current poultry
13 waste-to-energy contracts and the ability of one new poultry waste-to-
14 energy facility to reach its expected Commercial Operation Date in 2021.
15 To help meet future requirements of the poultry waste set-aside, several
16 facilities are expected to ramp up production throughout 2021-2022, with
17 two new facilities expected to come online in 2022. On the other hand, one
18 of the facilities that has previously been generating poultry RECs for DEC
19 will be taken offline for repairs and is not expected to be generating RECs
20 again until 2023.

21 **Q. WHAT ACTIONS HAS THE COMPANY TAKEN DURING THE**
22 **TEST PERIOD TO PROCURE OR DEVELOP POULTRY WASTE-**

1 **TO-ENERGY RESOURCES TO SATISFY ITS POULTRY WASTE**
2 **SET-ASIDE REQUIREMENTS?**

3 A. In the Test Period, the Company (1) continued direct negotiations for
4 additional supplies of both in-state and out-of-state resources with multiple
5 counterparties; (2) secured contracts for additional poultry waste-to-energy
6 resources; (3) worked diligently to understand the technological, permitting,
7 and operational risks associated with various methods of producing
8 qualifying poultry RECs to aid developers in overcoming those risks; when
9 those risks could not be overcome, the Company worked with developers
10 via contract amendments to adjust for more realistic outcomes; (4) explored
11 leveraging current bioenergy contracts by working with developers to add
12 poultry waste to their fuel mix; (5) explored adding thermal capabilities to
13 current poultry sites to bolster REC production; (6) explored poultry-
14 derived directed biogas at facilities located in North Carolina and directing
15 such biogas to combined cycle plants for combustion and electric
16 generation; (7) utilized the Company's REC trader to search the broker
17 market for out-of-state poultry RECs available in the market; and (8) funded
18 a North Carolina biogas utilization study through RTI International with
19 hopes for future growth of poultry-derived directed biogas project
20 development. Additional information on the Company's compliance with
21 the Poultry Waste Set-Aside requirement can be found in the Company's
22 Joint Semiannual Progress Report, filed on December 1, 2020 in Docket
23 No. E-100, Sub 113A.

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

4 **Q. HAS THE COMPANY COMPLIED WITH ITS SWINE WASTE**
5 **SET-ASIDE REQUIREMENT FOR 2020?**

6 A. Yes. The Company has met the 2020 Swine Waste Set-Aside Requirement
7 of 41,050 swine RECs. Pursuant to the NC-RETS Operating Procedures,
8 the Company has submitted for retirement 41,050 swine RECs.
9 Specifically, the RECs to be used for 2020 compliance have been
10 transferred from the NC-RETS Duke Energy Electric Power Supplier
11 account to the Duke Energy Compliance Sub-Account. Upon completion of
12 this regulatory proceeding, the Commission will finalize retirement of the
13 RECs.

14 **Q. WILL THE COMPANY COMPLY WITH ITS SWINE WASTE SET-**
15 **ASIDE REQUIREMENT IN 2021?**

16 A. The Company's ability to comply with its Swine Waste Set-Aside
17 Requirement in 2021 is dependent on the performance of swine waste-to-
18 energy developers on current contracts, particularly achievement of
19 projected delivery requirements.

20 Unfortunately, issues beyond the control of DEC that have
21 prevented compliance in the past, such as the inability to secure firm and
22 reliable sources of swine waste feedstock, project financing,
23 interconnection challenges, force majeure due to natural disasters and

1 technological challenges encountered when ramping up production, persist.
2 Additionally, the outbreak of the COVID-19 pandemic has adversely
3 impacted swine and poultry farms and processing plants in North Carolina
4 through staff shortages, personal protective equipment (“PPE”) supply
5 issues, and delivery challenges. Although industry representatives and state
6 and federal authorities are working to ensure continuity of operations,
7 uncertainty remains about the magnitude of the pandemic’s impact in North
8 Carolina and its corresponding effect on poultry and swine waste-to-energy
9 production.

10 Separately, DEC’s ability to offer longer-term fixed-price contracts
11 was previously an advantage over the California renewable natural gas
12 (“RNG”) market. However, financiers have now developed structures that
13 allow manure-based RNG projects with low carbon intensity scores to
14 obtain premium pricing for up to 10 years, which is leading to increased
15 cost of swine-derived RNG for DEC. Further, the North Carolina
16 Department of Environmental Quality’s Division of Water Resources has
17 recently decided that additional oversight is needed for expanding
18 renewable natural gas in our state and requires that all animal operations
19 choosing to participate in a RNG project first acquire a new Animal Feeding
20 Operations Permits. In addition to these challenges, activist groups continue
21 to publish misinformation related to swine waste biogas projects, leading to
22 increased pushback from surrounding communities related to fears
23 regarding the safety of surrounding air, soil and groundwater.

1 **Q. WHAT ACTIONS HAS DUKE ENERGY CAROLINAS TAKEN**
2 **DURING THE TEST PERIOD TO PROCURE OR DEVELOP**
3 **SWINE WASTE-TO-ENERGY RESOURCES TO MEET ITS SWINE**
4 **WASTE SET-ASIDE REQUIREMENTS?**

5 A. In the Test Period, the Company (1) continued direct negotiations for
6 additional supplies of both in-state and out-of-state resources; (2) continued
7 pursuit of swine-derived directed biogas from North Carolina facilities,
8 working with Piedmont Natural Gas Company, Inc. to locate favorable
9 biogas injection sites and continuing discussions with Align Renewable
10 Natural Gas who has announced that they will deploy millions of dollars in
11 North Carolina, covering swine lagoons and cleaning up the related RNG;
12 (3) worked diligently to understand the technological, permitting, and
13 operational risks associated with various methods of producing qualifying
14 swine RECs to aid developers in overcoming those risks; when those risks
15 could not be overcome, the Company worked with developers via contract
16 amendments to adjust for outcomes that the developers believe are
17 achievable based on new experience; (4) explored and is engaging in
18 modification of current bioenergy and set-asides contracts by working with
19 developers to add swine waste to their fuel mix; (5) utilized the Company's
20 REC trader to search the broker market for out-of-state swine RECs
21 available in the market; (6) continued support of research through North
22 Carolina State University associated with on-farm swine waste drying
23 technology and mortality combustion possibilities as well as funding a

1 North Carolina biogas utilization study through RTI International with
2 hopes for future growth of swine-derived directed biogas project
3 development; and (7) engaged the North Carolina Pork Council (“NCPC”)
4 in a project evaluation collaboration effort that will allow the Company and
5 the NCPC to discuss project viability, as appropriate, with respect to the
6 Company’s obligations to keep certain sensitive commercial information
7 confidential. Additional information on the Company’s compliance with the
8 Swine Waste Set-Aside requirement can be found in the Company’s Joint
9 Semiannual Progress Report, filed on December 1, 2020 in Docket No. E-
10 100, Sub 113A.

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

14 **Q. IS DUKE ENERGY CAROLINAS CONTINUING TO EXECUTE**
15 **ADDITIONAL REC PURCHASE AGREEMENTS?**

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

19 **Q. DID THE COMPANY SELL ANY RECS DURING THE TEST**
20 **PERIOD?**

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

1 **Q. DOES THE COMPANY HAVE IN ITS INVENTORY ANY RECS**
2 **THAT IT CANNOT USE FOR ITS OWN REPS COMPLIANCE**
3 **REQUIREMENTS?**

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

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

11 A. Under G.S. § 62-133.8(b)(2), an electric public utility, such as DEC, may
12 meet its REPS compliance requirement through several methods, including
13 by “generat[ing] electric power at a new renewable energy facility.” The
14 Commission accepted the registration of these DEC-owned hydroelectric
15 facilities as renewable energy facilities, but not as *new* renewable energy
16 facilities, in its July 31, 2009 *Order Accepting Registration of Renewable*
17 *Energy Facilities* in Docket Nos. E-7, Subs 886, 887, 888, 900, 903 and 904
18 (“*June 31, 2009 Registration Order*”) and its December 9, 2010 *Order*
19 *Accepting Registration of Renewable Energy Facilities* in Docket Nos. E-7,
20 Subs 942, 943, 945 and 946 (collectively, “*Registration Orders*”). In the
21 *Registration Orders*, the Commission specifically cited its June 17, 2009
22 *Order on Public Staff’s Motion for Clarification* in Docket No. E-100, Sub
23 113, where it concluded that these utility-owned hydroelectric facilities do

1 not meet the delivery requirement of G.S. § 62-133.8(a)(5)(c), which
2 requires the delivery of electric power to an electric power supplier, such as
3 DEC, by an entity other than the electric power supplier to qualify as a *new*
4 renewable energy facility.

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

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

1 Commission supported the Company's proposed REC transfers with
2 NCEMC, and the Commission concluded that the proposed transfer was
3 reasonable and served the public interest in its *Order Approving REPS and*
4 *REPS EMF Riders and 2017 REPS Compliance Report*, issued on August
5 17, 2018 in Docket No. E-7, Sub 1162.

6 **Q. HAS THE COMPANY EXCHANGED ANY OF THESE**
7 **HYDROELECTRIC RECS WITH NCEMC?**

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

12 **Cost of REPS Compliance**

13 **Q. WHAT ARE THE COMPANY'S COSTS ASSOCIATED WITH REPS**
14 **COMPLIANCE DURING THIS TEST PERIOD AND THE**
15 **UPCOMING BILLING PERIOD?**

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

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

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

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

6 **Q. PLEASE EXPLAIN THE OTHER INCREMENTAL COSTS**
7 **INCLUDED FOR RECOVERY IN THIS PROCEEDING.**

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

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

18 A. As required by G.S. § 62-155(f), DEC developed a Solar Rebate Program
19 offering reasonable incentives to residential and nonresidential customers
20 for the installation of small customer owned or leased solar energy facilities
21 participating in the Company’s net metering tariff. The incentive is limited
22 to 10 kilowatts alternating current (“kW-AC”) for residential solar
23 installations and 100 kW-AC for nonresidential solar installations. The

1 program incentive shall be limited to 10,000 kW of installed capacity
2 annually starting January 1, 2018 and continuing until December 31, 2022.

3 Consistent with the Commission's April 3, 2018 order and
4 subsequent orders in Docket Nos. E-7, Sub 1166 and E-2, Sub 1167, the
5 Solar Rebate Program launched on July 9, 2018. In every year since its
6 launch, the Solar Rebate Program's annual participation limits for the
7 residential and nonresidential classes have been met, although the two
8 thousand five hundred kW of capacity limit for nonprofit organizations has
9 not been met. On April 1, 2020, DEC filed its Solar Rebate Program Annual
10 Report for 2019, which included: (i) information on problems encountered
11 with the 2020 solar rebate application process due to a website malfunction,
12 (ii) the Company's commitment to technological fixes, and (iii) proposed
13 changes to the program to avoid a recurrence of the problems in future
14 years, including a request to amend the program application windows for
15 2021 and 2022. The NCUC subsequently issued an *Order Allowing*
16 *Comments on 2019 Annual Report*, through which parties could propose
17 their own changes to the program for the Commission's consideration.
18 Multiple parties filed comments and reply comments, which were followed
19 by a November 6, 2020 *Order Modifying Fourth Year of Solar Rebate*
20 *Program and Requesting Additional Comments* ("November 2020 Order").
21 Included in the November 2020 Order, the Commission approved Duke
22 Energy's recommendation that half of the available annual capacity each
23 year be offered in January and half in July. Thus, the first window of the

1 2021 program opened on January 6 with incentive amounts remaining at the
2 2020 levels of \$0.60 per watt for residential customer installations, \$0.50 per
3 watt for commercial customer installations, and \$0.75 per watt for nonprofit
4 customers. On January 8, 2021, DEC filed a notice that the participation
5 limit for the first window of 2021 for residential and nonresidential
6 customers under the Solar Rebate Program, exclusive of the non-profit
7 participation set-aside, was reached quickly.

8 Also in its November 2020 Order, the Commission solicited
9 comments recommending revised rebate amounts for residential,
10 commercial, and nonprofit customers for consideration to be effective for
11 the application window opening on July 7, 2021, with particular interest in
12 the viability of a tiered system aimed at incentivizing smaller solar installations
13 with a declining incentive structure up to 10 kW for residential customer
14 installations and 100 kW for nonresidential customer installations. Parties filed
15 comments in December 2020 with their recommendations, in which Duke
16 Energy proposed that a preferable approach would be to decrease the
17 residential rebate to \$0.40 per watt and reduce the commercial rebate to
18 \$0.30 per watt, keeping the non-profit rebate at \$0.75, in coordination with
19 the elimination of a tiered incentive structure. However, if the Commission
20 determined that a tiered rebate was necessary, the Companies recommended
21 \$0.50/watt for the first 5kW of a residential system and \$0.40/watt for
22 additional capacity to the 10kW limit. After reviewing all of the parties'
23 comments, on December 30, 2020, the NCUC issued an *Order Requiring*
24 *Additional Information*, in which it required Duke Energy to respond to five

1 questions, including information related to the January 2021 launch. Duke
2 Energy filed its response to the NCUC's questions on January 25, 2021 and
3 is awaiting a final Order on the rebate amounts for the July 2021 launch.

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

6 A. Yes. Pursuant to G.S. § 62-155(f), each public utility required to offer a
7 solar rebate program “shall be authorized to recover all reasonable and
8 prudent costs of incentives provided to customers and program
9 administrative costs by amortizing the total program incentives distributed
10 during a calendar year and administrative costs over a 20-year period,
11 including a return component adjusted for income taxes at the utility's
12 overall weighted average cost of capital established in its most recent
13 general rate case, which shall be included in the costs recoverable by the
14 public utility pursuant to G.S. 62-133.8(h).” G.S. § 62-133.8(h) provides for
15 an electric power supplier's cost recovery and customer charges under the
16 REPS statute; NC HB 589 amended it by adding a provision to allow for
17 the recovery of incremental costs incurred to “provide incentives to
18 customers, including program costs, incurred pursuant to G.S. § 62-155(f).”
19 Therefore, DEC has included for recovery in this filing costs incurred
20 during the EMF period, and projected to be incurred in the Billing Period,
21 related to the implementation of the NC HB 589 Solar Rebate Program. As
22 detailed on Jennings Confidential Exhibit No. 3, these costs include the
23 annual amortization of incentives paid to customers and program

1 administration costs, which includes labor, information technology and
2 marketing costs. Projected incentive costs for the Billing Period are based
3 on the currently-approved rebate amounts.

4 For a residential customer who obtains a rebate reservation in
5 January through June, the installation must be completed no later than
6 December 31 in the year in which the reservation was obtained. For a
7 residential customer who obtains a rebate reservation in July through
8 December, the installation must be completed no later than June 30 of the
9 following year. For a nonresidential customer, with a project size under 20
10 kW-AC, who obtains a rebate reservation prior to installation, the
11 installation must be completed no later than 365 days from the date the
12 rebate reservation was obtained. For a nonresidential customer, with a
13 project size over 20 kW-AC, who obtains a rebate reservation prior to
14 installation, the installation must be completed no later than 365 days from
15 the date of an executed interconnection agreement. Therefore, rebate
16 payments for a specific program year may continue into the next year, with
17 payments likely continuing after the final program year.

18 **Q. PLEASE PROVIDE DETAIL ON THE INTERNAL LABOR COSTS**
19 **THAT ARE ASSOCIATED WITH REPS COMPLIANCE AND NC**
20 **HB 589 SOLAR REBATE PROGRAM ACTIVITIES THAT ARE**
21 **INCLUDED IN DEC'S CURRENT APPLICATION FOR REPS**
22 **COST RECOVERY.**

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

8 **Q. HOW DO EMPLOYEES CHARGE THEIR REPS-RELATED AND**
9 **NC HB 589 SOLAR REBATE PROGRAM-RELATED LABOR**
10 **COSTS TO REPS?**

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

17 To educate employees to account for their time properly, DEC
18 annually provides instructions for charging time to REPS to affected
19 employees and the management of the employee groups performing REPS
20 work. Additionally, every year prior to filing for approval of the DEC REPS
21 Compliance Report and Cost-Recovery Rider, the labor hours charged are
22 carefully reviewed and confirmed.

23 **Research Costs**

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

6 **Q. THE COMMISSION’S ORDER APPROVING REPS AND REPS EMF**
7 **RIDERS AND 2012 REPS COMPLIANCE REQUIRES DUKE**
8 **ENERGY CAROLINAS TO FILE WITH ITS 2020 REPS RIDER**
9 **APPLICATION STUDY RESULTS FOR ANY STUDIES THE**
10 **COSTS OF WHICH IT HAS RECOVERED VIA THE REPS RIDER.**
11 **IS THE COMPANY SUPPLYING SUCH STUDIES IN THIS**
12 **FILING?**

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

17 • Astrape – Battery Storage Effective Load Carrying Capability
18 (“ELCC”) Study – In 2020, the Company contracted with Astrape
19 Consulting to analyze the capacity value of battery technology
20 within the Company’s system. The study results provide the
21 capacity value for battery energy storage systems used in the
22 Company’s Integrated Resource Plans. The results of this project
23 can be found in Jennings Exhibit No. 4.

- 1 • Center for Advanced Power Engineering Research (“CAPER”) –
2 Combined T&D System Model Study – In 2020, the Company
3 worked with North Carolina State University (“NCSU” or “NC
4 State University”) and the University of North Carolina Charlotte
5 (“UNCC”) through CAPER, to develop a combined system model
6 and simulation process for integrated planning and operations across
7 transmission and distribution systems. The progress report for this
8 project can be found in Jennings Confidential Exhibit No. 5.
- 9 • Coalition for Renewable Natural Gas – The Company renewed its
10 membership to the Coalition for Renewable Natural Gas in 2020, to
11 add a valuable resource of knowledge and public policy advocacy
12 in this growing sector of potential animal waste supply. The
13 Coalition for Renewable Natural Gas provides its members with
14 exclusive whitepapers, support on model pipeline gas specifications
15 and access to other members for discussions on current and future
16 projects.
- 17 • Distributed Generation (“DG”) Cost of Service Study – In 2020, the
18 Company teamed up with NC State University and Advanced
19 Energy to perform a study to determine the cost-of-service impacts
20 of DG. This study focuses on the Operations and Maintenance and
21 planning costs the utility incurs due to the DG impact on the system,
22 and develops a methodology for their quantification. The progress

- 1 report for this project can be found in Jennings Confidential Exhibit
2 Nos. 6-7.
- 3 • Eos Energy Storage Technology Development – The Company and
4 Eos Services started a collaborative technology development
5 program to validate, demonstrate, and quantify the benefits of an
6 Eos Aurora Battery System that is DC coupled to a PV facility at the
7 McAlpine Creek Substation 50 kW Solar Facility. The installation
8 of the Eos Aurora Battery System was completed in 2019, and
9 operational tests continued in 2020. The progress report of this
10 project can be found in Jennings Confidential Exhibit No. 8.
 - 11 • Electric Power Research Institute (“EPRI”) – In 2020, the Company
12 subscribed to the following EPRI programs, the costs of which were
13 recovered via the REPS rider: Program 174 – Integration of
14 Distributed Energy Resources (“DER”), and Program 94 – Energy
15 Storage and Distributed Generation. The Company completed a
16 supplemental project under Program 174 – “DER Interconnection
17 Standards & Practices.” The company also started two new
18 supplemental projects under Program 174 – “Field Validation Tool
19 for Smart Inverter Configuration and Settings” and “Model-Based
20 Analysis of DER Functions and Settings.” EPRI designates such
21 study results as proprietary or as trade secrets and licenses such
22 results to EPRI members, including Duke Energy Carolinas. As
23 such, the Company may not disclose the information publicly. Non-

1 members may access these studies for a fee. Information regarding
2 access to this information can be found at
3 <http://www.epri.com/Pages/Default.aspx>.

- 4 • Electric Power Research Institute (“EPRI”) – Inverter Reactive
5 Power and Voltage Control Effectiveness and Application Study –
6 In 2020, the Company contracted with EPRI to continue the
7 evaluation of the software-based controls of advanced inverters
8 according to the IEEE 1547-2018 standard. This study plans to
9 evaluate the impact of multiple DER power factor capabilities, use
10 of feeder head capacitor compensation for DER reactive power
11 absorption, benefits and application of voltage dependent and
12 voltage independent control methods, and the effectiveness of local
13 controls on other power system voltage regulation devices on the
14 feeder with the inverter reactive controls. The study started in Q4
15 2020 and is currently in progress. The description and update of this
16 study can be found in Jennings Exhibit No. 9.
- 17 • Emerging Technology Office (“ETO”) – Control Hardware-in-the
18 Loop (CHIL) Circuit and DER Simulation – In 2020, the Company
19 contracted with Open Energy Solutions (“OES”) to research the
20 potential benefits and impacts of DER and microgrids utilizing a
21 CHIL simulation model that utilities can use to test and simulate
22 different solution and distribution grid configurations prior to actual
23 installation on its distribution circuit. The study outlines a process

1 using CHIL to evaluate protection and coordination risk associated
2 with high penetration DER. The results of this project can be found
3 in Jennings Confidential Exhibit Nos. 10-11.

4 • Institute for Electrical and Electronics Engineers (“IEEE”) 1547
5 Conformity Assessment Education and Credentialing Program
6 Development – The company has previously sponsored two IEEE
7 1547 Conformity Assessment pilot projects in 2018 and 2019. In
8 2020, the Company joined teams with IEEE Standard Association
9 and other four utilities to create a credentialing program that will
10 train and certify individuals who can verify any installed DER
11 Interconnection for its compliance with the IEEE 1547-2018
12 standard and local jurisdictional requirements. This project will
13 continue in 2021. The 2020 deliverable of this project can be found
14 in Jennings Confidential Exhibit No. 12.

15 • Loyd Ray Farms – The Company partnered with Duke University
16 to develop a pilot-scale, sixty-five kW swine waste-to-energy
17 facility, which initiated operation and began producing renewable
18 energy in 2011. Jennings Exhibit No. 13 summarizes the project’s
19 progress in 2020.

20 • Navigant – Impact of Enabling Inverter Based Resource Reactive
21 Power Controls – In 2020, the Company completed a project with
22 Navigant Consulting to evaluate the software-based controls of
23 advanced inverters according to the IEEE 1547-2018 standard. This

1 study evaluates voltage-reactive power and voltage-active power
2 control functions for feeders in the Company's system. It was part
3 of the collaborative stakeholder process for analyzing smart inverter
4 control functionalities consistent with IEEE 1547-2018. The results
5 of this study can be found in Jennings Exhibit No. 14.

6 • NC State University – Adopting DVAR to Mitigate PV Impacts on
7 a Distribution System – In 2020, the Company continued the project
8 with NCSU to assess the effectiveness of the American
9 Superconductor Corp. Dynamic Volt-Amp Reactive Compensation
10 Solution (“mini-DVAR”) in mitigating various power quality issues
11 on distribution circuits due to increasing penetration of PV. The
12 scope of the project in 2020 focused on the optimal placement of
13 mini-DVAR and its optimal volt-var control. The project is expected
14 to continue in 2021 to further optimize the control settings. The
15 report of mini-DVAR optimal placement can be found in Jennings
16 Confidential Exhibit No. 15.

17 • NC State University's Future Renewable Electric Energy Delivery
18 and Management (“FREEDM”) Systems Center – Duke Energy
19 supports NC State University's FREEDM Center through annual
20 membership dues. The FREEDM partnership provides Duke Energy
21 with the ability to influence and focus research on materials,
22 technology, and products that will enable the utility industry to

- 1 transform the electric grid into a two-way power flow system
2 supporting distributed generation.
- 3 • NCSU – Swine Extrusion/Poultry Mortality – The Animal and
4 Poultry Waste Management Center (“APWMC”) at NC State
5 University – In 2020, the Company continued support of the
6 various projects being undertaken by the APWMC. This work is
7 centered around drying swine lagoon solids, bagged lagoon sludge
8 and lagoon sludge mixed with agricultural wastes at a farm-based
9 level to create a higher MMBtu fuel that can be safely and easily
10 transported to a central plant for combustion. An update on the
11 project can be found in Jennings Confidential Exhibit No. 16.
 - 12 • NREL – Carbon-Free Resource Integration Study – In 2020, the
13 Company continued the project with NREL to conduct a study of
14 the Carolinas’ system to help us understand the operational impacts,
15 benefits and limitations of solar. The study will also inform other
16 fleet transformation analyses, including how different clean energy
17 technologies can contribute to a carbon-free future. The study will
18 be conducted in two phases. Phase 1 was completed in 2019, and the
19 Phase 1 report can be found in Jennings Exhibit No. 17. Phase 2
20 continued in 2020 and will be completed in 2021. The interim Phase
21 2 report can be found in Jennings Exhibit No. 18.
 - 22 • PNNL – Dynamic Var Compensator (“DVC”) Pilot – Starting in
23 2018, the Company worked with One-Cycle Control, Inc. and

1 Pacific Northwest National Laboratory (“PNNL”) on a project,
2 which is part of DOE SunlAmp Contract: 0000-1714, to install and
3 commission two DVC devices in the Company’s distribution
4 system, and to evaluate its performance in mitigating the voltage
5 variability due to high penetration of distributed photovoltaic on a
6 distribution feeder. The project concluded in 2019. The cost of the
7 decommissioning of the devices incurred in 2020.

8 • Research Triangle Institute – Biogas Utilization in North Carolina –
9 In 2020, the Company continued support of the Research Triangle
10 Institute project for the NC Energy Policy Council to determine the
11 potential bioenergy/biogas resources available in NC, and to
12 identify the most beneficial and optimum utilization of resources to
13 maximize economic, environmental and societal advantages. An
14 overview of the project can be found in Jennings Confidential
15 Exhibit No. 19.

16 • Smart Electric Power Alliance (“SEPA”) – The company renewed
17 its membership to the Smart Electric Power Alliance in 2020. SEPA
18 provides its members with exclusive whitepapers and working
19 group event opportunities on various topics including DER
20 integration, DER management systems, energy efficiency and
21 demand response, electric vehicle development, microgrid and grid
22 resiliency. Please visit SEPA’s website at <https://sepapower.org/> for
23 more information on SEPA.

- 1 • Southeast Wind Coalition (“SEWC”) – The Company renewed its
2 membership in the Southeast Wind Coalition in 2020. SEWC
3 conducts research on land-based wind, offshore wind, and energy
4 storage, which informs the Company of potential renewable
5 generation opportunities that may enable the Company to comply
6 with REPS in a cost-effective manner. In addition, SEWC’s work is
7 to advance wind policies across the southeast by holding
8 conferences, addressing prohibitive state policies related to wind
9 deployment, and ensuring workforce development and educational
10 outreach. Please visit SEWC’s website at <https://www.sewind.org/>
11 for more information on SEWC.
- 12 • University of North Carolina Charlotte (“UNCC”) – Energy Storage
13 Integration Study – In 2020, the Company contracted with UNCC
14 to study the Grid Ancillary Uninterruptible Power Supplies
15 (“GAUPS”) and its utilization for modern sensitive and non-
16 sensitive critical loads alongside providing grid ancillary services.
17 The study results encapsulate the design and prototyping of the
18 GAUPS. The project was previously reported as “Marshall Solar
19 Site Algorithm - Phase V.” However, the scope of research has been
20 shifted from solar and energy storage control algorithm to energy
21 storage integration and application. Hence, the Company and UNCC
22 updated the project name to better reflect the study scope. The
23 Company is continuing to support the next phase of this project in

1 2021. The results of this project can be found in Jennings
2 Confidential Exhibit No. 20.

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

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

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

23 A. Yes.