



Brian L. Franklin
Associate General Counsel

Duke Energy
550 South Tryon Street
Charlotte, NC 28202

Mailing Address:
DEC45A / P.O. Box 1321
Charlotte, NC 28201

o: 980.373.4465
f: 980.373.8534

brian.franklin@duke-energy.com

March 9, 2016

**VIA ELECTRONIC FILING AND
OVERNIGHT DELIVERY**

Ms. Gail Mount, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

**RE: Duke Energy Carolinas, LLC's Application for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider
Docket No. E-7, Sub 1105**

Dear Ms. Mount:

I enclose Duke Energy Carolinas, LLC's Application for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider, together with Direct Testimonies and Exhibits of Robert P. Evans and Carolyn T. Miller, for filing in connection with the referenced matter. I will deliver fifteen (15) paper copies and a flash drive containing the accompanying work papers to the Clerk's Office by close of business on March 10, 2016, via overnight delivery.

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

Respectfully submitted,

Brian L. Franklin

Enclosures

cc: Parties of Record

OFFICIAL COPY

Mar 09 2016

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-7, SUB 1105

In the Matter of)	
Application of Duke Energy Carolinas, LLC)	APPLICATION OF
for Approval of Demand-Side Management)	DUKE ENERGY CAROLINAS,
and Energy Efficiency Cost Recovery Rider)	LLC FOR APPROVAL OF
Pursuant to N.C. Gen. Stat. § 62-133.9 and)	RIDER 8
Commission Rule R8-69)	

Duke Energy Carolinas, LLC (“DEC,” “Company,” or “Applicant”), pursuant to North Carolina General Statutes (“N.C. Gen. Stat.”) § 62-133.9 and North Carolina Utilities Commission (the “Commission”) Rule R8-69, hereby applies to the Commission for approval of its demand-side management (“DSM”) and energy efficiency (“EE”) (collectively, “DSM/EE”) cost recovery rider, Rider EE, for 2017 (“Rider 8”). Rider 8 encompasses components relating to both DEC’s save-a-watt pilot approved in Docket No. E-7, Sub 831, as well as the new cost recovery mechanism and portfolio of programs approved by the Commission in Docket No. E-7, Sub 1032. The prospective components of Rider 8 under the new mechanism include estimates of the revenue requirements for Vintage 2017¹ DSM/EE programs, as well as an estimate of the second year of net lost revenues for Vintage 2016 EE programs, the third year of net lost revenues for Vintage 2015 EE programs, and the final half-year of net lost revenues for Vintage 2014 EE programs. The Rider 8 Experience Modification Factor (“EMF”) includes the following true-ups: a true-up

¹ A vintage year is the twelve-month period in which a specific DSM or EE measure is installed for an individual participant or a group of participants. The vintage concept is employed under save-a-watt as well as the new mechanism. To distinguish from the four save-a-watt vintages (which are numbered 1, 2, 3, and 4), each vintage under the new mechanism is referred to by the calendar year of its respective rate period (*e.g.*, Vintage 2017).

of Vintage 2014 DSM/EE programs and a true-up of Vintage 2015 DSM/EE programs under the new mechanism; and the final true-up of the save-a-watt pilot resulting from adjustments to impacts from the Smart Energy Now pilot agreed upon by the Company and the Public Staff.

In support of this Application, DEC respectfully shows the Commission the following:

1. The Applicant's general offices are located at 550 South Tryon Street, Charlotte, North Carolina, and its mailing address is:

Duke Energy Carolinas, LLC
P. O. Box 1006
Charlotte, North Carolina 28201-1006

2. The names and addresses of Applicant's attorneys are:

Brian L. Franklin, Associate General Counsel
Duke Energy Carolinas, LLC
DEC45A/P.O. Box 1321
550 South Tryon Street
Charlotte, North Carolina 28201
(980) 373-4465
Brian.Franklin@duke-energy.com

Molly McIntosh Jagannathan
Troutman Sanders LLP
One Wells Fargo, Suite 3400
301 South College Street
Charlotte, North Carolina 28202
(704) 998-4074
Molly.Jagannathan@troutmansanders.com

3. N.C. Gen. Stat. § 62-133.9(d) authorizes the Commission to approve an annual rider to the rates of electric public utilities to recover all reasonable and prudent costs incurred for the adoption and implementation of new DSM/EE programs. Recoverable costs include, but are not limited to, all capital costs,

including cost of capital and depreciation expense, administrative costs, implementation costs, incentive payments to program participants, and operating costs. Such rider shall consist of the utility's forecasted cost during the rate period and an EMF rider to collect the difference between the utility's actual reasonable and prudent costs incurred during the test period and actual revenues realized during the test period. The Commission is also authorized to approve incentives for adopting and implementing new DSM/EE programs, including appropriate rewards based on capitalization of a percentage of avoided costs achieved by DSM/EE measures.

4. The Commission approved DEC's save-a-watt portfolio of DSM/EE measures in Docket No. E-7, Sub 831 on February 26, 2009, and approved the modified save-a-watt compensation mechanism, as set forth in the Agreement and Joint Stipulation of Settlement between DEC, the Public Staff, and Southern Alliance for Clean Energy ("SACE"), Environmental Defense Fund ("EDF"), Natural Resources Defense Council ("NRDC"), and the Southern Environmental Law Center ("Save-a-Watt Settlement"), in its *Order Approving Agreement and Joint Stipulation of Settlement Subject to Certain Commission-Required Modifications and Decisions on Contested Issues* issued February 9, 2010, in Docket No. E-7, Sub 831. The save-a-watt pilot, including DEC's initial portfolio of DSM/EE programs and the modified save-a-watt cost recovery mechanism, expired December 31, 2013.

5. The Save-a-Watt Settlement calls for a final true-up, which includes a final comparison of the revenues collected from customers through Rider EE during the modified save-a-watt pilot to the amount of revenue DEC is authorized to collect from customers based on the independently measured and verified results. The final

true-up process also includes calculations that determine the earnings for the entire program and ensure that the level of compensation recovered by DEC is capped so that the after-tax rate of return on actual program costs applicable to DSM/EE programs does not exceed the predetermined earnings cap levels set out in the Save-a-Watt Settlement.

6. In last year's DSM/EE cost recovery proceeding in Docket No. E-7, Sub 1073, DEC performed a calculation of the final true-up and earnings cap for the save-a-watt pilot, which included impacts from Evaluation, Measurement and Verification ("EM&V") of the Smart Energy Now pilot and the Specialty Bulb measures of the Energy Efficient Appliances and Devices Program. The Public Staff and the Company agreed that further discussion of the EM&V for the Smart Energy Now pilot and the Specialty Bulb measures, including whether the impacts relating to those programs should be adjusted, was necessary. In its *Order Approving DSM/EE Rider and Requiring Filing of Proposed Customer Notice* issued on August 21, 2015 in Docket No. E-7, Sub 1073, the Commission approved the final true-up and earnings cap relating to the save-a-watt pilot, subject to further adjustment and true-up depending upon the outcome of discussions of the EM&V for the Smart Energy Now pilot and Specialty Bulb measures between the Company and the Public Staff. As a result of those discussions, the Public Staff and the Company have agreed to make adjustments to EM&V for the Smart Energy Now pilot and further agreed not to make any adjustment relating to EM&V for the Specialty Bulb measures. Rider 8 includes the final true-up relating to the save-a-watt pilot, resulting from adjustment of impacts relating to the Smart Energy Now pilot as agreed upon by DEC and the

Public Staff.

7. The Company's new cost recovery mechanism, which replaces the modified save-a-watt compensation mechanism, is described in the Agreement and Stipulation of Settlement DEC reached with the Public Staff, the North Carolina Sustainable Energy Association, EDF, SACE, the South Carolina Coastal Conservation League, NRDC, and the Sierra Club filed with the Commission on August 19, 2013 (the "Stipulation"). The Commission approved the new mechanism as described in the Stipulation, as well as DEC's new portfolio of DSM/EE programs, in its *Order Approving DSM/EE Programs and Stipulation of Settlement* issued October 29, 2013 ("Sub 1032 Order"). The new mechanism is designed to allow DEC to collect revenue equal to its incurred program costs for a rate period plus a Portfolio Performance Incentive based on shared savings achieved by DEC's DSM/EE programs, and to recover net lost revenues for EE programs only.

8. Rule R8-69(b) provides that the Commission will each year conduct a proceeding for each electric public utility to establish an annual DSM/EE rider to recover DSM/EE related costs.

9. Pursuant to the provisions of N.C. Gen. Stat. § 62-133.9 and Rule R8-69, DEC requests the establishment of Rider 8 to recover: (1) a prospective component consisting of the estimated revenue requirements associated with Vintage 2017 of DEC's current portfolio of DSM/EE programs, the second year of net lost revenues for Vintage 2016 of DEC's EE programs, the third year of net lost revenues for Vintage 2015 of DEC's EE programs, and the final half-year of net lost revenues for Vintage 2014 of DEC's EE programs; and (2) an EMF component truing up

Vintage 2014 of DEC's DSM/EE programs, an EMF component trueing up Vintage 2015 of DEC's DSM/EE programs, and the final true-up of the save-a-watt pilot.

10. Pursuant to the provisions of N.C. Gen. Stat. § 62-133.9 and Rule R8-69, the Company requests Commission approval of the following annual billing factors (all shown on a cents per kilowatt hour ("¢/kWh") basis, including gross receipts tax and regulatory fee):

Residential Billing Factors	¢/kWh
Residential Billing Factor for Rider 8 Prospective Components	0.3861
Residential Billing Factor for Rider 8 EMF Components	0.0406

Non-Residential Billing Factors for Rider 8 Prospective Components	¢/kWh
Vintage 2014 EE participant	0.0139
Vintage 2015 EE participant	0.0418
Vintage 2016 EE Participant	0.0373
Vintage 2017 EE Participant	0.2437
Vintage 2017 DSM participant	0.0789

Non-Residential Billing Factors EMF Component	¢/kWh
Vintage 1 EE Participant	0.0003
Vintage 1 DSM Participant	0.0002
Vintage 2 EE Participant	(0.0053)
Vintage 2 DSM Participant	0.0002
Vintage 3 EE participant	(0.0024)

Vintage 3 DSM participant	0.0003
Vintage 4 EE participant	0.0004
Vintage 4 DSM participant	0.0002
Vintage 2014 EE participant	0.0046
Vintage 2014 DSM participant	(0.0015)
Vintage 2015 EE participant	0.0821
Vintage 2015 DSM participant	(0.0127)


Consistent with the Commission's *Order on Motions for Reconsideration* issued on June 3, 2010 in Docket No. E-7, Sub 938 and the Sub 1032 Order, Rider 8 will be in effect for the twelve month period January 1, 2017, through December 31, 2017. Also in accordance with these Orders, the test period for the Vintage 2015 EMF component is the period January 1, 2015 through December 31, 2015; the test period for the Vintage 2014 EMF component is the period from January 1, 2014 through December 31, 2014; the test period for the EMF related to the final true-up includes the save-a-watt vintages: Vintage 1 (June 1, 2009 through December 31, 2010); Vintage 2 (January 1, 2011 through December 31, 2011); Vintage 3 (January 1, 2012 through December 31, 2012); and Vintage 4 (January 1, 2013 through December 31, 2013).

11. The Company has attached hereto as required by Rule R8-69, the direct testimony and exhibits of witnesses Carolyn T. Miller and Robert P. Evans in support of the requested change in rates.

WHEREFORE, the Company respectfully prays:

That consistent with this Application, the Commission approves the changes to its rates as set forth in paragraph 10 above.

Respectfully submitted, this the 9th day of March 2016.

By: 
Brian L. Franklin
Associate General Counsel
Duke Energy Corporation
550 South Tryon Street
DEC45A/P.O. Box 1321
Charlotte, North Carolina 28201
Telephone: 980-373-4465
brian.franklin@duke-energy.com

Molly McIntosh Jagannathan
Troutman Sanders LLP
One Wells Fargo, Suite 3400
301 South College Street
Charlotte, North Carolina 28202
Telephone: 704-998-4074
molly.jagannathan@troutmansanders.com

ATTORNEYS FOR DUKE ENERGY CAROLINAS,
LLC

STATE OF NORTH CAROLINA)
)
COUNTY OF MECKLENBURG)

VERIFICATION

Carolyn T. Miller, being first duly sworn, deposes and says:

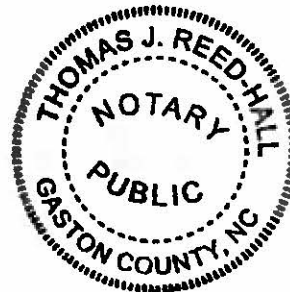
That she is MANAGER, RATES AND REGULATORY STRATEGY of DUKE ENERGY CAROLINAS, LLC, applicant in the above-titled action; that she has read the foregoing Application and knows the contents thereof; that the same is true except as to the matters stated therein on information and belief; and as to those matters, she believes them to be true.

Carolyn T. Miller
Carolyn T. Miller

Sworn to and subscribed before me
this the 8th day of March, 2016.

Thomas J. Reed-Hall
Notary Public

My Commission Expires: 7-30-17



BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-7, SUB 1105

In the Matter of)	
Application of Duke Energy Carolinas, LLC)	DIRECT TESTIMONY OF
for Approval of Demand-Side Management)	CAROLYN T. MILLER
and Energy Efficiency Cost Recovery Rider)	FOR
Pursuant to N.C. Gen. Stat. § 62-133.9 and)	DUKE ENERGY CAROLINAS,
Commission Rule R8-69)	LLC

1 **I. INTRODUCTION AND PURPOSE**

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

3 A. My name is Carolyn T. Miller, and my business address is 550 South Tryon
4 Street, Charlotte, North Carolina, 28202.

5 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

6 A. I am a Rates Manager for Duke Energy Corporation (“Duke Energy”)
7 supporting both Duke Energy Progress, LLC (“DEP”) and Duke Energy
8 Carolinas, LLC (“DEC” or the “Company”).

9 **Q. PLEASE SUMMARIZE YOUR EDUCATION AND PROFESSIONAL**
10 **QUALIFICATIONS.**

11 A. I graduated from the College of New Jersey in Trenton, New Jersey with a
12 Bachelor of Science in Accountancy. I am a certified public accountant
13 licensed in the State of North Carolina. I began my career in 1994 with Ernst
14 & Young as a staff auditor. In 1997, I began working with Duke Energy as a
15 Senior Business Analyst and have held a variety of positions in the Finance
16 organization. I joined the Rates Department in 2014 as Manager, Rates and
17 Regulatory Strategy.

18 **Q. WHAT ARE YOUR PRESENT RESPONSIBILITIES FOR DEC?**

19 A. I am responsible for providing regulatory support and guidance on DEC’s
20 energy efficiency cost recovery process.

21 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS**
22 **COMMISSION?**

1 A. Yes. I provided testimony in support of DEC's application for approval of its
2 demand-side management ("DSM") and energy efficiency ("EE")
3 (collectively, "DSM/EE") cost recovery rider in Docket No. E-7, Sub 1073 as
4 well as DEP's application for approval of its DSM/EE cost recovery rider in
5 Docket No. E-2, 1070.

6 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
7 **PROCEEDING?**

8 A. The purpose of my testimony is to explain and support DEC's proposed
9 DSM/EE cost recovery rider (Rider 8), including prospective and Experience
10 Modification Factor ("EMF") components, and provide information required
11 by Commission Rule R8-69.

12 **Q. PLEASE DESCRIBE THE EXHIBITS ATTACHED TO YOUR**
13 **TESTIMONY.**

14 A. Miller Exhibit 1 summarizes the individual rider components for which DEC
15 requests approval in this filing. Miller Exhibit 2 shows calculation of revenue
16 requirements for each vintage, with separate calculations for non-residential
17 EE and DSM programs within each vintage. Miller Exhibit 3 presents the
18 return calculations for Vintage Years 2014 and 2015. Miller Exhibit 4 shows
19 the actual and estimated prospective amounts collected from customers via
20 Riders 5-7 pertaining to Vintages 2014 through 2016. Miller Exhibit 5
21 provides the calculation of the allocation factors used to allocate system EE
22 and DSM costs to DEC's North Carolina retail jurisdiction. Miller Exhibit 6
23 presents the forecasted sales for the rate period (2017), and the estimated sales

1 related to customers that have opted out of various vintages. These amounts
2 are used to determine the forecasted sales to which the Rider 8 amounts will
3 apply. Miller Exhibit 7 shows the save-a-watt earnings cap calculation as
4 adjusted for revised impacts for the Smart Energy Now pilot. Miller Exhibit 8
5 is the proposed tariff sheet for Rider 8.

6 **Q. WERE MILLER EXHIBITS 1-8 PREPARED BY YOU OR AT YOUR**
7 **DIRECTION AND SUPERVISION?**

8 A. Yes.

9 **II. GENERAL STRUCTURE OF RIDERS**

10 **Q. PLEASE DESCRIBE THE STRUCTURE OF RIDER 8.**

11 A. DEC calculates one integrated (prospective) DSM/EE rider and one integrated
12 DSM/EE EMF rider for the residential class, to be effective each rate period.
13 The integrated residential DSM/EE EMF rider includes all true-ups for each
14 applicable vintage year. Given that qualifying non-residential customers can
15 opt out of EE and/or DSM programs, DEC calculates separate DSM and EE
16 billing factors for the non-residential class. Additionally, the non-residential
17 DSM and EE EMF billing factors are determined separately for each
18 applicable vintage year, so that the factors can be appropriately charged to
19 non-residential customers based on their opt-in/out status and participation for
20 each vintage year.

21 **Q. PLEASE PROVIDE A SUMMARY OF THE COMPONENTS OF**
22 **RIDER 8.**

23 A. There are three main components of Rider 8. The first represents the final

1 true-up of the save-a-watt pilot. The modified save-a-watt compensation
2 mechanism is described in the Agreement and Joint Stipulation of Settlement
3 between DEC, the Public Staff - North Carolinas Utilities Commission
4 (“Public Staff”), Southern Alliance for Clean Energy (“SACE”),
5 Environmental Defense Fund (“EDF”), Natural Resources Defense Council
6 (“NRDC”), and the Southern Environmental Law Center, which was filed on
7 June 12, 2009, in Docket No. E-7, Sub 831 (“Save-a-Watt Settlement”), and
8 approved in the Commission’s *Order Approving Agreement and Joint*
9 *Stipulation of Settlement Subject to Certain Commission-Required*
10 *Modifications and Decisions on Contested Issues* issued on February 9, 2010.

11 The second and third major components of Rider 8 represent amounts
12 to be collected under the new mechanism, broken down into EMF and
13 prospective rates, respectively. The Company’s new cost recovery
14 mechanism, which replaces the modified save-a-watt compensation
15 mechanism, is described in the Agreement and Stipulation of Settlement DEC
16 reached with the Public Staff, the North Carolina Sustainable Energy
17 Association, EDF, SACE, the South Carolina Coastal Conservation League,
18 NRDC, and the Sierra Club, which was filed with the Commission on August
19 19, 2013 (the “Stipulation”), and approved in the Commission’s *Order*
20 *Approving DSM/EE Programs and Stipulation of Settlement* issued on
21 October 29, 2013 (“Sub 1032 Order”). The new mechanism is designed to

1 allow DEC to collect revenue equal to its incurred program costs¹ for a rate
2 period plus a Portfolio Performance Incentive (“PPI”) based on shared savings
3 achieved by DEC’s DSM/EE programs, and to recover net lost revenues for
4 EE programs only.

5 The Company will continue the practice previously approved by the
6 Commission for the modified save-a-watt pilot program which allowed it to
7 recover net lost revenues associated with a particular vintage for the lesser of
8 36 months or the life of the measure, and provided that the recovery of net lost
9 revenues shall cease upon the implementation of new rates in a general rate
10 case to the extent that the new rates are set to recover net lost revenues.

11 Like the modified save-a-watt pilot, the new recovery mechanism
12 employs a vintage year concept based on the calendar year.² In each of its
13 annual rider filings, DEC plans to perform an annual true-up process for the
14 prior calendar year vintages. The true-up will reflect actual participation and
15 verified Evaluation, Measurement and Verification (“EM&V”) results for the
16 most recently completed vintage, applied in the same manner as agreed upon
17 by DEC, SACE, and the Public Staff, and approved by the Commission in its
18 *Order Approving DSM/EE Rider and Requiring Filing of Proposed Customer*
19 *Notice* issued on November 8, 2011, in Docket No. E-7, Sub 979 (“EM&V
20 Agreement”).

¹ Program costs are defined under Rule R8-68(b)(1) as all reasonable and prudent expenses expected to be incurred by the electric public utility, during a rate period, for the purpose of adopting and implementing new DSM and EE measures previously approved pursuant to Rule R8-68.

² To distinguish from save-a-watt vintages (which are numbered 1 through 4), each vintage under the new mechanism is referred to by the calendar year of its respective rate period (*e.g.*, Vintage 2017).

1 The Company has implemented deferral accounting for over- and
2 under-recoveries of costs that are eligible for recovery through the annual
3 DSM/EE rider. Under the Stipulation, the balance in the deferral account(s),
4 net of deferred income taxes, may accrue a return at the net-of-tax rate of
5 return rate approved in DEC's then most recent general rate case. The
6 methodology used for the calculation of interest shall be the same as that
7 typically utilized for DEC's Existing DSM Program rider proceedings.
8 Pursuant to Commission Rule R8-69(c)(3), DEC will not accrue a return on
9 net lost revenues or the PPI. Miller Exhibit 3, pages 1 through 8, shows the
10 calculation performed as part of the true-up of Vintage 2014 and Vintage
11 2015.

12 The Company expects that most EM&V will be available in the time
13 frame needed to true-up each vintage in the following calendar year. If any
14 EM&V results for a vintage are not available in time for inclusion in DEC's
15 annual rider filing, however, then the Company will make an appropriate
16 adjustment in the next annual filing.

17 **Q. PLEASE DESCRIBE THE SAVE-A-WATT COMPONENTS OF**
18 **RIDER 8 IN MORE DETAIL.**

19 A. The proposed Rider 8 includes the final settlement of issues relating to EM&V
20 for the Specialty Bulb measures of the Energy Efficient Appliances and
21 Devices Program and the Smart Energy Now pilot. In particular, the save-a-
22 watt true-up component of Rider 8 reflects the adjustment of impacts relating
23 to the Smart Energy Now pilot as agreed upon by DEC and the Public Staff.

1 The Save-a-Watt Settlement calls for a final true-up, which includes a
2 final comparison of the revenues collected from customers through Rider EE
3 during the modified save-a-watt pilot to the amount of revenue DEC is
4 authorized to collect from customers based on the independently measured
5 and verified results. The final true-up process also includes calculations that
6 determine the earnings for the entire program and ensure that the level of
7 compensation recovered by DEC is capped so that the after-tax rate of return
8 on actual program costs applicable to DSM/EE programs does not exceed the
9 predetermined earnings cap levels set out in the Save-a-Watt Settlement.

10 In last year's DSM/EE cost recovery proceeding in Docket No. E-7,
11 Sub 1073, DEC performed a calculation of the final true-up and earnings cap
12 for the save-a-watt pilot, which included impacts from EM&V for the Smart
13 Energy Now pilot and the Specialty Bulb measures of the Energy Efficient
14 Appliances and Devices Program. The Public Staff and the Company agreed
15 that further discussion of the EM&V for the Smart Energy Now pilot and the
16 Specialty Bulb measures, including whether the impacts relating to those
17 programs should be adjusted, was necessary.

18 As directed by the Commission in its *Order Approving DSM/EE Rider*
19 *and Requiring Filing of Proposed Customer Notice* issued on August 21, 2015
20 in Docket E-7, Sub 1073 ("Sub 1073 Order"), the Company worked with the
21 Public Staff to determine whether to make adjustments to the EM&V and the
22 related program and EMF impacts for the Smart Energy Now pilot and
23 Specialty Bulb measures. As described more fully in the testimony of DEC

1 witness Robert P. Evans, the Public Staff and the Company agreed that DEC
2 would make certain adjustments to the impacts for the Smart Energy Now
3 pilot, but not for the Specialty Bulb measures. These agreed upon revisions to
4 the avoided costs and net lost revenues for the Smart Energy Now pilot are the
5 only changes to the final true-up of the save-a-watt pilot and are the only
6 charges included in Rider 8 that relate to the save-a-watt pilot. Please see
7 Miller Exhibit 2, page 1 for a summary of the rate impacts for all vintages of
8 the save-a-watt pilot.

9 **Q. WILL RIDER 8 BE THE FINAL RIDER CONTAINING**
10 **COMPONENTS RELATING TO SAVE-A-WATT VINTAGES?**

11 A. Yes. The filing in this Docket is the last filing including charges relating to
12 the save-a-watt pilot, and Rider 8 will represent the final rider associated with
13 save-a-watt vintages.

14 **Q. WHAT ARE THE NEW MECHANISM COMPONENTS OF RIDER 8?**

15 A. The proposed Rider 8 consists of seven distinct components related to the new
16 mechanism: (1) a prospective Vintage 2014 component designed to collect the
17 final half-year of estimated net lost revenues for DEC's 2014 vintage of EE
18 programs; (2) a true-up of Vintage 2014 program costs, shared savings and
19 participation for DSM/EE programs based on additional EM&V results
20 received; (3) a prospective Vintage 2015 component designed to collect the
21 third year of estimated net lost revenues for DEC's 2015 vintage of EE
22 programs; (4) a true-up of Vintage 2015 program costs, shared savings and
23 participation for DSM/EE programs; (5) a prospective Vintage 2016

1 component designed to collect the second year of estimated net lost revenues
2 for DEC's 2016 vintage of EE programs; (6) a prospective Vintage 2017
3 component to collect program costs, shared savings (*i.e.*, the PPI), and the first
4 year of net lost revenues for DEC's 2017 vintage of EE programs; and (7) a
5 prospective Vintage 2017 component designed to collect program costs and
6 the PPI for DEC's 2017 vintage of DSM programs.

7 **Q. HOW DOES DEC CALCULATE THE PROPOSED BILLING**
8 **FACTORS?**

9 A. The billing factors are computed separately for EE and DSM measures by
10 dividing the revenue requirements for residential and non-residential
11 customers, by the forecasted sales for the rate period for each set of
12 customers. For non-residential rates, the forecasted sales exclude the
13 estimated sales to customers who have elected to opt out of Rider EE.
14 Because non-residential customers are allowed to opt out of DSM and/or EE
15 programs separately in an annual election, non-residential billing factors are
16 computed separately for each vintage.

17 **III. COST ALLOCATION METHODOLOGY**

18 **Q. HOW DOES DEC ALLOCATE REVENUE REQUIREMENTS TO THE**
19 **NORTH CAROLINA RETAIL JURISDICTION AND TO THE**
20 **RESIDENTIAL AND NON-RESIDENTIAL RATE CLASSES?**

21 A. The Company allocates both save-a-watt and the new portfolio revenue
22 requirements related to program costs and incentives for EE programs targeted
23 at retail residential customers across North Carolina and South Carolina to its

1 North Carolina retail jurisdiction based on the ratio of North Carolina retail
2 kWh sales (grossed up for line losses) to total retail kWh sales (grossed up for
3 line losses), and then recovers them only from North Carolina residential
4 customers. The revenue requirements related to EE programs targeted at retail
5 non-residential customers across North Carolina and South Carolina are
6 allocated to the North Carolina retail jurisdiction based on the ratio of North
7 Carolina retail kWh sales (grossed up for line losses) to total retail kWh sales
8 (grossed up for line losses), and then recovered from only North Carolina
9 retail non-residential customers. The portion of revenue requirements related
10 to net lost revenues for EE programs is not allocated to the North Carolina
11 retail jurisdiction, but rather is specifically computed based on the kW and
12 kWh savings of North Carolina retail customers.

13 For DSM programs, because residential and non-residential programs
14 are similar in nature, the aggregated revenue requirement for all retail DSM
15 programs targeted at both residential and non-residential customers across
16 North Carolina and South Carolina are allocated to the North Carolina retail
17 jurisdiction based on North Carolina's contribution to total retail peak
18 demand. Both residential and non-residential customer classes are allocated a
19 share of total system DSM revenue requirements based on each group's
20 contribution to total retail peak demand.

21 The allocation factors used in DSM/EE EMF true-up calculations for
22 each vintage are based on DEC's most recently filed Cost of Service studies at
23 the time that the Rider EE filing incorporating the true-up is made. If there

1 are subsequent true-ups for a vintage, DEC will use the same allocation
2 factors as those used in the original DSM/EE EMF true-up calculations.

3 **IV. UTILITY INCENTIVES AND NET LOST REVENUES**

4 **Q. HOW DOES DEC CALCULATE THE PPI?**

5 A. Pursuant to the Stipulation, DEC calculates the dollar amount of PPI by
6 multiplying the shared savings achieved by the system portfolio of DSM/EE
7 programs by 11.5%. Company witness Evans further describes the specifics
8 of the PPI calculation in his testimony. In addition, Evans Exhibit 1 page 6
9 and page 7 shows the revised PPI for Vintage 2014 and Vintage 2015,
10 respectively, based on updated EM&V results, and Evans Exhibit 1 page 8
11 shows the estimated PPI by program type and customer class for Vintage Year
12 2017. As shown on page 2, page 3 and page 5 of Miller Exhibit 2, the system
13 amount of PPI is then allocated to North Carolina retail customer classes in
14 order to derive customer rates.

15 **Q. HOW DOES DEC CALCULATE THE NET LOST REVENUES FOR**
16 **THE PROSPECTIVE COMPONENTS OF RIDER EE?**

17 A. For the prospective components of Rider EE, net lost revenues are estimated
18 by multiplying the portion of DEC's tariff rates that represent the recovery of
19 fixed costs by the estimated North Carolina retail kW and kWh reductions
20 applicable to EE programs by rate schedule, and reducing this amount by
21 estimated found revenues. The Company calculates the portion of North
22 Carolina retail tariff rates (including certain riders) representing the recovery
23 of fixed costs by deducting the recovery of fuel and variable operation and

1 maintenance (“O&M”) costs from its tariff rates. The lost revenues totals for
2 residential and non-residential customers are then reduced by North Carolina
3 retail found revenues computed using the weighted average lost revenue rates
4 for each customer class. The testimony and exhibits of Company witness
5 Evans provide information on the actual and estimated found revenues which
6 offset lost revenues.

7 **Q. HOW DOES DEC CALCULATE THE NET LOST REVENUES FOR**
8 **THE EMF COMPONENTS OF RIDER EE?**

9 A. For the EMF components of Rider EE, DEC calculates the net lost revenues
10 by multiplying the portion of its tariff rates that represent the recovery of fixed
11 costs by the actual and verified North Carolina retail kW and kWh reductions
12 applicable to EE programs by rate schedule, then reducing this amount by
13 actual found revenues.

14 **V. OPT-OUT PROVISIONS**

15 **Q. PLEASE EXPLAIN THE OPT-OUT PROCESS FOR NON-**
16 **RESIDENTIAL CUSTOMERS.**

17 A. In its *Order Granting Waiver, in Part, and Denying Waiver, in Part* (“Waiver
18 Order”) issued April 6, 2010, in Docket No. E-7, Sub 938, the Commission
19 approved, in part, DEC’s request for waiver of Commission Rule R8-69(d)(3),
20 thereby allowing the Company to permit qualifying non-residential
21 customers³ to opt out of the DSM and/or EE portion of Rider EE during
22 annual election periods. If a customer opts into a DSM program (or never

³ Individual commercial customer accounts with annual energy usage of not less than 1,000,000 kWh and any industrial customer account.

1 opted out), the customer is required to participate for three years in the
2 approved DSM programs and rider. If a customer chooses to participate in an
3 EE program (or never opted out), that customer is required to pay the EE-
4 related avoided cost revenue requirements and the net lost revenues for the
5 corresponding vintage of the programs in which it participated. Customers
6 that opt out of DEC's DSM and/or EE programs remain opted-out unless they
7 choose to opt back in during any of the succeeding annual election periods,
8 which occur from November 1 to December 31 each year, or any of the
9 succeeding annual opt-in periods in March as described below. If a customer
10 participates in any vintage of programs, the customer is subject to all true-up
11 provisions of the approved Rider EE for any vintage in which the customer
12 participates.

13 Under the new mechanism, DEC continues its practice of charging
14 Rider EE to all customers who have not elected to opt out during an
15 enrollment period and who participate in any vintage of programs. The new
16 mechanism also provides an additional opportunity for qualifying customers
17 to opt in to DEC's EE and/or DSM programs during the first five business
18 days of March. Customers who choose to begin participating in DEC's EE
19 and DSM programs during the special "opt-in period" during March of each
20 year will be retroactively billed the applicable Rider EE amounts back to
21 January 1 of the vintage year, such that they will pay the appropriate Rider EE
22 amounts for the full rate period.

4 A. Yes. The impact of opt-out results is considered in the development of the
5 Rider EE billing rates for non-residential customers. Since the revenue
6 requirements will not be recovered from non-residential customers that opt out
7 of DEC's programs, the forecasted sales used to compute the rate per kWh for
8 non-residential rates exclude sales to customers that have opted out of the
9 vintage to which the rate applies. This adjustment is shown on Miller Exhibit
10 6.

12 **Q. WHAT IS THE RATE PERIOD FOR THE PROSPECTIVE**
13 **COMPONENTS OF RIDER 8?**

18 **Q. PLEASE DESCRIBE THE BASIS FOR THE RATE PERIOD**
19 **REVENUE REQUIREMENTS RELATING TO VINTAGE 2014?**

A. The Company determines the estimated revenue requirements for Vintage 2014 separately for residential and non-residential customer classes, and bases them on the final half-year of net lost revenues for its Vintage 2014 EE programs. The amounts are based on estimated North Carolina retail kW and

1 kWh reductions and DEC's rates approved in its most recent general rate case,
2 which became effective September 25, 2013, adjusted as described above to
3 recover only the fixed cost component.

4 **Q. PLEASE DESCRIBE THE BASIS FOR THE RATE PERIOD**
5 **REVENUE REQUIREMENTS RELATING TO VINTAGE 2015.**

6 A. The Company determines the estimated revenue requirements for Vintage
7 2015 separately for residential and non-residential customer classes, and bases
8 them on the third year of net lost revenues for its Vintage 2015 EE programs.
9 The amounts are based on estimated North Carolina retail kW and kWh
10 reductions and DEC's rates approved in its most recent general rate case,
11 which became effective September 25, 2013, adjusted as described above to
12 recover only the fixed cost component.

13 **Q. PLEASE DESCRIBE THE BASIS FOR THE RATE PERIOD**
14 **REVENUE REQUIREMENTS RELATING TO VINTAGE 2016.**

15 A. The Company determines the estimated revenue requirements for Vintage
16 2016 separately for residential and non-residential customer classes, and bases
17 them on the second year of net lost revenues for its Vintage 2016 EE
18 programs. The amounts are based on estimated North Carolina retail kW and
19 kWh reductions and DEC's rates approved in its most recent general rate case,
20 which became effective September 25, 2013, adjusted as described above to
21 only recover the fixed cost component.

22 **Q. PLEASE DESCRIBE THE BASIS FOR THE RATE PERIOD**
23 **REVENUE REQUIREMENTS RELATING TO VINTAGE 2017.**

1 A. The estimated revenue requirements for Vintage 2017 EE programs include
2 program costs, a shared savings incentive (PPI), and the first year of net lost
3 revenues determined separately for residential and non-residential customer
4 classes. The estimated revenue requirements for Vintage 2017 DSM
5 programs include program costs and a shared savings incentive (PPI). The
6 program costs and shared savings incentive are computed at the system level
7 and allocated to North Carolina based on the allocation methodologies
8 discussed earlier in my testimony. The net lost revenues for EE programs are
9 based on estimated North Carolina retail kW and kWh reductions and the rates
10 approved in DEC's most recent general rate case, which became effective
11 September 25, 2013.

12 **VII. EMF**

13 **Q. WHAT IS THE TEST PERIOD FOR THE EMF COMPONENT?**

14 A. Pursuant to the Second Waiver Order and Sub 1032 Order, the "test period"
15 for the EMF component is defined as the most recently completed vintage
16 year at the time of DEC's Rider EE cost recovery application filing date,
17 which in this case is Vintage Year 2015 (January 1, 2015 through December
18 31, 2015). In addition, the Second Waiver Order allows the EMF component
19 to cover multiple test periods, so the EMF component for 2017 includes
20 Vintage 2014 (January 2014, through December 2014) as well. The test
21 period for the EMF component related to the final true-up includes the four
22 prior save-a-watt vintages: Vintage 1 (June 1, 2009 through December 31,
23 2010); Vintage 2 (January 1, 2011 through December 31, 2011); Vintage 3

1 (January 1, 2012 through December 31, 2012); and Vintage 4 (January 1,
2 2013 through December 31, 2013).

3 **Q. WHAT IS BEING “TRUED UP” FOR VINTAGE 2015?**

4 A. The chart below demonstrates which components of the Vintage 2015
5 estimate filed in 2014 are being “trued up” in the Vintage 2015 EMF
6 component of Rider 8. Miller Exhibit 2, page 3 contains the calculation of the
7 true-up for Vintage 2015. The second year of net lost revenues for Vintage
8 2015, which are a component of Rider 7 billings during 2016, will be trued-up
9 to actual amounts during the next rider filing.

	Vintage 2015 Estimate (2015) As Filed (Filed 2014)	Vintage 2015 True-Up (2017) (Filed March 2016)
	Rider 6	Rider 8 EMF
Participation	Estimated participation assuming January 1, 2015 sign up date	Update for actual participation for January – December 2015
EM&V	Initial assumptions of load impacts	Updated according to Commission-approved EM&V Agreement
Lost Revenues	Estimated 2015 participation using half-year convention	Update for actual participation for January – December 2015 and actual 2015 lost revenue rates
Found Revenues	Estimated according to Commission-approved guidelines	Update for actual according to Commission-approved guidelines
New Programs	Only includes programs approved prior to estimated filing	Update for any new programs and pilots approved and implemented since estimated filing

10 In addition, DEC has implemented deferral accounting for the
11 under/over collection of program costs and calculated a return at the net-of-tax
12 rate of return rate approved in DEC’s most recent general rate case. The

1 methodology used for the calculation of interest is the same as that typically
2 utilized for DEC's Existing DSM Program rider proceedings. Pursuant to
3 Commission Rule R8-69(c)(3), DEC is not accruing a return on net lost
4 revenues or the PPI. Please see Miller Exhibit 3, pages 1 through 8 for the
5 calculation performed as part of the true-up of Vintage Years 2014 and 2015.

6 **Q. HOW WERE THE LOAD IMPACTS UPDATED?**

7 A. For DSM programs, the contracted amounts of kW reduction capability from
8 participants are considered to be components of actual participation. As a
9 result, the Vintage 2015 true-up reflects the actual quantity of demand
10 reduction capability for the Vintage 2015 period. The load impacts for EE
11 programs were updated in accordance with the Commission-approved EM&V
12 Agreement.

13 **Q. HOW WERE ACTUAL NET LOST REVENUES COMPUTED FOR**
14 **THE VINTAGE 2015 TRUE-UP?**

15 A. Net lost revenues for year one (2015) of Vintage 2015 were calculated using
16 actual kW and kWh savings by North Carolina retail participants by customer
17 class, based on actual participation and load impacts reflecting EM&V results
18 applied according to the EM&V Agreement. The actual kW and kWh savings
19 were as experienced during the period January 1, 2015 through December 31,
20 2015. The rates applied to the kW and kWh savings are the retail rates that
21 were in effect for the period January 1, 2015 through December 31, 2015,
22 reduced by fuel and other variable costs. The lost revenues were then offset
23 by actual found revenues for year one of Vintage 2015 as explained by

1 Company witness Evans. The calculation of net lost revenues was performed
2 by rate schedule within the residential and non-residential customer classes.

3 **Q. WHAT IS BEING “TRUED UP” FOR VINTAGE YEAR 2014?**

4 A. Avoided costs for Vintage Year 2014 EE programs are being “trued up” based
5 on updated EM&V participation results. Avoided costs for Vintage 2014
6 DSM programs are being trued up to correct participation results. Net lost
7 revenues for all years were trued up for updated EM&V participation results.
8 The actual kW and kWh savings were as experienced during the period
9 January 1, 2014 through December 31, 2014. The rates applied to the kW and
10 kWh savings are the retail rates that were in effect during each period the lost
11 revenues were earned, reduced by fuel and other variable costs.

12 **Q. WHAT IS BEING “TRUED UP” IN THE FINAL SAVE-A-WATT**
13 **TRUE-UP?**

14 A. As described above, there are two programs, Specialty Bulb and Smart Energy
15 Now, that were subject to additional consideration following DEC’s last
16 DSM/EE rider proceeding. As required by the Sub 1073 Order, the Company
17 worked with the Public Staff to come to a final resolution of the EM&V of
18 those programs. This resolution resulted in changes to the avoided costs and
19 net lost revenues for the Smart Energy Now Pilot as described by Company
20 witness Evans. Rider 8 includes those changes flowed through to all save-a-
21 watt vintages, including the earnings cap approved in the Sub 1073 Order.

22 **VIII. PROPOSED RATES**

1 **Q. WHAT ARE DEC'S PROPOSED INITIAL BILLING FACTORS**
2 **APPLICABLE TO NORTH CAROLINA ELECTRIC CUSTOMERS**
3 **FOR THE PROSPECTIVE COMPONENTS OF RIDER 8?**

4 A. The Company's proposed initial billing factor for the Rider 8 prospective
5 components is 0.3861 cents per kWh for DEC's North Carolina retail
6 residential customers. For non-residential customers, the amounts differ
7 depending upon customer elections of participation. The following chart
8 depicts the options and rider amounts:

9

Non-Residential Billing Factors for Rider 8 Prospective Components	¢/kWh
Vintage 2014 EE participant	0.0139
Vintage 2015 EE participant	0.0418
Vintage 2016 EE participant	0.0373
Vintage 2017 EE participant	0.2437
Vintage 2017 DSM participant	0.0789

10
11
12
13
14
15
16

17 **Q. WHAT ARE DEC'S PROPOSED EMF BILLING FACTORS**
18 **APPLICABLE TO NORTH CAROLINA ELECTRIC CUSTOMERS**
19 **FOR THE TRUE-UP COMPONENTS OF RIDER 8?**

20 A. The Company's proposed EMF billing factor for the true-up components of
21 Rider 8 is 0.0406 cents per kWh for DEC's North Carolina retail residential
22 customers. For non-residential customers, the amounts differ depending upon
23 customer elections of participation. The following chart depicts the options
24 and rider amounts:

Non-Residential Billing Factors EMF Component	¢/kWh
Vintage Year 2015 EE Participant	0.0821
Vintage Year 2015 DSM Participant	(0.0127)
Vintage Year 2014 EE Participant	0.0046
Vintage Year 2014 DSM Participant	(0.0015)
Vintage 4 EE participant	0.0004
Vintage 4 DSM participant	0.0002
Vintage 3 EE participant	(0.0024)
Vintage 3 DSM participant	0.0003
Vintage 2 EE participant	(0.0053)
Vintage 2 DSM participant	0.0002
Vintage 1 EE participant	0.0003
Vintage 1 DSM participant	0.0002

IX. CONCLUSION

Q. PLEASE SUMMARIZE THE SPECIFIC RATE MAKING APPROVAL REQUESTED BY DEC.

A. DEC seeks approval of the Rider 8 billing factors to be effective for 2017. As discussed above, Rider 8 contains (1) a prospective component, which includes the final half-year of net lost revenues for Vintage Year 2014; the third year of net lost revenues for Vintage Year 2015, the second year of net lost revenues for Vintage Year 2016 and the revenue requirements for Vintage Year 2017; and (2) an EMF component which represents the final true-up under save-a-watt, as well as a true-up of Vintage Year 2014 and Vintage

1 Year 2015. Consistent with the Stipulation, for DEC's North Carolina
2 residential customers, the Company calculated one integrated prospective
3 billing factor and one integrated EMF billing factor for Rider 8. Also in
4 accordance with the Stipulation, the non-residential DSM and EE billing
5 factors have been determined separately for each vintage year and will be
6 charged to non-residential customers based on their opt-in/out status and
7 participation for each vintage year.

8 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

9 **A. Yes.**

Duke Energy Carolinas, LLC
DSM/EE Cost Recovery Rider 8
Docket Number E-7 Sub 1105
Exhibit Summary for Rider EE Exhibits and Factors

Residential Billing Factors

Residential Billing Factor for Rider 8 True-up (EMF) Components

Line			
1	SAW Settlement True-up	Miller Exhibit 2, pg. 1a, Line 8	\$ 459,999
2	Year 2014 EE/DSM True-Up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 2 Line 15	6,336,746
3	Year 2015 EE/DSM True-Up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 3 Line 15	2,324,972
4	Total True-up (EMF) Revenue Requirement	Sum Lines 1-3	\$ 8,661,718
5	Projected NC Residential Sales (kWh) for rate period	Miller Exhibit 6 pg. 1, Line 1	21,321,202,431
6	SAW EE/DSM Revenue Requirement EMF Residential Rider EE (cents per kWh)	Line 4 / Line 5 * 100	0.0406

Residential Billing Factor for Rider 8 Prospective Components

7	Vintage 2014 Total EE/DSM Prospective Amounts Revenue Requirement	Miller Exhibit 2 pg. 2, Line 15	\$ 5,005,380
8	Vintage 2015 Total EE/DSM Prospective Amounts Revenue Requirement	Miller Exhibit 2 pg. 3, Line 15	8,090,365
9	Vintage 2016 Total EE/DSM Prospective Amounts Revenue Requirement	Miller Exhibit 2 pg. 4, Line 1	5,723,916
10	Vintage 2017 Total EE/DSM Prospective Amounts Revenue Requirement	Miller Exhibit 2 pg. 5, Line 11	63,508,411
11	Total Prospective Revenue Requirement	Sum Lines 7-10	\$ 82,328,071
12	Projected NC Residential Sales (kWh) for rate period	Miller Exhibit 6 pg. 2, Line 1	21,321,202,431
13	SAW EE/DSM Revenue Requirement Prospective Residential Rider EE (cents per kWh)	Line 11 / Line 12 * 100	0.3861

Total Revenue Requirements in Rider 8 from Residential Customers

14	Total True-up (EMF) Revenue Requirement	Line 4	\$ 8,661,718
15	Total Prospective Revenue Requirement	Line 11	82,328,071
16	Total EE/DSM Revenue Requirement for Residential Rider EE	Line 14 + Line 15	\$ 90,989,789
17	Total EE/DSM Revenue Requirement for Residential Rider EE (cents per kWh)	Line 6 + Line 13	0.4267

Non-Residential Billing Factors for Rider 8 True-up (EMF) Components

Line			
	<u>SAW EE Revenue Requirements True-up (EMF)</u>		
1	Vintage 1 EE True-up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 1a, Line 20	\$ 59,126
2	Projected Vintage 1 EE Participants NC Non-Residential Sales (kwh) for rate period	Miller Exhibit 6 pg. 1, Line 21	21,519,305,625
3	SAW EE Revenue Requirement Vintage 1 EMF Non-Residential Rider EE (cents per kWh)	Line 1/Line 2 * 100	0.0003
4	Vintage 1 DSM True-up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 1a, Line 31	\$ 34,835
5	Projected Vintage 1 DSM Participants NC Non-Residential Sales (kwh) for rate period	Miller Exhibit 6 pg. 1, Line 21	21,357,726,016
6	SAW DSM Revenue Requirement Vintage 1 EMF Non-Residential Rider EE (cents per kWh)	Line 4/Line 5 * 100	0.0002
7	Vintage 2 EE True-up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 1a, Line 42	\$ (1,177,031)
8	Projected Vintage 2 EE Participants NC Non-Residential Sales (kwh) for rate period	Miller Exhibit 6 pg. 1, Line 21	22,084,821,944
9	SAW EE Revenue Requirement Vintage 2 EMF Non-Residential Rider EE (cents per kWh)	Line 7/Line 8 * 100	(0.0053)
10	Vintage 2 DSM True-up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 1a, Line 53	\$ 39,102
11	Projected Vintage 2 DSM Participants NC Non-Residential Sales (kwh) for rate period	Miller Exhibit 6 pg. 1, Line 21	21,830,486,336
12	SAW DSM Revenue Requirement Vintage 2 EMF Non-Residential Rider EE (cents per kWh)	Line 10/Line 11 * 100	0.0002
13	Vintage 3 EE True-up (EMF) Revenue Requirement	Miller Exhibit 2 pg. 1b, Line 64	\$ (543,461)
14	Projected Vintage 3 EE Participants NC Non-Residential Sales (kwh) for rate period	Miller Exhibit 6 pg. 1, Line 21	22,216,051,130
15	SAW EE Revenue Requirement Vintage 3 EMF Non-Residential Rider EE (cents per kWh)	Line 13/Line 14 * 100	(0.0024)

Non-Residential Billing Factors Continued

16 Vintage 3 DSM True-up (EMF) Revenue Requirement
17 Projected Vintage 3 DSM Participants NC Non-Residential Sales (kwh) for rate period
18 *SAW DSM Revenue Requirement Vintage 3 EMF Non-Residential Rider EE (cents per kWh)*

19 Vintage 4 EE True-up (EMF) Revenue Requirement
20 Projected Vintage 4 EE Participants NC Non-Residential Sales (kwh) for rate period
21 *SAW EE Revenue Requirement Vintage 4 EMF Non-Residential Rider EE (cents per kWh)*

22 Vintage 4 DSM True-up (EMF) Revenue Requirement
23 Projected Vintage 4 DSM Participants NC Non-Residential Sales (kwh) for rate period
24 *SAW DSM Revenue Requirement Vintage 4 EMF Non-Residential Rider EE (cents per kWh)*

25 Vintage Year 2014 EE True-up (EMF) Revenue Requirement
26 Projected Year 2014 EE Participants NC Non-Residential Sales (kwh) for rate period
27 *EE Revenue Requirement Year 2014 EMF Non-Residential Rider EE (cents per kWh)*

28 Vintage Year 2014 DSM True-up (EMF) Revenue Requirement
29 Projected Year 2014 DSM Participants NC Non-Residential Sales (kwh) for rate period
30 *DSM Revenue Requirement Year 2014 EMF Non-Residential Rider EE (cents per kWh)*

31 Vintage Year 2015 EE True-up (EMF) Revenue Requirement
32 Projected Year 2015 EE Participants NC Non-Residential Sales (kwh) for rate period
33 *EE Revenue Requirement Year 2015 EMF Non-Residential Rider EE (cents per kWh)*

34 Vintage Year 2015 DSM True-up (EMF) Revenue Requirement
35 Projected Year 2015 DSM Participants NC Non-Residential Sales (kwh) for rate period
36 *DSM Revenue Requirement Year 2015 EMF Non-Residential Rider EE (cents per kWh)*

Non-Residential Billing Factors for Rider 8 Prospective Components

37 Vintage Year 2014 EE Prospective Amounts Revenue Requirement
38 Projected Program Year 2014 EE Participants NC Non-Residential Sales (kwh) for rate period
39 *EE Revenue Requirement Vintage 2014 Prospective Component for Non-Residential Rider EE (cents per kWh)*

40 Vintage Year 2015 EE Prospective Amounts Revenue Requirement
41 Projected Program Year 2015 EE Participants NC Non-Residential Sales (kwh) for rate period
42 *EE Revenue Requirement Vintage 2015 Prospective Component for Non-Residential Rider EE (cents per kWh)*

43 Vintage Year 2016 EE Prospective Amounts Revenue Requirement
44 Projected Program Year 2016 EE Participants NC Non-Residential Sales (kwh) for rate period
45 *EE Revenue Requirement Vintage 2016 Prospective Component for Non-Residential Rider EE (cents per kWh)*

46 Vintage Year 2017 EE Prospective Amounts Revenue Requirement
47 Projected Program Year 2017 EE Participants NC Non-Residential Sales (kwh) for rate period
48 *EE Revenue Requirement Vintage 2016 Prospective Component for Non-Residential Rider EE (cents per kWh)*

49 Vintage Year 2017 DSM Prospective Amounts Revenue Requirement
50 Projected Vintage 2017 DSM Participants NC Non-Residential Sales (kwh) for rate period
51 *DSM Revenue Requirement Vintage 2017 Prospective Component for Non-Residential Rider EE (cents per kWh)*

Total EMV Rate

Total Prospective Rate

Miller Exhibit 1, page 2

Miller Exhibit 2 pg. 1b, Line 77 \$ 56,452
Miller Exhibit 6 pg. 1, Line 21 21,978,739,156
Line 16/Line 17 * 100 **0.0003**

Miller Exhibit 2 pg. 1b, Line 88 \$ 96,167
Miller Exhibit 6 pg. 1, Line 21 22,643,596,192
Line 19/Line 20 * 100 **0.0004**

Miller Exhibit 2 pg. 1b, Line 99 \$ 53,188
Miller Exhibit 6 pg. 1, Line 21 22,094,321,259
Line 22/Line 23 * 100 **0.0002**

Miller Exhibit 2 pg. 2, Line 25 \$ 1,038,350
Miller Exhibit 6 pg. 2, Line 21 22,652,526,998
Line 25/Line 26 * 100 **0.0046**

Miller Exhibit 2 pg. 2, Line 35 \$ (323,961)
Miller Exhibit 6 pg. 2, Line 21 21,944,178,772
Line 28/Line 29 * 100 **(0.0015)**

Miller Exhibit 2 pg. 3, Line 25 \$ 18,614,716
Miller Exhibit 6 pg. 2, Line 21 22,663,138,747
Line 30/Line 31 * 100 **0.0821**

Miller Exhibit 2 pg. 3, Line 35 \$ (2,761,404)
Miller Exhibit 6 pg. 2, Line 21 21,706,361,718
Line 34/Line 35 * 100 **(0.0127)**

Miller Exhibit 2 pg. 2, Line 25 \$ 3,150,271
Miller Exhibit 6 pg. 2, Line 21 22,652,526,998
Line 37/Line 38 * 100 **0.0139**

Miller Exhibit 2 pg. 3, Line 25 \$ 9,483,428
Miller Exhibit 6 pg. 2, Line 21 22,663,138,747
Line 40/Line 41 * 100 **0.0418**

Miller Exhibit 2 pg. 4, Line 4 \$ 8,309,444
Miller Exhibit 6 pg. 2, Line 21 22,256,996,675
Line 43/Line 44 * 100 **0.0373**

Miller Exhibit 2 pg. 5, Line 18 \$ 54,250,339
Miller Exhibit 6 pg. 2, Line 21 22,256,996,675
Line 46/Line 47 * 100 **0.2437**

Miller Exhibit 2 pg. 5, Line 25 \$ 17,118,417
Miller Exhibit 6 pg. 2, Line 21 21,706,200,959
Line 49/Line 50 * 100 **0.0789**

0.0664

0.4156

Total Revenue Requirements in Rider 8 from Non-Residential Customers

Miller Exhibit 1, page 3

52	Vintage 1 EE True-up (EMF) Revenue Requirement	Line 1	\$	59,126
53	Vintage 1 DSM True-up (EMF) Revenue Requirement	Line 4		34,835
54	Vintage 2 EE True-up (EMF) Revenue Requirement	Line 7		(1,177,031)
55	Vintage 2 DSM True-up (EMF) Revenue Requirement	Line 10		39,102
56	Vintage 3 EE True-up (EMF) Revenue Requirement	Line 13		(543,461)
57	Vintage 3 DSM True-up (EMF) Revenue Requirement	Line 16		56,452
58	Vintage 4 EE True-up (EMF) Revenue Requirement	Line 19		96,167
59	Vintage 4 DSM True-up (EMF) Revenue Requirement	Line 22		53,188
60	Vintage Year 2014 EE True-up (EMF) Revenue Requirement	Line 25		1,038,350
61	Vintage Year 2014 DSM True-up (EMF) Revenue Requirement	Line 28		(323,961)
62	Vintage Year 2015 EE True-up (EMF) Revenue Requirement	Line 31		18,614,716
63	Vintage Year 2015 DSM True-up (EMF) Revenue Requirement	Line 34		(2,761,404)
62	Vintage Year 2014 EE Prospective Amounts Revenue Requirement	Line 37		3,150,271
63	Vintage Year 2015 EE Prospective Amounts Revenue Requirement	line 40		9,483,428
64	Vintage Year 2016 EE Prospective Amounts Revenue Requirement	Line 43		8,309,444
65	Vintage Year 2017 EE Prospective Amounts Revenue Requirement	Line 46		54,250,339
66	Vintage Year 2017 DSM Prospective Amounts Revenue Requirement	Line 49		17,118,417
Total Non-Residential Revenue Requirement in Rider 7		Sum (Lines 52-66)	\$	107,497,979

DUKE ENERGY CAROLINAS, LLC

Docket No. E-7, Sub 1105

Miller Exhibit 2 page 1a

SUMMARY OF REVENUE REQUIREMENT AND
ILLUSTRATIVE BILLING FACTOR ADJUSTMENTS
RELATED TO SEN 68 METER SPLIT AND 75% WEATHER
SAVE-A-WATT VINTAGES 1-4

Line	RESIDENTIAL REVENUE REQUIREMENTS AND BILLING FACTORS	Adjusted	Filed	Difference
	EMF:			
1	Cost and avoided cost portion	\$ 198,429,202	\$ 198,429,202	\$ -
2	Cap effect - Miller Exhibit 7, Line 35	(19,907,033)	(20,366,412)	459,378
3	GRT and Reg Fee	4,488,610	4,487,989	621
4	Net cost and bonus portion	183,010,779	182,550,779	459,999
5	NLR portion	126,985,668	126,985,668	-
6	Gross revenue requirement	309,996,447	309,536,447	459,999
7	Amount collected	(303,898,511)	(303,898,511)	-
8	Net revenue requirement	\$ 6,097,935	\$ 5,637,935	\$ 459,999
9	Forecasted kWh sales, Miller Exhibit 6, page 1	21,321,202,431	21,674,738,000	21,321,202,431
10	Billing factor	\$ 0.000281	\$ 0.000260	\$ 0.000022
11	Total Revised Residential EMF Revenue Requirement	\$ 6,097,935	\$ 5,637,935	\$ 459,999

Note: 2014 estimates are included as filed. Any adjustments to Vintage Year 2014 are shown in Miller Exhibit 2 page 2.

NONRESIDENTIAL REVENUE REQUIREMENTS AND BILLING FACTORS

12	Vintage 1 EE True-up (EMF) Revenue Requirement:			
13	Cost and avoided cost portion	\$ 18,824,786	\$ 18,824,786	\$ -
14	Cap effect, Miller Exhibit 7 Line 36	(2,558,767)	(2,617,814)	59,047
15	GRT and Reg Fee	553,259	553,179	80
16	Net cost and bonus portion	16,819,278	16,760,152	59,126
17	NLR portion	1,963,183	1,963,183	-
18	Gross revenue requirement	18,782,461	18,723,335	59,126
19	Amount collected	(18,109,461)	(18,109,461)	-
20	Net revenue requirement	\$ 673,001	\$ 613,874	\$ 59,126
21	Forecasted kWh sales, Miller Exhibit 6, page 1	21,519,305,625	22,972,364,776	21,519,305,625
22	Billing factor	\$ 0.000029	\$ 0.000027	\$ 0.000003
23	Vintage 1 DSM True-up (EMF) Revenue Requirement			
24	Cost and avoided cost portion	\$ 11,332,673	\$ 11,332,673	\$ -
25	Cap effect, Miller Exhibit 7, Line 37	(1,507,520)	(1,542,308)	34,788
26	GRT and Reg Fee	333,498	333,451	47
27	Net cost and bonus portion	10,158,651	10,123,816	34,835
28	NLR portion	-	-	-
29	Gross revenue requirement	10,158,651	10,123,816	34,835
30	Amount collected	(9,735,234)	(9,735,234)	-
31	Net revenue requirement	\$ 423,417	\$ 388,582	\$ 34,835
32	Forecasted kWh sales, Miller Exhibit 6, page 1	21,357,726,016	22,484,503,238	21,357,726,016
33	Billing factor	\$ 0.000019	\$ 0.000017	\$ 0.000002
34	Vintage 2 EE True-up (EMF) Revenue Requirement			
35	Cost and avoided cost portion, Evans Exhibit 1, page 3, Line 16	\$ 21,897,111	\$ 22,512,602	(615,491)
36	Cap effect, Miller Exhibit 7, Line 36	(2,659,546)	(2,720,918)	61,372
37	GRT and Reg Fee	633,884	634,633	(749)
38	Net cost and bonus portion	19,871,449	20,426,317	(554,867)
39	NLR portion, Evans Exhibit 2, page 1, Line 33	6,500,835	7,122,998	(622,163)
40	Gross revenue requirement	26,372,284	27,549,315	(1,177,031)
41	Amount collected	(24,107,260)	(24,107,260)	-
42	Net revenue requirement	\$ 2,265,024	\$ 3,442,055	\$ (1,177,031)
43	Forecasted kWh sales, Miller Exhibit 6, page 1	22,084,821,944	23,295,755,187	22,084,821,944
44	Billing factor	\$ 0.000097	\$ 0.000148	\$ (0.000053)
45	Vintage 2 DSM True-up (EMF) Revenue Requirement			
46	Cost and avoided cost portion	\$ 12,713,578	\$ 12,713,578	\$ -
47	Cap effect, Miller Exhibit 7, Line 37	(1,692,191)	(1,731,240)	39,049
48	GRT and Reg Fee	374,047	373,994	53
49	Net cost and bonus portion	11,395,435	11,356,332	39,102
50	NLR portion	-	-	-
51	Gross revenue requirement	11,395,435	11,356,332	39,102
52	Amount collected	(10,927,797)	(10,927,797)	-
53	Net revenue requirement	\$ 467,638	\$ 428,535	\$ 39,102
54	Forecasted kWh sales, Miller Exhibit 6, page 1	21,830,486,336	22,950,230,628	21,830,486,336
55	Billing factor	\$ 0.000020	\$ 0.000019	\$ 0.000002

Line		Miller Exhibit 2, page 1b		
56	Vintage 3 EE True-up (EMF) Revenue Requirement			
57	Cost and avoided cost portion, Evans Exhibit 1, page 4, Line 17	\$ 32,759,898	\$ 33,096,739	(336,841)
58	Cap effect, Miller Exhibit 7, Line 36	(4,443,124)	(4,545,655)	102,530
59	GRT and Reg Fee	872,120	872,437	(317)
60	Net cost and bonus portion	29,188,894	29,423,522	(234,627)
61	NLR portion, Evans Exhibit 2, page , Line 52	13,292,107	13,600,940	(308,833)
62	Gross revenue requirement	42,481,001	43,024,462	(543,461)
63	Amount collected	(36,869,399)	(36,869,399)	-
64	Net revenue requirement	\$ 5,611,602	\$ 6,155,063	\$ (543,461)
65	Forecasted kWh sales, Miller Exhibit 6, page 1	22,216,051,130	23,556,939,761	22,216,051,130
66	Billing factor	\$ 0.000238	\$ 0.000261	\$ (0.000024)
67	Vintage 3 DSM True-up (EMF) Revenue Requirement			
68	Cost and avoided cost portion	\$ 14,489,221	\$ 14,489,221	\$ -
69	Cap effect, Miller Exhibit 7, Line 37	(2,035,837)	(2,082,817)	46,979
70	GRT and Reg Fee	405,407	405,343	64
71	Net cost and bonus portion	12,858,790	12,811,747	47,044
72	NLR portion	-	-	-
73	Gross revenue requirement	12,858,790	12,811,747	47,044
74	Amount collected	(13,146,993)	(13,146,993)	-
75	True-up amount before interest	(288,203)	(335,247)	\$ 47,044
76	Interest	(57,641)	(67,049)	9,408
77	Net revenue requirement	\$ (345,844)	\$ (402,296)	\$ 56,452
78	Forecasted kWh sales, Miller Exhibit 6, page 1	21,978,739,156	23,100,220,941	21,978,739,156
79	Billing factor	\$ (0.000015)	\$ (0.000017)	\$ 0.000003
80	Vintage 4 EE True-up (EMF) Revenue Requirement			
81	Cost and avoided cost portion	\$ 31,540,107	\$ 31,540,107	\$ -
82	Cap effect, Miller Exhibit 7, Line 36	(4,161,744)	(4,257,781)	96,037
83	GRT and Reg Fee	659,899	659,769	130
84	Net cost and bonus portion	28,038,262	27,942,095	96,167
85	NLR portion	17,266,084	17,266,084	-
86	Gross revenue requirement	45,304,346	45,208,179	96,167
87	Amount collected	(37,388,248)	(37,388,248)	-
88	Net revenue requirement	\$ 7,916,098	\$ 7,819,931	\$ 96,167
89	Forecasted kWh sales, Miller Exhibit 6, page 1	22,643,596,192	23,966,011,232	22,643,596,192
90	Billing factor	\$ 0.000330	\$ 0.000326	\$ 0.000004
91	Vintage 4 DSM True-up (EMF) Revenue Requirement			
92	Cost and avoided cost portion	\$ 16,813,960	\$ 16,813,960	\$ -
93	Cap effect, Miller Exhibit 7, line 37	(2,301,740)	(2,354,856)	53,115
94	GRT and Reg Fee	510,218	510,146	72
95	Net cost and bonus portion	15,022,438	14,969,250	53,188
96	NLR portion	-	-	-
97	Gross revenue requirement	15,022,438	14,969,250	53,188
98	Amount collected	(14,864,137)	(14,864,137)	-
99	Net revenue requirement	\$ 158,301	\$ 105,113	\$ 53,188
100	Forecasted kWh sales, Miller Exhibit 6, page 1	22,094,321,259	23,215,694,176	22,094,321,259
101	Billing factor	\$ 0.000007	\$ 0.000005	\$ 0.000002
102	Total Revised Vintage 1-4 EMF Revenue Requirement - Non-Residential	\$ 17,169,237	\$ 18,550,858	\$ (1,381,622)
			Total True up	(921,623)

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Year 4 Lost Revenues and True up Year 1 and 2 for Vintage Year 2014

RESIDENTIAL
Energy Efficiency Programs

Line	Reference	Year 2014 Yr 4 LR Estimate
1	Residential EE Program Cost	Evans Exhibit 1 pg. 6, Line 10 * NC Alloc. Factor
2	Residential EE Earned Utility Incentive	Evans Exhibit 1 pg. 6, Line 10 * NC Alloc. Factor
3	Return on undercollection of Residential EE Program Costs	Miller Exhibit 3 pg 1
4	Total EE Program Cost and Incentive Components	Line 1 + Line 2 + line 3
5	Residential DSM Program Cost	Evans Exhibit 1 pg. 6, Line 11 * NC Alloc. Factor
6	Residential DSM Earned Utility Incentive	Evans Exhibit 1 pg. 6, Line 11 * NC Alloc. Factor
7	Return on overcollection of Residential DSM Program Costs	Miller Exhibit 3 pg 2
8	Total DSM Program Cost and Incentive Components	Line 5 + Line 6 + Line 7
9	Total EE/DSM Program Cost and Incentive Components	Line 4 + Line 8
10	Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 6
11	Total EE/DSM Program Cost and Incentive Revenue Requirement	Line 9 * Line 10
12	Residential Net Lost Revenues	Evans Exhibit 2 pg. 4
13	Total Residential EE/DSM Revenue Requirement	Line 11 + Line 12
14	Total Collected for Vintage Year 2014 (through estimated Rider 7)	Miller Exhibit 4 Line 1
15	Total Residential EE/DSM Revenue Requirement	Line 11 + Line 12

E-7 Sub 1031	E-7 Sub 1050	E-7 1073	E-7 Sub 1073	E-7 Sub 1105	
Rider 5 Original Estimate	Rider 6 Year 2 Lost Revenue Estimate	Rider 7 - True up of Year 1	Rider 7 - Estimate of Year 3 Lost Revenue	Rider 8 - True up of Lost Revenues and EM&V	Year 2014
\$ 29,754,660		\$ (1,844,170)		\$ 1	\$ 27,910,491
2,242,156		2,715,537		88,645	5,046,338
		53,935		140,851	194,786
31,996,816		925,302		229,497	33,151,615
13,143,935		(2,535,104)		(0)	10,608,831
3,240,520		(12,767)		(25,251)	3,202,502
		(69,597)		(136,468)	(206,065)
16,384,455		(2,617,468)		(161,719)	13,605,268
48,381,271		(1,692,166)		67,778	46,756,883
1.017953		1.001482		1.001482	
49,249,860		(1,694,674)		67,878	47,623,065
8,435,982	3,810,949	3,065,327	9,895,892	6,287,758	31,495,908
57,685,842	3,810,949	1,370,653	9,895,892	6,355,636	79,118,972
					72,782,226
					\$ 6,336,746

See Miller Exhibit A for rate

NON-RESIDENTIAL
Energy Efficiency Programs

	Reference	Year 2014 Yr 3 LR Estimate
16	Non- Residential EE Program Cost	Evans Exhibit 1 pg. 6, Line 24 * NC Alloc. Factor
17	Non-Residential EE Earned Utility Incentive	Evans Exhibit 1 pg. 6, Line 24 * NC Alloc. Factor
18	Return on undercollection of Non-residential EE Program Costs	Miller Exhibit 3 page 3
19	Total EE Program Cost and Incentive Components	Line 16 + Line 17 + Line 18
20	Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 6
21	Total Non-Residential EE Program Cost and Incentive Revenue Requireme	Line 19 * Line 20
22	Non-Residential Net Lost Revenues	Evans Exhibit 2 pg. 4
23	Total Non-Residential EE Revenue Requirement	Line 21 + Line 22
24	Total Collected for Year 2014 (through Estimated Rider 7)	Miller Exhibit 4 Line 5
25	Non-Residential EE Revenue Requirement True-Up Amount	Line 23 - Line 24
26	Projected NC Residential Sales (kWh)	Miller Exhibit 6, pg. 2, Line 21
27	NC Non-Residential EE billing factor (Cents/kWh)	Line 25/Line 26*100

E-7 Sub 1031	E-7 Sub 1050	E-7 1073	E-7 Sub 1073		
Rider 5 Original Estimate	Rider 6 Year 2 Lost Revenue Estimate	Rider 7 - True up of Year 1	Rider 7 - Estimate of Year 3 Lost Revenue	Rider 8 - True up of Lost Revenues & EM&V	Year 2014
16,206,358		(1,398,648)		(0)	14,807,710
5,782,942		2,021,277		35,872	7,840,091
		94,850		130,948	225,798
21,989,300		717,479		166,819	22,873,598
1.017953		1.001482		1.001482	
22,384,074		718,542		167,067	23,269,683
1,831,641	4,837,353	1,222,389	6,094,150	1,203,734	15,189,267
24,215,715	4,837,353	1,940,931	6,094,150	1,370,800	38,458,949
					37,420,600
					1,038,350
					22,652,526,998
					0.0046

1

DSM Programs

	Reference	
28	Non-Residential DSM Program Cost	Evans Exhibit 1, pg. 6 Line 25 * NC Alloc. Factor
29	Non-Residential DSM Earned Utility Incentive	Evans Exhibit 1, pg. 6 Line 25 * NC Alloc. Factor
30	Return on overcollection of Non-residential DSM Program Costs	Miller Exhibit 3 page 4
31	Total Non-Residential DSM Program Cost and Incentive Components	Line 28 + Line 29 + Line 30
32	Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 6
33	Total Non-Residential DSM Revenue Requirement	Line 31 * Line 32
34	Total Revenue Collected for DSM Programs Year 2014	Miller Exhibit 4 Line 9
35	Non-Residential DSM Revenue Requirement True up Amount	Line 33- Line 34
36	Projected NC Non-Residential Sales (kWh)	Miller Exhibit 6 pg. 2, Line 21
37	NC Non-Residential DSM billing factor	Line 35/Line 36*100

E-7 Sub 1031	E-7 1073	E-7 Sub 1105	
Rider 5 Original Estimate	Rider 7 - True up of Year 1	Rider 8 - True up	Year 2014
15,046,160	(2,195,319)	(0)	12,850,841
3,709,497	200,391	(30,588)	3,879,300
	(19,939)	(82,394)	(102,333)
18,755,657	(2,014,867)	(112,983)	16,627,807
1.017953	1.001482	1.001482	
19,092,377	(2,017,853)	(113,150)	16,961,374
			17,285,335
			(323,961)
			21,944,178,772
			(0.0015)

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Year 3 Lost Revenue and True Up of Year 1 for Vintage Year 2015

RESIDENTIAL
Energy Efficiency Programs

Line		Reference	Year 2015 Yr 3 LR Estimate
1	Residential EE Program Cost	Evans Exhibit 1 pg. 7, Line 10 * NC Alloc. Factor	
2	Residential EE Earned Utility Incentive	Evans Exhibit 1 pg. 7, Line 10 * NC Alloc. Factor	
3	Return on undercollection of Residential EE Program Costs	Miller Exhibit 3 pg 5	
4	Total EE Program Cost and Incentive Components	Line 1 + Line 2 + line 3	
5	Residential DSM Program Cost	Evans Exhibit 1 pg. 7, Line 11 * NC Alloc. Factor	
6	Residential DSM Earned Utility Incentive	Evans Exhibit 1 pg. 7, Line 11 * NC Alloc. Factor	
7	Return on overcollection of Residential DSM Program Costs	Miller Exhibit 3 pg 6	
8	Total DSM Program Cost and Incentive Components	Line 5 + Line 6 + Line 7	
9	Total EE/DSM Program Cost and Incentive Components	Line 4 + Line 8	
10	Revenue-related taxes and regulatory fees factor **	Miller Exhibit 2, pg. 6	
11	Total EE/DSM Program Cost and Incentive Revenue Requirement	Line 9 * Line 10	
12	Residential Net Lost Revenues	Evans Exhibit 2 pg. 4	\$ 8,090,365
13	Total Residential EE/DSM Revenue Requirement	Line 11 + Line 12	8,090,365
14	Total Collected for Vintage Year 2015 (through estimated Rider 7)	Miller Exhibit 4 Line 2	
15	Total Residential EE/DSM Revenue Requirement	Line 11 + Line 12	\$ 8,090,365

NON-RESIDENTIAL
Energy Efficiency Programs

Line		Reference	Year 2015 Yr 3 LR Estimate
16	Non- Residential EE Program Cost	Evans Exhibit 1 pg. 7, Line 25 * NC Alloc. Factor	
17	Non-Residential EE Earned Utility Incentive	Evans Exhibit 1 pg. 7, Line 25 * NC Alloc. Factor	
18	Return on undercollection of Non-residential EE Program Costs	Miller Exhibit 3 page 7	
19	Total EE Program Cost and Incentive Components	Line 16 + Line 17 + Line 18	
20	Revenue-related taxes and regulatory fees factor	Miller Exhibit 3, pg. 7	
21	Total Non-Residential EE Program Cost and Incentive Revenue Requirements	Line 19 * Line 20	
22	Non-Residential Net Lost Revenues	Evans Exhibit 2 pg. 4	9,483,428
23	Total Non-Residential EE Revenue Requirement	Line 21 + Line 22	9,483,428
24	Total Collected for Year 2015 (Rider 5)	Miller Exhibit 4 Line 6	
25	Total Collected for Vintage Year 2015 (through estimated Rider 7)	Line 23 - Line 24	9,483,428
26	Projected NC Residential Sales (kWh)	Miller Exhibit 6, pg. 2, Line 17	22,663,138,747
27	NC Non-Residential EE billing factor (Cents/kWh)	Line 25/Line 26*100	0.0418

DSM Programs

Line		Reference
28	Non-Residential DSM Program Cost	Evans Exhibit 1, pg. 7 Line 26 * NC Alloc. Factor
29	Non-Residential DSM Earned Utility Incentive	Evans Exhibit 1, pg. 7 Line 26 * NC Alloc. Factor
30	Return on overcollection of Non-residential DSM Program Costs	Miller Exhibit 3 page 8
31	Total Non-Residential DSM Program Cost and Incentive Components	Line 28 + Line 29 + Line 30
32	Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 13
33	Total Non-Residential DSM Revenue Requirement	Line 31 * Line 32
34	Total Revenue Collected for DSM Programs Year 2015	Miller Exhibit 4 Line 10
35	Non-Residential EE Revenue Requirement True-up Amount	Line 33- Line 34
36	Projected NC Non-Residential Sales (kWh)	Miller Exhibit 6 pg. 2, Line 17
37	NC Non-Residential DSM billing factor	Line 35/Line 36*100

** Actual regulatory fee rate in effect in year of collection. May differ from original filed estimates.

E-7 Sub 1050	
Rider 6 Original Estimate	Rider 7 Year 2 Lost Revenues True up Year 2015 Year 1
\$ 30,685,449	\$ (2,724,945) \$ 27,960,504
2,374,641	2,431,772 4,806,413
	49,062 49,062
33,060,090	(244,111) 32,815,979
12,532,432	(2,188,543) 10,343,889
3,275,217	(670,147) 2,605,070
	(10,458) (10,458)
15,807,649	(2,869,149) 12,938,500
48,867,739	(3,113,260) 45,754,479
1.001417	1.001482
48,936,985	(3,117,873) 45,819,111
9,169,840	4,071,955 5,563,184 18,804,979
58,106,825	4,071,955 2,445,311 64,624,090
	62,299,118
	\$ 2,324,972

See Miller Exhibit A for rate

E-7 Sub 1050	
Rider 6 Original Estimate	Rider 7 Year 2 Lost Revenues True up Year 2015 Year 1
17,348,807	11,905,884 29,254,691
6,214,226	3,350,818 9,565,044
	457,941 457,941
23,563,033	15,714,643 39,277,676
1.001417	1.001482
23,596,422	15,737,932 39,334,354
2,523,480	8,194,003 2,547,914 13,265,397
26,119,902	8,194,003 18,285,845 52,599,750
	33,985,034
	18,614,716
	22,663,138,747
	0.0821

E-7 Sub 1050	
Rider 6 Original Estimate	True up Year 2015 Year 1
16,493,488	(2,992,379) 13,501,109
4,310,397	(910,193) 3,400,204
	(106,777) (106,777)
20,803,885	(4,009,350) 16,794,535
1.001417	1.001482
20,833,364	(4,015,292) 16,818,072
	19,579,477
	(2,761,404)
	21,706,361,718
	(0.0127)

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Year 2 Lost Revenues for Vintage Year 2016

Miller Exhibit 2, page 4

RESIDENTIAL

Line

- 1 Residential Net Lost Revenues
- 2 Projected NC Residential Sales (kWh)
- 3 **NC Residential EE Billing Factor (Cents/kWh)**

Reference

Evans Exhibit 2 pg. 4 Line 61
Miller Exhibit 6 pg 2
Line 1/Line 2*100

2017

5,723,916
\$ 21,321,202,431
0.0268

NON-RESIDENTIAL

Energy Efficiency Programs

- 4 Non-Residential Net Lost Revenues
- 5 Projected NC Residential Sales (kWh)
- 6 **NC Non-Residential EE billing factor (Cents/kWh)**

Reference

Evans Exhibit 2 pg. 4 Line 75
Miller Exhibit 6, pg. 2
Line 4/Line 5*100

2017

8,309,444
22,256,996,675
0.0373

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Program Costs, Earned Incentive and Lost Revenues for Vintage Year 2017

Miller Exhibit 2, page 5

RESIDENTIAL

Line	Reference	2017
1 Residential EE Program Cost	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	\$ 33,488,974
2 Residential EE Earned Utility Incentive	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	4,149,244
3 Total EE Program Cost and Incentive Components	Line 1 + Line 2, Evans Exhibit 1, Line 10	37,638,218
4 Residential DSM Program Cost	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	10,258,751
5 Residential DSM Earned Utility Incentive	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	2,837,134
6 Total DSM Program Cost and Incentive Components	Line 4 + Line 5, Evans Exhibit 1, Line 11	13,095,886
7 Total EE/DSM Program Cost and Incentive Components	Line 3 + Line 6	50,734,104
8 Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 6	1.001482
9 Total EE/DSM Program Cost and Incentive Revenue Requirement	Line 7 * Line 8	50,809,292
10 Residential Net Lost Revenues	Evans Exhibit 2 pg. 4 Line 87	12,699,119
11 Total Residential EE Revenue Requirement	Line 9 + Line 10	\$ 63,508,411
	See Miller Exhibit 1 for rate	

NON-RESIDENTIAL Energy Efficiency Programs

	Reference	2017
12 Non- Residential EE Program Cost	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	\$ 38,791,601
13 Non-Residential EE Earned Utility Incentive	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	9,347,504
14 Total EE Program Cost and Incentive Components	Line 12 + Line 13, Evans Exhibit 1, Line 24	48,139,105
15 Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 6	1.001482
16 Total Non-Residential EE Program Cost and Incentive Revenue Requirements	Line 14 * Line 15	48,210,448
17 Non-Residential Net Lost Revenues	Evans Exhibit 2 pg. 4 Line 103	6,039,892
18 Total Non-Residential EE Revenue Requirement	Line 16 + Line 17	\$ 54,250,339
19 Projected NC Residential Sales (kWh)	Miller Exhibit 6, pg. 2, Line 21	22,256,996,675
20 NC Non-Residential EE billing factor (Cents/kWh)	Line 18/Line 19*100	0.2437

DSM Programs

		2017
21 Non-Residential DSM Program Cost	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	\$ 13,389,985
22 Non-Residential DSM Earned Utility Incentive	Evans Exhibit 1, pg. 8 * NC Alloc. Factor	3,703,101
23 Total Non-Residential DSM Program Cost and Incentive Components	Line 21 + Line 22, Evans Exhibit 1, Line 25	17,093,085
24 Revenue-related taxes and regulatory fees factor	Miller Exhibit 2, pg. 13	1.001482
25 Total Non-Residential DSM Revenue Requirement	Line 23 * Line 24	17,118,417
26 Projected NC Non-Residential Sales (kWh)	Miller Exhibit 6, pg. 2, Line 21	21,706,200,959
27 NC Non-Residential DSM billing factor	Line 25/Line 26*100	0.0789

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Gross Receipts Tax Years 2014 through estimated 2017

	<u>Year</u>		<u>Actual GRT Rate In Effect</u>
	2014	Jan - June	1.034554
		July - Dec	1.001352
Rider 5	2014	Weighted Average	1.017953
	2015	Jan - June	1.001352
		July - Dec	1.001482
Rider 6	2015	Weighted Average	1.001417
Rider 7	2016		1.001482
Rider 8	2017		1.001482

Note: the current rate is used as the estimate for 2016 and 2017. This will be subject to true-up based on actual rates in effect.

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation - Residential EE Programs Vintage 2014

		Residential EE Program Costs	NC Allocated EE Program Costs	NC Residential Revenue Collected(EEC2)	NC Residential EE Program Collection %	EE Program Costs Revenue Collected	(Over)/Under Collection	
NC Residential EE		Incurred	NC Allocation %					
		Miller Exhibit 5 pg. 1, Line 4			PY calculation			
Beginning Balance - source f		38,254,486	72.9600473%	27,910,491	41,513,726	62.0990603%	25,779,634	2,130,857
2015	January		72.9600473%	-		-	-	
2015	February		72.9600473%	-		-	-	
2015	March		72.9600473%	-		-	-	
2015	April		72.9600473%	-		-	-	
2015	May		72.9600473%	-		-	-	
2015	June		72.9600473%	-		-	-	
2015	July		72.9600473%	-		-	-	
2015	August		72.9600473%	-		-	-	
2015	September		72.9600473%	-		-	-	
2015	October		72.9600473%	-		-	-	
2015	November		72.9600473%	-		-	-	
2015	December		72.9600473%	-		-	-	
		-		-				

EE Program Costs	-
EE Revenue Requirement	3,810,949
% Revenue related to Program Costs	0%
Note: Vintage Year 2014 collections in 2015 stem from Rider 6. Rider 6 only had an estimate for Year 2 lost revenues to be collected. Therefore, no funds received are allocated toward program costs.	

NC Residential EE	Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
		2015				7.02%			0.654765	
Beginning Balance - Rider 7	2,130,857	0.383471		817,122	1,313,735					
2015 January	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	7,685	0.654765	11,738
2015 February	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	15,371	0.654765	23,475
2015 March	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	23,056	0.654765	35,213
2015 April	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	30,741	0.654765	46,950
2015 May	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	38,427	0.654765	58,688
2015 June	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	46,112	0.654765	70,425
2015 July	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	53,797	0.654765	82,163
2015 August	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	61,483	0.654765	93,901
2015 September	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	69,168	0.654765	105,638
2015 October	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	76,854	0.654765	117,376
2015 November	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	84,539	0.654765	129,113
2015 December	2,130,857	0.349155	-	817,122	1,313,735	0.005850	7,685	92,224	0.654765	140,851
							92,224			140,851

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation - Residential DSM Programs Vintage 2014

NC Residential DSM		Total System NC DSM Program Costs Incurred	NC Residential DSM Allocation %	NC Allocated DSM Residential Program Costs	NC Residential Revenue Collected(EEC2)	NC Residential DSM Program Collection %	DSM Program Costs Revenue Collected	(Over)/Under Collection
		Miller Exhibit 5, pg 1 Line 9			PY calculation			
Beginning Balance - from Ri		31,183,185	34.0209980%	10,608,831	16,876,548	75.0945971%	12,673,376	(2,064,545)
2015	January		34.0209980%	-		0.0000000%	-	-
2015	February		34.0209980%	-		0.0000000%	-	-
2015	March		34.0209980%	-		0.0000000%	-	-
2015	April		34.0209980%	-		0.0000000%	-	-
2015	May		34.0209980%	-		0.0000000%	-	-
2015	June		34.0209980%	-		0.0000000%	-	-
2015	July		34.0209980%	-		0.0000000%	-	-
2015	August		34.0209980%	-		0.0000000%	-	-
2015	September		34.0209980%	-		0.0000000%	-	-
2015	October		34.0209980%	-		0.0000000%	-	-
2015	November		34.0209980%	-		0.0000000%	-	-
2015	December		34.0209980%	-		0.0000000%	-	-
		-		-	-			

Note: No true up was included in Rider 6 for 2014 DSM costs.
Therefore, no revenue was returned to the customer in 2015.
as part of the residential tariff rates.
Interest will continue to be calculated at original over-collected balance.

NC Residential DSM		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
		2015					7.02%		1-.345235	
Beginning Balance - from Ri		(2,064,545)	0.383471		(791,693)	(1,272,852)				
2015	January	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(11,372)
2015	February	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(22,745)
2015	March	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(34,117)
2015	April	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(45,489)
2015	May	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(56,862)
2015	June	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(68,234)
2015	July	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(79,606)
2015	August	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(90,978)
2015	September	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(102,351)
2015	October	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(113,723)
2015	November	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(7,446)	0.654765	(125,095)
2015	December	(2,064,545)	0.349155	-	(791,693)	(1,272,852)	0.005850	(89,354)	0.654765	(136,468)
							(89,354)			(136,468)

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation - Non- Residential EE Programs Vintage 2014

NC Non- Residential EE		Non-Residential EE Program Costs Incurred	NC Allocation %	NC Allocated EE Program Costs	NC Residential Revenue Collected(EEC14)	NC Non- Residential EE Program Collection %	Non-Residential EE Program Costs Revenue Collected	(Over)/Under Collection
		Miller Exhibit 5. pg 1, Line 4			See calc. at right			
Beginning Balance - from Rider 7		20,295,644	0.729600473	14,807,711	22,574,937	56.818171%	12,826,666	1,981,045
2015	January		72.9600473%	-		0.0000000%	-	-
2015	February		72.9600473%	-		0.0000000%	-	-
2015	March		72.9600473%	-		0.0000000%	-	-
2015	April		72.9600473%	-		0.0000000%	-	-
2015	May		72.9600473%	-		0.0000000%	-	-
2015	June		72.9600473%	-		0.0000000%	-	-
2015	July		72.9600473%	-		0.0000000%	-	-
2015	August		72.9600473%	-		0.0000000%	-	-
2015	September		72.9600473%	-		0.0000000%	-	-
2015	October		72.9600473%	-		0.0000000%	-	-
2015	November		72.9600473%	-		0.0000000%	-	-
2015	December		72.9600473%	-		0.0000000%	-	-
		-		-	-		-	-

2015 Revenue Requirement	
Non-Res EE Program Costs	-
Non-Res EE Revenue Requirement	4,837,353
% Revenue related to Program Costs	0%
Note: Vintage Year 2014 collections in 2015 stem from Rider 6. Rider 6 only had an estimate for Year 2 lost revenues to be collected. Therefore, no funds received are allocated toward program costs.	

NC Non-Residential EE		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
		2015			7.02%			1 - .345235			
Beginning Balance - From Rider 7		1,981,045	0.383471		759,673	1,221,372		58,887			
2015	January	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	7,145	0.654765	10,912
2015	February	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	14,290	0.654765	21,825
2015	March	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	21,435	0.654765	32,737
2015	April	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	28,580	0.654765	43,649
2015	May	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	35,725	0.654765	54,562
2015	June	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	42,870	0.654765	65,474
2015	July	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	50,015	0.654765	76,386
2015	August	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	57,160	0.654765	87,299
2015	September	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	64,305	0.654765	98,211
2015	October	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	71,450	0.654765	109,124
2015	November	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	78,595	0.654765	120,036
2015	December	1,981,045	0.349155	-	759,673	1,221,372	0.005850	7,145	85,740	0.654765	130,948
								85,740			130,948

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation -Non - Residential DSM Programs Vintage 2014

		Total System NC DSM Program Costs Incurred	NC Non- Residential DSM Allocation %	NC Allocated DSM Non-Residential Program Costs	Incentives Earned & GRT remitted (Allocated based on WA of Program Costs Incurred)	Total DSM Revenue Requirement	NC Non-Residential DSM Revenue Collected(DS14)	NC Non-Residential DSM Program Collection %	Non-Residential DSM Program Costs Revenue Collected	(Over)/Under Collection
NC Non- Residential DSM										
			See Miller Exhibit 5 pg. 1, Line 10		calculated interest on entire balance due to over- collection in total			100% used due to over-collection of entire vintage		
Beginning Balance - from Rider 7		31,183,185	41.2108021%	12,850,841	4,243,911	17,094,752	18,087,702	100.0000000%	(18,087,702)	(992,950)
2015	January		41.2108021%	-		-	335,385	100.0000000%	(335,385)	(335,385)
2015	February		41.2108021%	-		-	(3,303)	100.0000000%	3,303	3,303
2015	March		41.2108021%	-		-	(68,621)	100.0000000%	68,621	68,621
2015	April		41.2108021%	-		-	(34,057)	100.0000000%	34,057	34,057
2015	May		41.2108021%	-		-	15	100.0000000%	(15)	(15)
2015	June		41.2108021%	-		-	(17)	100.0000000%	17	17
2015	July		41.2108021%	-		-	190	100.0000000%	(190)	(190)
2015	August		41.2108021%	-		-	23	100.0000000%	(23)	(23)
2015	September		41.2108021%	-		-	191	100.0000000%	(191)	(191)
2015	October		41.2108021%	-		-	(145)	100.0000000%	145	145
2015	November		41.2108021%	-		-	(80)	100.0000000%	80	80
2015	December		41.2108021%	-		-	-	100.0000000%	-	-
		-		-	-	-	229,580			(1,222,530)

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
NC Non-Residential DSM			2015 tax rate				7.02%			1 - .345235	
		(992,950)	0.383471	(380,768)	(380,768)	(612,182)					
2015	January	(1,328,335)	0.349155	(117,101)	(497,869)	(830,466)	0.005850	(4,220)	(4,220)	0.654765	(6,445)
2015	February	(1,325,032)	0.349155	1,153	(496,715)	(828,316)	0.005850	(4,852)	(9,072)	0.654765	(13,855)
2015	March	(1,256,410)	0.349155	23,960	(472,756)	(783,654)	0.005850	(4,715)	(13,787)	0.654765	(21,056)
2015	April	(1,222,353)	0.349155	11,891	(460,865)	(761,488)	0.005850	(4,520)	(18,306)	0.654765	(27,958)
2015	May	(1,222,368)	0.349155	(5)	(460,870)	(761,498)	0.005850	(4,455)	(22,761)	0.654765	(34,762)
2015	June	(1,222,351)	0.349155	6	(460,864)	(761,487)	0.005850	(4,455)	(27,216)	0.654765	(41,566)
2015	July	(1,222,541)	0.349155	(66)	(460,931)	(761,611)	0.005850	(4,455)	(31,671)	0.654765	(48,370)
2015	August	(1,222,564)	0.349155	(8)	(460,938)	(761,626)	0.005850	(4,455)	(36,126)	0.654765	(55,174)
2015	September	(1,222,755)	0.349155	(67)	(461,005)	(761,750)	0.005850	(4,456)	(40,582)	0.654765	(61,980)
2015	October	(1,222,609)	0.349155	51	(460,954)	(761,655)	0.005850	(4,456)	(45,038)	0.654765	(68,785)
2015	November	(1,222,530)	0.349155	28	(460,926)	(761,603)	0.005850	(4,456)	(49,494)	0.654765	(75,590)
2015	December	(1,222,530)	0.349155	-	(460,926)	(761,603)	0.005850	(4,455)	(53,949)	0.654765	(82,394)
								(53,949)			(82,394)

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation - Residential EE Programs Vintage 2015

NC Residential EE		Residential EE Program Costs Incurred	NC Allocation %	NC Allocated EE Program Costs	NC Residential Revenue Collected(EEC2)	NC Residential EE Program Collection %	EE Program Costs Revenue Collected	(Over)/Under Collection
		Miller Exhibit 5 pg. 2, Line 4			see calc. at right			
2015	January	2,831,100	72.9564706%	2,065,470	2,050,382	58.8068%	(1,205,765)	859,706
2015	February	2,794,544	72.9564706%	2,038,800	4,437,037	58.8068%	(2,609,281)	(570,481)
2015	March	4,057,474	72.9564706%	2,960,190	4,811,035	58.8068%	(2,829,217)	130,973
2015	April	1,528,490	72.9564706%	1,115,132	2,940,487	58.8068%	(1,729,207)	(614,075)
2015	May	3,906,384	72.9564706%	2,849,960	2,691,519	58.8068%	(1,582,797)	1,267,163
2015	June	2,950,300	72.9564706%	2,152,434	3,841,806	58.8068%	(2,259,244)	(106,810)
2015	July	3,517,104	72.9564706%	2,565,955	4,891,966	58.8068%	(2,876,810)	(310,855)
2015	August	3,225,812	72.9564706%	2,353,439	4,634,878	58.8068%	(2,725,625)	(372,186)
2015	September	3,073,973	72.9564706%	2,242,662	3,902,014	58.8068%	(2,294,651)	(51,989)
2015	October	3,685,106	72.9564706%	2,688,523	2,775,756	58.8068%	(1,632,334)	1,056,189
2015	November	3,224,679	72.9564706%	2,352,612	2,784,195	58.8068%	(1,637,297)	715,315
2015	December	3,529,947	72.9564706%	2,575,325	5,877,004	58.8068%	(3,456,080)	(880,755)
		38,324,913		27,960,504	45,638,078			1,122,196

EE Program Costs	27,960,504
EE Revenue Requirement	47,546,353
% Revenue related to Program Costs	58.8068%

NC Residential EE		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
		2015 tax rate					7.02%				
2015	January	859,706	0.349155	300,171	300,171	559,535	0.005850	1,637	1,637	0.654765	2,500
2015	February	289,225	0.349155	(199,186)	100,984	188,241	0.005850	2,187	3,824	0.654765	5,840
2015	March	420,198	0.349155	45,730	146,714	273,484	0.005850	1,351	5,174	0.654765	7,903
2015	April	(193,877)	0.349155	(214,407)	(67,693)	(126,184)	0.005850	431	5,605	0.654765	8,561
2015	May	1,073,286	0.349155	442,436	374,743	698,543	0.005850	1,674	7,279	0.654765	11,118
2015	June	966,476	0.349155	(37,293)	337,450	629,026	0.005850	3,883	11,163	0.654765	17,048
2015	July	655,621	0.349155	(108,537)	228,913	426,708	0.005850	3,088	14,251	0.654765	21,764
2015	August	283,435	0.349155	(129,951)	98,963	184,472	0.005850	1,788	16,038	0.654765	24,495
2015	September	231,447	0.349155	(18,152)	80,811	150,636	0.005850	980	17,018	0.654765	25,992
2015	October	1,287,636	0.349155	368,774	449,585	838,051	0.005850	2,892	19,910	0.654765	30,408
2015	November	2,002,951	0.349155	249,756	699,340	1,303,611	0.005850	6,264	26,175	0.654765	39,976
2015	December	1,122,196	0.349155	(307,520)	391,820	730,376	0.005850	5,949	32,124	0.654765	49,062
								32,124			49,062

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation - Residential DSM Programs Vintage 2015

		Total System NC DSM Program Costs Incurred	NC Residential DSM Allocation %	NC Allocated DSM Residential Program Costs	NC Residential Revenue Collected(EEC2)	NC Residential DSM Program Collection %	DSM Program Costs Revenue Collected	(Over)/Under Collection
NC Residential DSM		Miller Exhibit 5, pg 2 Line 9						
		See calc. at right						
2015	January	1,843,929	32.5218612%	599,680	565,590	79.7701233%	(451,172)	148,508
2015	February	1,685,602	32.5218612%	548,189	1,223,939	79.7701233%	(976,338)	(428,149)
2015	March	1,756,708	32.5218612%	571,314	1,327,105	79.7701233%	(1,058,633)	(487,319)
2015	April	1,457,079	32.5218612%	473,869	811,122	79.7701233%	(647,033)	(173,164)
2015	May	3,137,241	32.5218612%	1,020,289	742,445	79.7701233%	(592,249)	428,040
2015	June	1,853,889	32.5218612%	602,919	1,059,747	79.7701233%	(845,362)	(242,442)
2015	July	4,208,050	32.5218612%	1,368,536	1,349,430	79.7701233%	(1,076,442)	292,095
2015	August	3,634,366	32.5218612%	1,181,963	1,278,513	79.7701233%	(1,019,871)	162,092
2015	September	4,327,444	32.5218612%	1,407,365	1,076,355	79.7701233%	(858,610)	548,755
2015	October	3,689,853	32.5218612%	1,200,009	765,681	79.7701233%	(610,785)	589,224
2015	November	1,867,140	32.5218612%	607,229	768,009	79.7701233%	(612,642)	(5,413)
2015	December	2,344,656	32.5218612%	762,526	1,621,149	79.7701233%	(1,293,192)	(530,667)
		31,805,956		10,343,889	12,589,085		(10,042,329)	301,560

DSM Program Costs	10,343,889
DSM Revenue Requirement	12,967,122
% Revenue related to Program Costs	80%

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
NC Residential DSM											
		2015			7.02%			1-.345235			
2015	January	148,508	0.349155	51,852	51,852	96,656	0.005850	283	283	0.654765	432
2015	February	(279,640)	0.349155	(149,490)	(97,638)	(182,002)	0.005850	(250)	33	0.654765	51
2015	March	(766,960)	0.349155	(170,150)	(267,788)	(499,172)	0.005850	(1,992)	(1,959)	0.654765	(2,992)
2015	April	(940,123)	0.349155	(60,461)	(328,249)	(611,875)	0.005850	(3,250)	(5,209)	0.654765	(7,956)
2015	May	(512,083)	0.349155	149,452	(178,796)	(333,287)	0.005850	(2,765)	(7,974)	0.654765	(12,178)
2015	June	(754,526)	0.349155	(84,650)	(263,446)	(491,079)	0.005850	(2,411)	(10,385)	0.654765	(15,861)
2015	July	(462,431)	0.349155	101,986	(161,460)	(300,971)	0.005850	(2,317)	(12,702)	0.654765	(19,399)
2015	August	(300,339)	0.349155	56,595	(104,865)	(195,474)	0.005850	(1,452)	(14,154)	0.654765	(21,617)
2015	September	248,416	0.349155	191,601	86,736	161,680	0.005850	(99)	(14,253)	0.654765	(21,768)
2015	October	837,640	0.349155	205,730	292,466	545,174	0.005850	2,068	(12,185)	0.654765	(18,610)
2015	November	832,227	0.349155	(1,890)	290,576	541,651	0.005850	3,179	(9,006)	0.654765	(13,755)
2015	December	301,560	0.349155	(185,285)	105,291	196,269	0.005850	2,158	(6,848)	0.654765	(10,458)
							(6,848)		(10,458)		

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation - Non- Residential EE Programs Vintage 2015

NC Non- Residential EE		Non-Residential EE Program Costs	NC Allocation %	NC Allocated EE	NC Residential	NC Non- Residential EE	Non-Residential EE Program Costs	(Over)/Under Collection
		Incurred		Program Costs	Revenue Collected(EEC15)	Program Collection %	Revenue Collected	
		Miller Exhibit 5. pg 2, Line 4			See calc. at right			
2015	January	1,951,993	72.9564706%	1,424,105	926,067	66.5679256%	(616,463)	807,642
2015	February	4,884,453	72.9564706%	3,563,524	2,031,427	66.5679256%	(1,352,279)	2,211,246
2015	March	3,338,657	72.9564706%	2,435,766	2,086,992	66.5679256%	(1,389,268)	1,046,498
2015	April	3,356,411	72.9564706%	2,448,719	2,009,870	66.5679256%	(1,337,929)	1,110,790
2015	May	3,414,009	72.9564706%	2,490,740	1,986,868	66.5679256%	(1,322,617)	1,168,123
2015	June	3,559,236	72.9564706%	2,596,693	2,654,937	66.5679256%	(1,767,336)	829,357
2015	July	3,085,033	72.9564706%	2,250,731	2,552,944	66.5679256%	(1,699,442)	551,289
2015	August	3,326,554	72.9564706%	2,426,936	2,515,794	66.5679256%	(1,674,712)	752,225
2015	September	2,952,705	72.9564706%	2,154,190	2,385,291	66.5679256%	(1,587,839)	566,351
2015	October	3,316,328	72.9564706%	2,419,476	2,023,365	66.5679256%	(1,346,912)	1,072,564
2015	November	2,825,062	72.9564706%	2,061,066	2,127,202	66.5679256%	(1,416,034)	645,031
2015	December	4,088,390	72.9564706%	2,982,745	2,490,273	66.5679256%	(1,657,723)	1,325,022
		40,098,830		29,254,691	25,791,031		(17,168,554)	12,086,137

Non-Res EE Program Costs	29,254,691
Non-Res EE Revenue Requirement	43,947,128
% Revenue related to Program Costs	67%

NC Non-Residential EE		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly A/T Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
		2015					7.02%			1 - .345235	
2015	January	807,642	0.349155	281,992.30	281,992	525,650	0.005850	1,538	1,538	0.654765	2,348
2015	February	3,018,888	0.349155	772,067.44	1,054,060	1,964,828	0.005850	7,285	8,822	0.654765	13,474
2015	March	4,065,386	0.349155	365,390.16	1,419,450	2,645,936	0.005850	13,486	22,309	0.654765	34,071
2015	April	5,176,176	0.349155	387,837.99	1,807,288	3,368,889	0.005850	17,593	39,902	0.654765	60,941
2015	May	6,344,300	0.349155	407,856.04	2,215,144	4,129,156	0.005850	21,932	61,834	0.654765	94,437
2015	June	7,173,656	0.349155	289,574.00	2,504,718	4,668,938	0.005850	25,734	87,568	0.654765	133,740
2015	July	7,724,945	0.349155	192,485.31	2,697,203	5,027,742	0.005850	28,363	115,931	0.654765	177,057
2015	August	8,477,170	0.349155	262,643.02	2,959,846	5,517,324	0.005850	30,844	146,775	0.654765	224,165
2015	September	9,043,521	0.349155	197,744.20	3,157,590	5,885,930	0.005850	33,355	180,130	0.654765	275,106
2015	October	10,116,084	0.349155	374,490.96	3,532,081	6,584,003	0.005850	36,475	216,604	0.654765	330,812
2015	November	10,761,115	0.349155	225,215.81	3,757,297	7,003,818	0.005850	39,744	256,349	0.654765	391,513
2015	December	12,086,137	0.349155	462,637.94	4,219,935	7,866,202	0.005850	43,495	299,844	0.654765	457,941
							299,844				457,941

Duke Energy Carolinas, LLC
Docket No. E-7, Sub 1105
Estimated Return Calculation -Non - Residential DSM Programs Vintage 2015

		Total System NC DSM Program Costs Incurred	NC Non- Residential DSM Allocation %	NC Allocated DSM Non-Residential Program Costs	Incentives Earned & GRT remitted (Allocated based on WA of Program Costs Incurred)	Total DSM Revenue Requirement	NC Non-Residential DSM Revenue Collected(DS15)	NC Non-Residential DSM Program Collection %	Non-Residential DSM Program Costs Revenue Collected	(Over)/Under Collection
NC Non- Residential DSM										
			See Miller Exhibit 5 pg. 2, Line 10		calculated interest on entire balance due to over- collection in total			100% used due to over-collection of entire vintage		
2015	January	1,843,929	42.4483655%	782,718	198,498	981,216	707,247	100.0000000%	(707,247)	273,969
2015	February	1,685,602	42.4483655%	715,510	181,454	896,965	1,544,765	100.0000000%	(1,544,765)	(647,800)
2015	March	1,756,708	42.4483655%	745,694	189,109	934,803	1,565,944	100.0000000%	(1,565,944)	(631,141)
2015	April	1,457,079	42.4483655%	618,506	156,854	775,360	1,512,715	100.0000000%	(1,512,715)	(737,355)
2015	May	3,137,241	42.4483655%	1,331,707	337,723	1,669,430	1,518,790	100.0000000%	(1,518,790)	150,640
2015	June	1,853,889	42.4483655%	786,945	199,570	986,516	2,033,460	100.0000000%	(2,033,460)	(1,046,944)
2015	July	4,208,050	42.4483655%	1,786,249	452,995	2,239,244	1,937,781	100.0000000%	(1,937,781)	301,463
2015	August	3,634,366	42.4483655%	1,542,729	391,238	1,933,967	1,910,721	100.0000000%	(1,910,721)	23,246
2015	September	4,327,444	42.4483655%	1,836,929	465,848	2,302,777	1,811,343	100.0000000%	(1,811,343)	491,434
2015	October	3,689,853	42.4483655%	1,566,282	397,211	1,963,494	1,577,080	100.0000000%	(1,577,080)	386,414
2015	November	1,867,140	42.4483655%	792,571	200,997	993,568	1,605,598	100.0000000%	(1,605,598)	(612,030)
2015	December	2,344,656	42.4483655%	995,268	252,401	1,247,669	1,854,034	100.0000000%	(1,854,034)	(606,365)
		31,805,956		13,501,109	3,423,899	16,925,008	19,579,477			(2,654,469)

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
NC Non-Residential DSM			2015 tax rate				7.02%			1 - .345235	
2015	January	273,969	0.349155	95,658	95,658	178,311	0.005850	522	522	0.654765	797
2015	February	(373,831)	0.349155	(226,183)	(130,525)	(243,306)	0.005850	(190)	331	0.654765	506
2015	March	(1,004,972)	0.349155	(220,366)	(350,891)	(654,081)	0.005850	(2,625)	(2,293)	0.654765	(3,503)
2015	April	(1,742,327)	0.349155	(257,451)	(608,342)	(1,133,985)	0.005850	(5,230)	(7,524)	0.654765	(11,490)
2015	May	(1,591,687)	0.349155	52,597	(555,745)	(1,035,941)	0.005850	(6,347)	(13,871)	0.654765	(21,184)
2015	June	(2,638,631)	0.349155	(365,546)	(921,291)	(1,717,340)	0.005850	(8,053)	(21,924)	0.654765	(33,484)
2015	July	(2,337,168)	0.349155	105,257	(816,034)	(1,521,134)	0.005850	(9,473)	(31,396)	0.654765	(47,951)
2015	August	(2,313,921)	0.349155	8,117	(807,917)	(1,506,004)	0.005850	(8,854)	(40,251)	0.654765	(61,474)
2015	September	(1,822,487)	0.349155	171,587	(636,331)	(1,186,157)	0.005850	(7,875)	(48,125)	0.654765	(73,500)
2015	October	(1,436,074)	0.349155	134,918	(501,412)	(934,661)	0.005850	(6,203)	(54,329)	0.654765	(82,974)
2015	November	(2,048,104)	0.349155	(213,693)	(715,106)	(1,332,998)	0.005850	(6,633)	(60,962)	0.654765	(93,105)
2015	December	(2,654,469)	0.349155	(211,715)	(926,821)	(1,727,648)	0.005850	(8,952)	(69,914)	0.654765	(106,777)
								(69,914)			(106,777)

Duke Energy Carolinas, LLC
DSM/EE Actual Revenues Collected from Years 2014-2015 (By Vintage)
and Estimated 2016 Collections from Rider 7 (by Vintage)
Docket Number E-7, Sub 1105
For Vintage Year 2014-2017 Estimate and True Up Calculations

			Actual 2014 Rider 5	Actual 2015 Rider 6	Estimate 2016 Rider 7	⁽¹⁾	Total
Residential							
Line		Vintage					
1	EE/DSM	Year 2014	58,390,274	3,829,621	10,562,332		72,782,226
2		Year 2015		58,227,163	4,071,955		62,299,118
3		Year 2016			58,886,406		58,886,406
4	Total Residential		\$ 58,390,274	\$ 62,056,784	\$ 73,520,693		\$ 193,967,751
Non-Residential							
5	EE	Year 2014	22,574,937	5,169,897	9,675,766		37,420,600
6		Year 2015	-	25,791,031	8,194,003		33,985,034
7		Year 2016			51,408,650		51,408,650
8							
9	DSM	Year 2014	18,087,702	210,549	(1,012,916)		17,285,335
10		Year 2015		19,579,477			19,579,477
11		Year 2016			16,375,648		16,375,648
12							
13	Total Non-Residential		\$ 40,662,639	\$ 50,750,953	\$ 84,641,151		\$ 176,054,743
14	Total Revenue		\$ 99,052,912	\$ 112,807,737	\$ 158,161,844		\$ 370,022,494

⁽¹⁾ Rider 7 estimates are based on Rider 7 E-7 Sub 1073

Duke Energy Carolinas, LLC
Vintage Year 2014 Allocation for the Period January 1, 2014
Docket Number E-7, Sub 1105
Allocation Factors

			MWH			
				NC	SC	Total
Line	New Mechanism Sales Allocator at Generator					
1	NC Retail MWH Sales Allocation	Company Records	58,149,791			
2	SC Retail MWH Sales Allocation	Company Records	21,551,077			
3	Total Retail	Line 1 + Line 2	79,700,868			
Allocation 1 to state based on kWh sales						
4	NC Retail	Line 1 / Line 3	72.9600473%			
Demand Allocators						
5	Residential	Company Records	5,051,778	1,502,084	6,553,862	
6	Non Residential	Company Records	6,119,392	2,175,746	8,295,138	
7	Total	Line 5 + Line 6	11,171,170	3,677,830	14,849,000	
Allocation 2 to state based on peak demand						
8	NC Retail	Line 7, NC / Line 7 Total	75.2318001%			
Allocation 3 NC res vs non-res Peak Demand to retail system peak						
9	NC Residential	Line 5 NC/ Line 7 Total	34.0209980%			
10	NC Non-residential	Line 6 NC/ Line 7 Total	41.2108021%			

Duke Energy Carolinas, LLC
Vintage Year 2015-Vintage Year 2017 Allocation Factors for the Period January 1, 2015 to December 31, 2017
Docket Number E-7, Sub 1105
Allocation Factors

			MWH		
				NC	SC
				Total	
Line	New Mechanism Sales Allocator at Generator				
1	NC Retail MWH Sales Allocation	Company Records	59,567,575		
2	SC Retail MWH Sales Allocation	Company Records	22,080,529		
3	Total Retail	Line 1 + Line 2	81,648,104		
Allocation 1 to state based on kWh sales					
4	NC Retail	Line 1 / Line 3	72.9564706%		
Demand Allocators					
5	Residential	Company Records	4,994,057	1,469,714	6,463,771
6	Non Residential	Company Records	6,518,371	2,373,858	8,892,229
7	Total	Line 5 + Line 6	11,512,428	3,843,572	15,356,000
Allocation 2 to state based on peak demand					
8	NC Retail	Line 7, NC / Line 7 Total	74.9702266%		
Allocation 3 NC res vs non-res Peak Demand to retail system peak					
9	NC Residential	Line 5 NC/ Line 7 Total	32.5218612%		
10	NC Non-residential	Line 6 NC/ Line 7 Total	42.4483655%		

NOTE: These allocation factors are used for vintages 2015-2017 based on the most recently filed Cost of Service Study (May 2015)

Duke Energy Carolinas, LLC
DSM/EE Cost Recovery Rider 7
Docket Number E-7 Sub 1105
Forecasted 2017 kWh Sales for Rate Period for SAW Vintages 1-4 True up

Total 2017

Fall 2015 Sales Forecast - kWhs

North Carolina Retail:

Line

1	Residential	21,321,202,431
2	Non-Residential	36,616,918,489
3	Total Retail	57,938,120,920

Opt Out Sales

2015 kwh usage

Vintage 1 Opt Out		
4	EE	15,097,612,864
5	DSM	15,259,192,473
Vintage 2 Opt Out		
6	EE	14,532,096,545
7	DSM	14,786,432,153
Vintage 3 Opt Out		
8	EE	14,400,867,359
9	DSM	14,638,179,333
Vintage 4 Opt Out		
10	EE	13,973,322,297
11	DSM	14,522,597,230

Non-Residential Forecast Sales Less Opt Out

	V1 EE Rate Components	V1 DSM Rate Components	V2 EE Rate Components	V2 DSM Rate Components	V3 EE Rate Components	V3 DSM Rate Components	V4 EE Rate Components	V4 DSM Rate Components
12 Total Non-Residential	36,616,918,489	36,616,918,489	36,616,918,489	36,616,918,489	36,616,918,489	36,616,918,489	36,616,918,489	36,616,918,489
13 Less V1 EE Opt Out	15,097,612,864							
14 Less V1 DSM Opt Out		15,259,192,473						
15 Less V2 EE Opt Out			14,532,096,545					
16 Less V2 DSM Opt Out				14,786,432,153				
17 Less V3 EE Opt Out					14,400,867,359			
18 Less V3 DSM Opt Out						14,638,179,333		
19 Less V4 EE Opt Out							13,973,322,297	
20 Less V4 DSM Opt Out								14,522,597,230
21 Sales for Rider Calculation	21,519,305,625	21,357,726,016	22,084,821,944	21,830,486,336	22,216,051,130	21,978,739,156	22,643,596,192	22,094,321,259

Duke Energy Carolinas, LLC
DSM/EE Cost Recovery Rider 8
Docket Number E-7 Sub 1105
Forecasted 2017 kWh Sales for Rate Period for Vintage Years 2014-2017

		Total 2017							
Fall 2015 Sales Forecast - kWhs									
North Carolina Retail:									
Line									
1	Residential	21,321,202,431							
2	Non-Residential	35,885,264,168							
3	Total Retail	57,209,387,545							
Opt Out Sales									
		2015 kWh Usage							
	Vintage 2014 Actual Opt Out								
4	EE	13,232,737,170							
5	DSM	13,941,085,396							
	Vintage 2015 Actual Opt Out								
6	EE	13,222,125,421							
7	DSM	14,178,902,450							
	Vintage 2016 Estimated Opt Out								
8	EE	13,628,267,493							
9	DSM	14,177,595,613							
	Vintage 2017 Estimated Opt Out								
10	EE	13,628,267,493							
11	DSM	14,179,063,209							
Non-Residential Forecast Sales Less Opt Out									
		2014 EE Rate Components	2014 DSM Rate Components	2015 EE Rate Components	2015 DSM Rate Components	2016 EE Rate Components	2016 DSM Rate Components	2017 EE Rate Components	2017 DSM Rate Components
12	Total Non-Residential	35,885,264,168	35,885,264,168	35,885,264,168	35,885,264,168	35,885,264,168	35,885,264,168	35,885,264,168	35,885,264,168
13	Less V2014 Estimated Opt Out	13,232,737,170							
14	Less V2014 Estimated DSM Opt Out		13,941,085,396						
15	Less V2015 Estimated EE Opt Out			13,222,125,421					
16	Less V2015 Estimated DSM Opt Out				14,178,902,450				
17	Less V2016 Estimated EE Opt Out					13,628,267,493			
18	Less V2016 Estimated DSM Opt Out						14,177,595,613		
19	Less V2017 Estimated EE Opt Out							13,628,267,493	
20	Less V2017 Estimated DSM Opt Out								14,179,063,209
21	Sales for Rider Calculation	22,652,526,998	21,944,178,772	22,663,138,747	21,706,361,718	22,256,996,675	21,707,668,555	22,256,996,675	21,706,200,959

Duke Energy Carolinas, LLC
Docket Number E-7, Sub 1105
DSM/EE Earnings Cap Calculation for the Period June 1, 2009 to December 31, 2013

			2009-2010	2011	2012	2013	
			Vintage 1	Vintage 2	Vintage 3	Vintage 4	Total
			a	b	c	d	e = sum(a-d)
Line	Total for EE	50%					
1	AC Revenues-50%	Evans Exhibit 1	\$ 54,046,415	\$ 52,445,197	\$ 55,357,834	\$ 49,007,754	\$ 210,857,199
2	Program Costs	Evans Exhibit 3	35,112,011	32,010,151	36,593,077	35,593,812	139,309,051
3	Income Before Taxes	Line 1 - Line 2	18,934,404	20,435,045	18,764,757	13,413,942	71,548,148
4	Income Tax Rate		0.391760	0.391713	0.391373	0.391373	
5	Income Taxes	Line 3 * Line 4	7,417,742	8,004,673	7,344,019	5,249,855	28,016,289
6	Net Income	Line 3 - Line 5	\$ 11,516,662	\$ 12,430,372	\$ 11,420,738	\$ 8,164,087	\$ 43,531,859
Total for DSM Programs							
7	AC Revenues-75%	Evans Exhibit 1	\$ 20,997,871	\$ 22,415,245	\$ 27,146,629	\$ 30,694,489	\$ 101,254,234
8	Program Costs	Evans Exhibit 3	15,278,329	20,974,142	20,862,044	20,854,936	77,969,452
9	Income Before Taxes	Line 7 - Line 8	5,719,543	1,441,103	6,284,584	9,839,552	23,284,782
10	Income Tax Rate		0.391760	0.391713	0.391373	0.391373	
11	Income Taxes	Line 9 * Line 10	2,240,688	564,499	2,459,617	3,850,935	9,115,739
12	Net Income	Line 9 - Line 11	\$ 3,478,855	\$ 876,604	\$ 3,824,968	\$ 5,988,617	\$ 14,169,044
Total for SAW Programs Adjusted for DSM Cap							
13	AC Revenues	Line 1 + Line 7	\$ 75,044,286	\$ 74,860,442	\$ 82,504,463	\$ 79,702,242	\$ 312,111,433
14	Program Costs	Line 2 + Line 8	50,390,340	52,984,294	57,455,121	56,448,748	217,278,503
15	Income Before Taxes	Line 13 - Line 14	24,653,946	21,876,148	25,049,342	23,253,494	94,832,931
16	Income Tax Rate		0.391760	0.391713	0.391373	0.391373	0.391552
17	Income Taxes	Line 15 * Line 16	9,658,430	8,569,172	9,803,636	9,100,790	37,132,027
18	Net Income	Line 15 - Line 17	\$ 14,995,516	\$ 13,306,977	\$ 15,245,706	\$ 14,152,704	\$ 57,700,903
19	Allowed After-tax Return on Program Cost Investment	Line 14 * 15%					32,591,775
20	Allowed Pre-tax Return on Program Cost Investment	Line 19 /(1-Line 16)					53,565,428
21	Avoided Cost Revenues for the SAW program	Line 13					\$ 312,111,433
22	Total Program Cost Investment + Allowed Pre-tax Return	Line 14 + Line 20					270,843,931
23	Excess Pre-tax Return = Cap Adjustment	Line 21 - Line 22					\$ 41,267,502
24	Total Avoided Costs Allowed to Collect	Minimum of Line 21 and Line 22					\$ 270,843,931
25	Avoided Cost Revenue Collected (R1-5 actuals and R6 estimates)-before GRT	E-7 Sub 1073					266,136,697
26	Amount to be collected (returned) from (to) Customers	Line 24 - Line 25					\$ 4,707,234

Allocation of Cap Adjustment (Line 23) to Residential/Non-Residential and Vintage

27	Residential Avoided Cost Revenue Collections-Before GRT	E-7 Sub 1073	\$ 38,456,310	\$ 25,587,418	\$ 35,395,980	\$ 28,941,989	\$ 128,381,698
28	Non-Residential EE Avoided Cost Revenue Collections-Before GRT	E-7 Sub 1073	16,501,648	17,151,577	28,653,985	26,839,346	89,146,556
29	Non-Residential DSM Avoided Cost Revenue Collections-Before GRT	E-7 Sub 1073	9,722,090	10,913,043	13,129,243	14,844,068	48,608,443
30	Total Revenue Collections		<u>\$ 64,680,048</u>	<u>\$ 53,652,038</u>	<u>\$ 77,179,208</u>	<u>\$ 70,625,403</u>	<u>\$ 266,136,697</u>

Relative Percentage:

31	Residential Avoided Cost Revenue	Line 27 / Line 30	59%	48%	46%	41%	48%
32	Non-Residential EE Avoided Cost Revenue	Line 28 / Line 30	26%	32%	37%	38%	33%
33	Non-Residential DSM Avoided Cost Revenue	Line 29 / Line 30	15%	20%	17%	21%	18%
34	Total Revenue	Line 30 Vintage Total / Line 30 Total Rev Collections	<u>24%</u>	<u>20%</u>	<u>29%</u>	<u>27%</u>	<u>100%</u>

Cap Adjustment Allocation:

35	Residential	Line 31 * Line 38 Total	\$ 5,963,085	\$ 3,967,618	\$ 5,488,547	\$ 4,487,783	\$ 19,907,033
36	Non-Residential EE	Line 32 * Line 38 Total	2,558,767	2,659,546	4,443,124	4,161,744	13,823,181
37	Non-Residential DSM	Line 33 * Line 38 Total	1,507,520	1,692,191	2,035,837	2,301,740	7,537,288
38	Total Cap Adjustment	Line 34 * Line 23	<u>\$ 10,029,372</u>	<u>\$ 8,319,355</u>	<u>\$ 11,967,508</u>	<u>\$ 10,951,267</u>	<u>\$ 41,267,502</u>

Rider EE (NC)
ENERGY EFFICIENCY RIDERAPPLICABILITY (North Carolina Only)

Service supplied under the Company's rate schedules is subject to approved adjustments for new energy efficiency and demand-side management programs approved by the North Carolina Utilities Commission (NCUC). The Rider Adjustments are not included in the Rate Schedules of the Company and therefore, must be applied to the bill as calculated under the applicable rate. Cost recovery under Rider EE consists of two four-year term programs, years 2009 – 2013 and years 2014 – 2017 as outlined separately below. This rider applies to service supplied under all rate schedules for program years 2009-2013 but does not apply to Rate Schedules OL, FL, PL, GL, and NL for program years 2014-2017.

I. PROGRAM YEARS 2009-2013GENERAL PROVISIONS

This Rider will recover the cost of new energy efficiency and demand-side management programs, using the method approved by the NCUC, for programs implemented over a four-year period (*i.e.*, comprising four 12-month program years or "Vintage Years"). In each year this Rider will include components to recover revenue requirements related to demand-side management and energy efficiency programs implemented in that Vintage Year, as well as net lost revenues resulting from the energy efficiency programs. Net lost revenues are revenue losses, net of both marginal costs avoided at the time of the lost kilowatt hour sale(s) and increases in revenues resulting from any activity by the Company's public utility operations that cause a customer to increase demand or energy consumption. Net lost revenues associated with each Vintage Year will be recovered for 36 months upon implementation, except that the recovery of net lost revenues will end upon implementation of new rates approved by the Commission in a general rate case or comparable proceeding to the extent that rates are set in a rate case for vintages up to that point. To recover net lost revenues for programs implemented in years 3 and 4, the Rider will continue beyond the four-year period.

Revenue requirements will be determined on a system basis and allocated to North Carolina retail customers based on the North Carolina retail contribution to system retail peak demand for demand side management programs and North Carolina retail contribution to system retail kWh sales for energy efficiency programs. Residential customer classes will pay for residential programs and non-residential customer classes will pay for non-residential programs through methods found appropriate by the Commission for demand-side management and energy efficiency programs, respectively. All allocation factors will be based on the Company's most recently completed cost of service study utilizing the allocation method approved by NCUC in the Company's most recent general rate proceeding and will exclude the amounts related to customers that elect to opt out of this Rider.

TRUE-UP PROVISIONS

Rider amounts will initially be determined based on estimated kW and kWh impacts related to expected customer participation in the programs, and will be trued-up as actual customer participation and actual kW and kWh impacts are verified. If a customer participates in any vintage of programs, the customer is subject to the true-ups as discussed in this section for any vintage of programs in which the customer participated.

Participation true-ups: After the completion of the first Vintage Year, the Rider will include a true-up of previous Rider amounts billed to reflect actual customer participation in the programs.

Measurement and verification true-up: In the seventh year a final true-up will be based on changes in participation combined with actual verified kW and kWh savings.

Earnings cap true-up: In the seventh year, a true up will adjust customer bills, if applicable, to refund with interest, amounts collected through the Rider in excess of the earnings cap, in accordance with the following levels of achievement of actual energy and peak demand reductions and allowed return on investment.

<u>Percentage Actual Target Achievement</u>	<u>Return on Investment Cap on Program Costs Percentage</u>
>=90%	15%
80% to 89%	12%
60% to 79%	9%
< 60%	5%

Rider EE (NC)
ENERGY EFFICIENCY RIDERDETERMINATION OF ENERGY EFFICIENCY RIDER ADJUSTMENT

Energy Efficiency Adjustments (EEA) will be applied to the energy in kilowatt hours (kWh) billed of all rate schedules for each vintage as determined by the following formula, adjusted as appropriate for the time value of money:

EEA Residential (expressed as cents per kWh) =

(Residential Avoided Cost Revenue Requirement + Residential Net Lost Revenues) / Forecasted Residential kWh Sales for the Rider billing period

Where

Residential Avoided Cost Revenue Requirement = (Residential Demand-Side Management Program Avoided Cost X 75%) + (Residential Energy Efficiency Program Avoided Cost X 50%)

EEA Non-residential (expressed as cents per kWh) =

(Non-residential Avoided Cost Revenue Requirement + Non-residential Net Lost Revenues) / Forecasted Non-residential kWh Sales for the Rider billing period

Where

Non-residential Avoided Cost Revenue Requirement = (Non-residential Demand-Side Management Program Avoided Cost X 75%) + (Non-residential Energy Efficiency Program Avoided Cost X 50%)

II. PROGRAM YEARS 2014-2017GENERAL PROVISIONS

This Rider will recover the cost of new energy efficiency and demand-side management programs, using the method approved by the NCUC, for programs implemented over a four-year period (*i.e.*, comprising four 12-month program years or "Vintage Years").

TRUE-UP PROVISIONS

Rider amounts will initially be determined based on estimated kW and kWh impacts related to expected customer participation in the programs, and will be trued-up as actual customer participation and actual kW and kWh impacts are verified. If a customer participates in any vintage of programs, the customer is subject to the true-ups as discussed in this section for any vintage of programs in which the customer participated.

RIDER EE OPT OUT PROVISION FOR QUALIFYING NON-RESIDENTIAL CUSTOMERS

The Rider EE increment applicable to energy efficiency programs and/or demand-side management programs will not be applied to the energy charge of the applicable rate schedule for Customers qualified to opt out of the programs where:

- a. The Customer has notified the Company that it has, or has plans for implementing alternative energy efficiency measures in accordance with quantifiable goals.
- b. Electric service to the Customer must be provided under:
 1. An electric service agreement where the establishment is classified as a "manufacturing industry" by the Standard Industrial Classification Manual published by the United States Government and where more than 50% of the electric energy consumption of such establishment is used for its manufacturing processes. Additionally, all other agreements billed to the same entity associated with the manufacturing industry located on the same or contiguous properties are also eligible to opt out.
 2. An electric service agreement for general service as provided for under the Company's rate schedules where the Customer's annual energy use is 1,000,000 kilowatt hours or more. Additionally, all other agreements billed to the same entity with lesser annual usage located on the same or contiguous properties are also eligible to opt out.

Rider EE (NC)
ENERGY EFFICIENCY RIDER

The following additional provisions apply for qualifying customers who elect to opt out:

For Customers who elect to opt out of energy efficiency programs, the following provisions also apply:

- Qualifying customers may opt out of the Company's energy efficiency programs each calendar year only during the annual two-month enrollment period between November 1 and December 31 immediately prior to a new Rider EE becoming effective on January 1. (Qualifying new customers have sixty days after beginning service to opt out).
- Customers may not opt out of individual energy efficiency programs offered by the Company. The choice to opt out applies to the Company's entire portfolio of energy efficiency programs.
- If a customer participates in any vintage of energy efficiency programs, the customer, irrespective of future opt out decisions, remains obligated to pay the remaining portion of the lost revenues for each vintage of energy efficiency programs in which the customer participated.
- Customers who elect to opt out during the two-month annual enrollment period immediately prior to the new Rider EE becoming effective may elect to opt in to the Company's energy efficiency programs during the first 5 business days of March each calendar year. Customers making this election will be back-billed retroactively to the effective date of the new Rider EE.

For Customers who elect to opt out of demand-side management programs, the following provisions also apply:

- Qualifying customers may opt out of the Company's demand-side management program during the enrollment period between November 1, and December 31 immediately prior to a new Rider EE becoming effective on January 1 of the applicable year. (Qualifying new customers have sixty days after beginning service to opt out).
- If a customer elects to participate in a demand-side management program, the customer may not subsequently choose to opt out of demand-side management programs for three years.
- Customers who elect to opt out during the two-month annual enrollment period immediately prior to the new Rider EE becoming effective may elect to opt in to the Company's demand-side management program during the first 5 business days of March each calendar year. Customers making this election will be back-billed to the effective date of the new Rider EE.

Any qualifying non-residential customer that has not participated in an energy efficiency or demand-side management program may opt out during any enrollment period, and have no further responsibility to pay Rider EE amounts associated with the Customer's opt out election for energy efficiency and/or demand-side management programs.

ENERGY EFFICIENCY RIDER ADJUSTMENTS (EEA) FOR ALL PROGRAM YEARS

The Rider EE amounts applicable to the residential and nonresidential rate schedules for the period January 1, 2017 through December 31, 2017 including utility assessments are as follows:

<u>Residential</u>	Vintage 1, 2, 3, 4, 2014 ¹ , 2015 ¹	0.0406¢ per kWh
	Vintage 2014 ² , 2015 ² , 2016, 2017	<u>0.3861¢ per kWh</u>
	Total Residential Rate	0.4267¢ per kWh
<u>Nonresidential</u>		
	Vintage 1	
	Energy Efficiency	0.0003¢ per kWh
	Demand Side Management	0.0002¢ per kWh
	Vintage 2	
	Energy Efficiency	(0.0053)¢ per kWh
	Demand Side Management	0.0002¢ per kWh
	Vintage 3	
	Energy Efficiency	(0.0024)¢ per kWh
	Demand Side Management	0.0003¢ per kWh

Rider EE (NC)
ENERGY EFFICIENCY RIDER

Vintage 4	
Energy Efficiency	0.0004¢ per kWh
Demand Side Management	0.0002¢ per kWh
Vintage 2014 ³	
Energy Efficiency	0.0185¢ per kWh
Demand Side Management	(0.0015)¢ per kWh
Vintage 2015 ³	
Energy Efficiency	0.1239¢ per kWh
Demand Side Management	(0.0127)¢ per kWh
Vintage 2016 ³	
Energy Efficiency	0.0373¢ per kWh
Demand Side Management	NA
Vintage 2017 ³	
Energy Efficiency	0.2437¢ per kWh
Demand Side Management	0.0789¢ per kWh
Total Nonresidential	0.4820¢ per kWh

¹ Includes the true-up of program costs, shared savings and lost revenues from Year 1 of Vintage 2015 and Year 2 of Vintage 2014

² Includes prospective component of Vintage 2014 and 2015

³ Not Applicable to Rate Schedules OL, FL, PL, GL, and NL

Each factor listed under Nonresidential is applicable to nonresidential customers who are not eligible to opt out and to eligible customers who have not opted out. If a nonresidential customer has opted out of a Vintage(s), then the applicable energy efficiency and/or demand-side management charge(s) shown above for the Vintage(s) during which the customer has opted out, will not apply to the bill.

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-7, SUB 1105

In the Matter of)
Application of Duke Energy Carolinas, LLC)
for Approval of Demand-Side Management)
and Energy Efficiency Cost Recovery Rider)
Pursuant to N.C. Gen. Stat. § 62-133.9 and)
Commission Rule R8-69)

DIRECT TESTIMONY OF
ROBERT P. EVANS
FOR
DUKE ENERGY CAROLINAS, LLC

I. INTRODUCTION AND PURPOSE

1 **Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION**
2 **WITH DUKE ENERGY.**

3 A. My name is Robert P. Evans, and my business address is 150 Fayetteville
4 Street, Raleigh, North Carolina 27602. I am employed by Duke Energy
5 Corporation (“Duke Energy”) as Senior Manager-Strategy and Collaboration for
6 the Carolinas in the Market Solutions Regulatory Strategy and Evaluation
7 group.

8 **Q. PLEASE BRIEFLY STATE YOUR EDUCATIONAL BACKGROUND**
9 **AND EXPERIENCE.**

10 A. I graduated from Iowa State University (“ISU”) in 1978 with a Bachelor of
11 Science Degree in Industrial Administration and a minor in Industrial
12 Engineering. As a part of my undergraduate work, I participated in both the
13 graduate level Regulatory Studies Programs sponsored by American Telephone
14 and Telegraph Corporation, and graduate level study programs in Engineering
15 Economics. Subsequent to my graduation from ISU, I received additional
16 Engineering Economics training at the Colorado School of Mines, completed
17 the National Association of Regulatory Utility Commissioners Regulatory
18 Studies program at Michigan State, and completed the Advanced American Gas
19 Association Ratemaking program at the University of Maryland. Upon
20 graduation from ISU, I joined the Iowa State Commerce Commission (now
21 known as the Iowa Utility Board (“IUB”)) in the Rates and Tariffs Section of
22 the Utilities Division. During my tenure with the IUB, I held several positions,

1 including Senior Rate Analyst in charge of Utility Rates and Tariffs, and
2 Assistant Director of the Utility Division. In those positions, I provided
3 testimony in gas, electric, water and telecommunications proceedings as an
4 expert witness in the areas of rate design, service rules and tariff applications.
5 In 1982, I accepted employment with City Utilities of Springfield, Missouri, as
6 an Operations Analyst. In that capacity, I provided support for rate-related
7 matters associated with the municipal utility's gas, electric, water, and sewer
8 operations. In addition, I worked closely with its load management and energy
9 conservation programs. In 1983, I joined the Rate Services staff of the Iowa
10 Power and Light Company, now known as MidAmerican Energy, as a Rate
11 Engineer. In this position, I was responsible for the preparation of rate-related
12 filings and presented testimony on rate design, service rules, and accounting
13 issues before the IUB. In 1986, I accepted employment with Tennessee-
14 Virginia Energy Corporation (now known as the United Cities Division of
15 Atmos Energy) as Director of Rates and Regulatory Affairs. While in this
16 position, I was responsible for regulatory filings, regulatory relations, and
17 customer billing. In 1987, I went to work for the Virginia State Corporation
18 Commission in the Division of Energy Regulation as a Utilities Specialist. In
19 this capacity, I worked on electric and natural gas issues and provided testimony
20 on cost of service and rate design matters brought before that regulatory body.
21 In 1988, I joined North Carolina Natural Gas Corporation ("NCNG") as its
22 Manager of Rates and Budgets. Subsequently, I was promoted to Director-
23 Statistical Services in NCNG's Planning and Regulatory Compliance

1 Department. In that position, I performed a variety of work associated with
2 financial, regulatory and statistical analysis and presented testimony on several
3 issues brought before the North Carolina Utilities Commission (“Commission”).
4 I held that position until the closing of NCNG’s merger with Carolina Power
5 and Light Company, the predecessor of Progress Energy, Inc. (“Progress”), on
6 July 15, 1999.

7 From July 1999 through January 2008, I was employed in Principal and
8 Senior Analyst roles by the Progress Energy Service Company, LLC. In these
9 roles, I provided NCNG, Progress Energy Carolinas, Inc. (now Duke Energy
10 Progress, LLC, or “DEP”), and Progress Energy Florida, Inc. with rate and
11 regulatory support in their state and federal venues. From 2008 through the
12 merger of Duke Energy and Progress, I provided regulatory support for energy
13 efficiency (“EE”) and demand-side management (“DSM”) (collectively,
14 “DSM/EE”) programs. Subsequent to the Progress merger with Duke Energy, I
15 obtained my current position.

16 **Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN MATTERS**
17 **BROUGHT BEFORE THIS COMMISSION?**

18 A. Yes. I have provided testimony to this Commission in matters concerning
19 revenue requirements, avoided costs, cost of service, rate design, and the
20 recovery of costs associated with DSM/EE programs and related accounting
21 matters.

22 **Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?**

1 A. I am responsible for the regulatory support of DSM/EE programs in North
2 Carolina for both Duke Energy Carolinas, LLC (“DEC” or the “Company”) and
3 DEP.

4 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
5 **PROCEEDING?**

6 A. My testimony supports DEC’s Application for approval of its DSM/EE Cost
7 Recovery Rider, Rider EE, for 2017 (“Rider 8”), which encompasses
8 components relating to both the Company’s save-a-watt pilot approved in
9 Docket No. E-7, Sub 831, as well as the currently effective cost recovery
10 mechanism and portfolio of programs approved in the Commission’s *Order*
11 *Approving DSM/EE Programs and Stipulation of Settlement* issued October 29,
12 2013, in Docket No. E-7, Sub 1032 (“Sub 1032 Order”). My testimony
13 provides (1) a discussion of items the Commission specifically directed the
14 Company to address in this proceeding; (2) an overview of the Commission’s
15 Rule R8-69 filing requirements; (3) a synopsis of the DSM/EE programs
16 included in this filing; (4) a discussion of program results; (5) an explanation of
17 how these results have affected the Rider 8 calculations; (6) information on
18 DEC’s Evaluation Measurement & Verification (“EM&V”) activities; and (7)
19 an overview of the calculation of the Portfolio Performance Incentive (“PPI”).

20 **Q. PLEASE DESCRIBE THE EXHIBITS ATTACHED TO YOUR**
21 **TESTIMONY.**

22 A. Evans Exhibit 1 supplies, for each program, load impacts and avoided cost
23 revenue requirements by vintage. Evans Exhibit 2 contains a summary of net

1 lost revenues for the period June 1, 2009 through December 31, 2017. Evans
2 Exhibit 3 contains the actual program costs for North Carolina for the period
3 June 1, 2009 through December 31, 2015 and estimated costs for the DEC
4 system for the twelve months ending December 31, 2017. Evans Exhibit 4
5 contains the found revenues used in the net lost revenues calculations. Evans
6 Exhibit 5 supplies evaluations of event-based programs. Evans Exhibit 6
7 contains information about and the results of DEC's programs and a comparison
8 of actual impacts to previous estimates. Evans Exhibit 7 contains the projected
9 program and portfolio cost-effectiveness results for the portfolio of programs
10 approved in the Sub 1032 Order. Evans Exhibit 8 contains a summary of 2015
11 program performance and an explanation of the variances between the expected
12 program results and the actual results. It is designed to create more
13 transparency with regard to the factors that have driven these variances. Evans
14 Exhibit 9 is a list of DEC's industrial and large commercial customers that have
15 opted out of participation in its DSM or EE programs and a listing of those
16 customers that have elected to participate in new measures after having initially
17 notified the Company that they declined to participate, as required by
18 Commission Rule R8-69(d)(2). Evans Exhibit 10 contains the projected shared
19 savings incentive associated with Vintage 2017. Evans Exhibit 11 provides a
20 summary of the estimated activities and timeframe for completion of EM&V by
21 program. Evans Exhibit 12 provides the actual and expected dates when the
22 EM&V for each program or measure will become effective. Evans Exhibits A
23 through F provide the detailed completed EM&V reports or updates for the

1 following programs: Power Manager Program (Evans Exhibit A); EE in
2 Schools Program (Evans Exhibit B); Multi-Family EE Program (Evans Exhibit
3 C); Energy Efficient Appliances and Devices: CFL Bulbs (Evans Exhibit D);
4 Save Energy and Water Kit Program (Evans Exhibit E); and Appliance
5 Recycling Program (Evans Exhibit F).

6 **Q. WERE EVANS EXHIBITS 1-12 PREPARED BY YOU OR AT YOUR**
7 **DIRECTION AND SUPERVISION?**

8 A. Yes, they were.

9 **II. ACTIONS ORDERED BY THE COMMISSION**

10 **Q. PLEASE DESCRIBE THE ACTIONS THE COMMISSION DIRECTED**
11 **DEC TO TAKE IN THE COMMISSION'S ORDER IN DOCKET NO. E-**
12 **7, SUB 1073.**

13 A. In its August 21, 2015 *Order Approving DSM/EE Rider and Requiring Filing of*
14 *Proposed Customer Notice* in Docket No. E-7, Sub 1073 ("Sub 1073 Order"),
15 the Commission ordered: (1) that the Company shall incorporate the
16 recommendations made by Public Staff witness Jack Floyd into future EM&V
17 reports filed with the Commission in subsequent DSM/EE rider proceedings; (2)
18 that in its next proceeding, the Company shall address in testimony and exhibits
19 any adjustments to the EM&V for the Smart Energy Now pilot and the
20 Specialty Bulb measures in the Energy Efficient Appliance and Devices
21 program, as well as how these adjustments, if any, affect the Experience
22 Modification Factor ("EMF") and program impacts; (3) that DEC shall continue
23 to use its Collaborative to work with stakeholders and discuss program offerings

1 that could reduce the number of opt-outs; and (4) that the specific
2 recommendations made by Southern Alliance for Clean Energy (“SACE”)
3 witness Taylor Allred regarding new programs or enhancements to existing
4 programs shall be considered by the Collaborative.

5 **Q. PLEASE DESCRIBE PUBLIC STAFF WITNESS FLOYD’S**
6 **RECOMMENDATIONS THAT THE COMMISSION ORDERED DEC**
7 **TO INCORPORATE INTO FUTURE EM&V REPORTS.**

8 A. In Docket No. E-7, Sub 1073, Public Staff witness Floyd recommended that the
9 Company implement certain recommendations in its future EM&V studies,
10 subject to the consideration of whether the cost would outweigh the benefit.
11 These recommendations were that: (1) the Public Staff and DEC should further
12 discuss the EM&V information presented in Ham Exhibit B (Smart Energy
13 Now pilot) and Ham Exhibit E (Energy Efficient Appliances and Devices
14 Program [Specialty Bulb measures]); (2) the Public Staff and DEC should work
15 to coordinate an expeditious review of future planned program evaluations of
16 existing programs and methodologies proposed for future EM&V; (3) future
17 planned program evaluation plans of existing programs should include, as
18 applicable, the survey instrument and scoring methodology used to account for
19 net-to-gross (“NTG”) adjustments; (4) future light logging studies should
20 consider using stratification criteria to account for variables such as the
21 percentage of people at home during the weekday (in the sample versus the
22 population), when appropriate; (5) future evaluations which use an S-curve to
23 estimate free-ridership (or spillover) in any NTG analysis should provide an

1 explanation of changes made to current S-curves relative to S-curves used in
2 past evaluations of DEC programs; (6) future evaluations which use technical
3 reference manuals (“TRMs”) from other states to estimate program savings
4 should use available data (to the extent that it is reasonable and cost-effective do
5 to so) from DEC’s Carolinas service territory when calculating savings using
6 algorithms in these TRMs; and (7) future evaluation plans (for any program
7 which addresses residential lighting measures) should consider the feasibility of
8 collecting specific data from DEC’s service territory to revise the final adjusted
9 in-service rates for program bulbs.

10 **Q. HAVE THE PUBLIC STAFF AND DEC DISCUSSED EM&V**
11 **INFORMATION REGARDING THE SMART ENERGY NOW PILOT**
12 **AND SPECIALTY BULB MEASURES THAT WERE PART OF THE**
13 **ENERGY EFFICIENT APPLIANCES AND DEVICES PROGRAM?**

14 A. Yes. The Company and Public Staff have discussed EM&V for both programs
15 and reached an agreement. As a result, the Company is reporting different
16 results for its Smart Energy Now pilot than it reported in Docket No. E-7, Sub
17 1073. In particular, the Public Staff and DEC agreed it was necessary to revise
18 the EM&V impact results for the Smart Energy Now pilot to address an
19 inaccuracy in the data set, due to a meter split during the course of the pilot, that
20 was used by the Company’s third party evaluator. The revised impacts for the
21 Smart Energy Now pilot also reflect a compromise between the Company and
22 the Public Staff regarding the need to adjust the results for the impacts of
23 weather. After considering the methodology used to evaluate the Specialty

1 Bulb measures to potential alternative methodologies, the parties determined
2 that no changes to the results reported for Specialty Bulb measures were
3 required.

4 **Q. WHAT ARE THE NEW IMPACTS FOR THE SMART ENERGY NOW**
5 **PILOT?**

6 A. The Company is now recognizing lowered results for the Smart Energy Now
7 pilot consistent with the agreement reached with the Public Staff. The updated
8 values are reflected in Evans Exhibits 1 and 2. The resulting changes to the
9 save-a-watt true-up component of the EMF filed in Docket No. E-7, Sub 1073
10 are discussed in the testimony of DEC witness Carolyn T. Miller.

11 **Q. DOES THE COMPANY BELIEVE THAT THIS PROCEEDING**
12 **OFFICIALLY CONCLUDES THE COMPANY'S SAVE-A-WATT COST**
13 **RECOVERY MECHANISM?**

14 A. Yes. Consistent with the Sub 1073 Order, the Company has applied all
15 adjustments to the EM&V for the Smart Energy Now pilot and, as discussed by
16 Company witness Miller, has appropriately reflected the adjustments to the final
17 save-a-watt true-up in the Rider 8 EMF.

18 **Q. HAVE THE PUBLIC STAFF AND DEC WORKED TO COORDINATE**
19 **AN EXPEDITIOUS REVIEW OF FUTURE PLANNED PROGRAM**
20 **EVALUATIONS IN ACCORDANCE WITH WITNESS FLOYD'S**
21 **SECOND RECOMMENDATION?**

1 A. Yes. The Company and Public Staff have reached an agreement to share
2 EM&V evaluation plans, keeping in mind budgetary and deadline
3 considerations.

4 **Q. HAS THE COMPANY CONSIDERED FLOYD'S REMAINING EM&V**
5 **RECOMMENDATIONS?**

6 A. Yes. DEC has communicated Floyd's recommendations 3 through 7 to its
7 independent evaluators, who will include these recommendations in future
8 EM&V reports subject to consideration of whether the cost would outweigh the
9 benefit, in accordance with the Sub 1073 Order.

10 **Q. CAN YOU SUMMARIZE THE NEW PROGRAMS AND**
11 **ENHANCEMENTS TO EXISTING PROGRAMS RECOMMENDED BY**
12 **SACE WITNESS ALLRED?**

13 A. Yes. Witness Allred recommended that DEC work with the Collaborative to:
14 (1) develop and launch a self direct EE program targeted to its non-residential
15 customers; (2) develop and implement on-bill financing programs for residential
16 and non-residential customers; (3) recognize non-energy benefits in program
17 cost-effectiveness determinations; (4) develop single and multi-family
18 residential low-income add-ons to DEC's existing Income-Qualified EE
19 Weatherization Program; (5) develop an upstream EE program targeted at
20 manufactured homes; and (6) increase transparency in its EE program reporting.

21 **Q. HAVE THE RECOMMENDATIONS BY WITNESS ALLRED BEEN**
22 **CONSIDERED BY THE COLLABORATIVE?**

1 A. Yes. The new programs and enhancements to existing programs, recommended
2 by witness Allred, were discussed by the DEC Collaborative, and will continue
3 to be discussed in future Collaborative meetings. In addition, the Company has
4 established a working group to study the potential of on-bill financing
5 programs, which met multiple times during the year.

6 **Q. HAS THE COMMISSION ORDERED ANY OTHER ISSUES TO BE**
7 **DISCUSSED IN THIS FILING?**

8 A. Yes. In its February 9, 2016 *Order on Application for Approval of Program*
9 *Modifications* to DEC's Residential HVAC EE Program in Docket No. E-7, Sub
10 1032 ("HVAC EE Order"), the Commission ordered DEC to discuss in its
11 Collaborative meetings the recommendations filed by the Southern Environmental
12 Law Center ("SELC") and the North Carolina Sustainable Energy Association
13 ("NCSEA") in that proceeding.

14 **Q. DID DEC DISCUSS IN ITS COLLABORATIVE MEETINGS THE**
15 **RECOMMENDATIONS FROM SELC AND NCSEA WITH RESPECT TO**
16 **ITS RESIDENTIAL HVAC EE PROGRAM?**

17 A. Yes. In accordance with the HVAC EE Order, the SELC and NCSEA
18 Residential HVAC EE Program recommendations were discussed at both
19 DEC's February 17, 2016 and DEP's February 18, 2016 Collaborative
20 meetings. Before the February 17, 2016 DEC Collaborative, DEC provided its
21 membership with a listing of NCSEA's and SELC's Residential HVAC EE
22 Program recommendations. In addition, I requested that NCSEA and SELC
23 present their recommendations to the Collaborative. In summary, NCSEA and

1 SELC recommended: (1) bundling air- and duct-sealing measures with high
 2 Seasonal EE Ratio unit upgrades and quality installation; (2) leveraging the data
 3 from smart meters and smart thermostats to target other EE programs to
 4 structures with the highest energy intensity; (3) providing educational materials
 5 on best practices in smart thermostat usage; (4) performing an assessment of
 6 cost-effectiveness of individual measures within the program; (5) analyzing the
 7 use of a bundled approach in combination with on-bill financing to deepen
 8 energy savings potential; (6) updating the market potential analysis; and (7)
 9 surveying marketing acquisition costs for contractors in DEC and DEP
 10 territories. It is anticipated that these recommendations will be discussed, in
 11 further detail, at future meetings of the Collaborative.

12 **III. RULE R8-69 FILING REQUIREMENTS**

13 **Q. WHAT INFORMATION DOES DEC PROVIDE IN RESPONSE TO THE** 14 **COMMISSION'S FILING REQUIREMENTS?**

15 A. The information for Rider 8 is provided in response to the Commission's filing
 16 requirements contained in R8-69(f)(1) and can be found in the testimony and
 17 exhibits of Company witnesses Evans and Miller as follows:

R8-69(f)(1)		Items	Location in Testimony
(i)		Projected NC retail sales for the rate period	Miller Exhibit 6
(ii)		For each measure for which cost recovery is requested through Rider 8:	
(ii)	a.	Total expenses expected to be incurred during the rate period	Evans Exhibit 1
(ii)	b.	Total costs savings directly attributable to measures	Evans Exhibit 1
(ii)	c.	EM&V activities for the rate period	Evans Exhibit 1
(ii)	d.	Expected summer and winter peak demand reductions	Evans Exhibit 1
(ii)	e.	Expected energy reductions	Evans Exhibit 1

(iii)		Filing requirements for DSM/EE EMF rider, including:	
(iii)	a.	Total expenses for the test period in the aggregate and broken down by type of expenditure, unit, and jurisdiction	Evans Exhibit 3
(iii)	b.	Total avoided costs for the test period in the aggregate and broken down by type of expenditure, unit, and jurisdiction	Evans Exhibit 1
(iii)	c.	Description of results from EM&V activities	Testimony of Robert Evans and Evans Exhibits A-F
(iii)	d.	Total summer and winter peak demand reductions in the aggregate and broken down per program	Evans Exhibit 1
(iii)	e.	Total energy reduction in the aggregate and broken down per program	Evans Exhibit 1
(iii)	f.	Discussion of findings and results of programs	Testimony of Robert Evans and Evans Exhibit 6
(iii)	g.	Evaluations of event-based programs	Evans Exhibit 5
(iii)	h.	Comparison of impact estimates from previous year and explanation of significant differences	Testimony of Robert Evans and Evans Exhibits 6 and 8
(iv)		Determination of utility incentives	Testimony of Robert Evans and Evans Exhibit 10
(v)		Actual revenues from DSM/EE and DSM/EE EMF riders	Miller Exhibit 3
(vi)		Proposed Rider 8	Testimony of Carolyn Miller and Miller Exhibit 1
(vii)		Projected NC sales for customers opting out of measures	Miller Exhibit 6
(viii)		Supporting work papers	Flash drive accompanying filing

1 **IV. PORTFOLIO OVERVIEW**

2 **Q. WHAT ARE DEC'S CURRENT EE AND DSM PROGRAMS?**

3 A. The Company has two interruptible programs for non-residential customers,
4 Interruptible Service ("IS") and Standby Generation ("SG") that are accounted
5 for outside of the cost recovery mechanism approved by the Commission in
6 the Sub 1032 Order. Aside from IS and SG, the following DSM/EE programs
7 have been implemented by DEC in its North Carolina service territory:

1 **RESIDENTIAL CUSTOMER PROGRAMS**

- 2 • Appliance Recycling Program
- 3 • Energy Assessments Program
- 4 • EE Education Program
- 5 • Energy Efficient Appliances and Devices
- 6 • HVAC EE Program
- 7 • Multi-Family EE Program
- 8 • My Home Energy Report
- 9 • Income-Qualified EE and Weatherization Program
- 10 • Power Manager

11 **NON-RESIDENTIAL CUSTOMER PROGRAMS**

- 12 • Non-Residential Smart \$aver® Energy Efficient Food Service
- 13 Products Program
- 14 • Non-Residential Smart \$aver® Energy Efficient HVAC Products
- 15 Program
- 16 • Non-Residential Smart \$aver® Energy Efficient IT Products Program
- 17 • Non-Residential Smart \$aver® Energy Efficient Lighting Products
- 18 Program
- 19 • Non-Residential Smart \$aver® Energy Efficient Process Equipment
- 20 Products Program
- 21 • Non-Residential Smart \$aver® Energy Efficient Pumps and Drives
- 22 Products Program

- 1 • Non-Residential Smart Saver® Custom Program
- 2 • Non-Residential Smart Saver® Custom Energy Assessments Program
- 3 • PowerShare®
- 4 • PowerShare® CallOption
- 5 • Small Business Energy Saver
- 6 • Smart Energy in Offices
- 7 • Business Energy Report Pilot (Approved August 19, 2015, in Docket
- 8 No. E-7, Sub 1081)
- 9 • EnergyWise for Business (Approved October 27, 2015, in Docket No.
- 10 E-7, Sub 1093)

11 **Q. ARE THESE SUBSTANTIVELY THE SAME PROGRAMS DEC**
12 **RECEIVED APPROVAL FOR IN DOCKET NO. E-7, SUB 1032?**

13 A. Yes. The programs contained in the current portfolio are the same as those
14 approved by the Commission in the Sub 1032 Order, with the exception of the
15 recent additions of the Business Energy Report pilot (“BER”) and
16 EnergyWise for Business (“EWB”) programs, the prior additions of the Smart
17 Energy in Offices (“SEiO”) and Small Business Energy Saver (“SBES”)
18 programs, and discontinuation of the Energy Management Information
19 Services Pilot Program.

20 **Q. PLEASE DESCRIBE ANY UPDATES MADE TO THE UNDERLYING**
21 **ASSUMPTIONS FOR DEC’S PORTFOLIO OF PROGRAMS THAT**
22 **HAVE ALTERED PROJECTIONS FOR VINTAGE 2017.**

1 A. EM&V results were updated to reflect the savings impacts for those programs
2 for which DEC received EM&V results after it prepared its application in
3 Docket No. E-7, Sub 1073. Updating programs for EM&V results will
4 change the projected avoided cost benefits associated with the projected
5 participation and hence will impact the calculation of the specific program and
6 overall portfolio cost-effectiveness, as well as impact the calculation of DEC's
7 projected shared savings incentive.

8 **Q. AFTER FACTORING THESE UPDATES INTO THE VINTAGE 2017**
9 **PORTFOLIO, DO THE RESULTS OF DEC'S PROSPECTIVE COST-**
10 **EFFECTIVENESS TESTS INDICATE THAT IT SHOULD**
11 **DISCONTINUE OR MODIFY ANY OF ITS PROGRAMS?**

12 A. DEC performed a prospective analysis of each of its programs and the
13 aggregate portfolio for the Vintage 2017 period. It is important to note that
14 this analysis does not include any values for DEC's Residential HVAC EE,
15 Appliance Recycling and PowerShare Call Option programs, as no costs have
16 been included for these programs during Vintage 2017. With the exception of
17 the aforementioned programs, the entire portfolio for Vintage 2017 is
18 contained in Evans Exhibit 7. This exhibit shows that, with the exception of
19 the Income-Qualified EE Products and Services Program, which was not cost-
20 effective at the time of Commission approval, the aggregate portfolio
21 continues to project cost-effectiveness. In the HVAC EE Order, DEC recently
22 received approval to modify the program design and is evaluating additional
23 opportunities to modify the Residential HVAC EE Program in order to make

1 it cost-effective by the end of 2016. In the absence of a projected Total
2 Resource Cost test ("TRC") score of 1.0 or greater, pursuant to the
3 Commission's HVAC EE Order, the Residential HVAC EE Program will be
4 terminated on March 31, 2017.

5 **Q. DID DEC MAKE ANY MODIFICATIONS TO ITS PORTFOLIO OF**
6 **PROGRAMS DURING VINTAGE 2015?**

7 A. Yes. The Company has made several modifications to its portfolio of
8 programs during Vintage 2015. These modifications were made in
9 compliance with the Flexibility Guidelines approved by the Commission in its
10 Sub 1032 Order. Changes to DEC's Residential Energy Efficient Appliances
11 and Devices Program are: (1) the addition of candelabra bulbs; (2) a reduction
12 in the incentive for A-Line LED bulbs; (3) the addition of specialty recessed
13 outdoor LED bulbs; (4) the removal of free CFL bulbs; (5) the additions of
14 free LED bulbs; (6) the removal of CFL bulbs from its retail delivery channel;
15 and (7) the addition of LED bulbs to its retail delivery channel. Other
16 portfolio changes involve the: (1) addition and removal of measures in its
17 Non-Residential Smart Saver® Energy Efficient Food Service Products
18 Program; (2) addition and removal of measures in its Non-Residential Smart
19 Saver® Energy Efficient HVAC Products Program; and (3) addition and
20 removal of measures in its Non-Residential Smart Saver® Energy Efficient IT
21 Products Program.

22 **V. DSM/EE PROGRAM RESULTS TO DATE**

1 **Q. HOW MUCH ENERGY, CAPACITY AND AVOIDED COST SAVINGS**
2 **DID DEC DELIVER AS A RESULT OF ITS DSM/EE PROGRAMS**
3 **DURING VINTAGE 2015?**

4 A. During Vintage 2015, DEC's DSM/EE programs delivered over 649 million
5 kilowatt hours ("kWh") of energy savings and nearly 1,004 megawatts
6 ("MW") of capacity savings, which produced net present value of avoided
7 cost savings of over \$351 million. The 2015 performance results for
8 individual programs are provided in Evans Exhibits 6 and 8.

9 **Q. DID ANY PROGRAMS SIGNIFICANTLY OUT-PERFORM**
10 **RELATIVE TO THEIR ORIGINAL ESTIMATES FOR VINTAGE**
11 **2015?**

12 A. Yes. During Vintage 2015, DEC's portfolio of programs was able to deliver
13 energy and capacity savings that yielded avoided costs that were 124 percent
14 of the target, and it did so while expending 105 percent of targeted program
15 costs. While the Company's entire portfolio of programs performed well,
16 programs in the portfolio that feature lighting measures continued to
17 contribute the largest portion of the avoided cost impacts. In the residential
18 market, the three highest ranked programs in terms of percentage increases in
19 avoided costs from those forecasted for 2015 were the Energy Assessments
20 Program, the Energy Efficient Appliances and Devices Program, and the My
21 Home Energy Report (MyHER) Program. These impacts were achieved
22 largely due to elevated participation of customers adopting measures at much
23 higher rates than originally anticipated. The avoided cost savings impacts for

1 these three programs, compared to those originally filed for Vintage 2015,
2 exceeded the projections by 462 percent, 399 percent and 140 percent,
3 respectively. The energy savings impacts for the three programs, compared to
4 those originally filed for Vintage 2015, exceeded the projections by 303
5 percent, 413 percent and 151 percent, respectively.

6 The non-residential program with the largest percentage increase in
7 avoided costs from those forecasted for 2015 is the SEiO Program. This
8 program produced 170 percent of expected avoided costs and 151 percent of
9 expected energy savings.

10 **Q. HAVE ANY PROGRAMS SIGNIFICANTLY UNDERPERFORMED**
11 **RELATIVE TO THEIR ORIGINAL ESTIMATES IN VINTAGE 2015?**

12 A. Yes. In the residential market, the three lowest ranked programs, in terms of
13 percentage variations in avoided costs from those forecasted for 2015, are the
14 Appliance Recycling Program, the Income-Qualified EE and Weatherization
15 Program, and the Residential HVAC EE Program.

16 The Appliance Recycling Program produced 19 percent of forecasted
17 avoided costs and 33 percent of forecasted energy savings. These shortfalls
18 were largely due to the bankruptcy of the program vendor, which interrupted
19 the program delivery and negatively impacted participation. Furthermore, the
20 program was encumbered by a reduction in the impact of program measures.

21 The Company continues to evaluate the long-term viability of the program
22 and is exploring potential new program vendors should it be deemed
23 appropriate to maintain the program as part of the Company's portfolio.

1 The Income-Qualified EE and Weatherization Program
2 underperformed during Vintage 2015, largely due to the continuing inability
3 to implement the Weatherization and Equipment Replacement component of
4 the program. Since the exhaustion of the North Carolina and South Carolina
5 State Energy Offices' American Recovery and Reinvestment Act funds in late
6 2012, DEC had been working with the State Energy Offices to reestablish a
7 plan for them to partner and administer the program as a component of the
8 new portfolio filing. In 2014, the State Energy Offices requested to be
9 removed from consideration in providing weatherization services as the
10 program administrator. The Company has since identified a program
11 administrator for the Weatherization and Equipment Replacement measures
12 through a Request for Proposal. The Company has contracted with a program
13 administrator and, as a result, anticipates greater program participation in
14 2016.

15 The primary driver for the underperformance of DEC's Residential
16 HVAC EE Program is related to lower than anticipated participation levels.
17 The major barriers to participation are the current high out-of-pocket costs of
18 higher efficiency HVAC equipment and the challenge of gaining contractor
19 acceptance with respect to the program's tune and seal measures due to the
20 required diagnostic equipment and need for additional industry certifications.

21 **VI. PROJECTED RESULTS**

1 **Q. PLEASE PROVIDE A PROJECTION OF THE RESULTS THAT DEC**
2 **EXPECTS TO SEE FROM IMPLEMENTATION OF ITS PORTFOLIO**
3 **OF PROGRAMS.**

4 A. Consistent with its practices during the save-a-watt pilot, DEC will update the
5 actual and projected EE achievement levels in its annual Rider EE filing to
6 account for any program or measure additions based on the performance of
7 programs, market conditions, economics and consumer demand. The actual
8 results for Vintage 2015 and projection of the results for the next three years
9 as well as the associated projected program expense for DEC's portfolio of
10 programs are summarized in the table below:

DEC System (NC & SC) DSM/EE Portfolio 2015 Actual Results and 2016-2018 Projected Results				
	2015	2016	2017	2018
Annual System MW	1,004	958	1,002	1,020
Annual System Net GWh	649	598	608	585
Annual Program Costs (Millions)	\$110	\$116	\$131	\$116

11 These projections are very similar to those provided by DEC and reported to
12 the Commission in Docket No. E-7, Sub 1073. The projected impacts and
13 cost for Vintage 2017 are different as a result of updated participation
14 estimates as well as the EM&V results that have been applied to the following
15 programs: Power Manager; EE Education in Schools; Multi-Family EE; the
16 Save Energy and Water Kit and CFL measures included in the Energy
17 Efficient Appliances and Devices Program; and Appliance Recycling. In

addition, the Vintage 2017 projected impacts and costs reflect projected participation in the SBES and SEiO, which were approved during Vintage 2014, as well as BER and EWB, which were approved during Vintage 2015.

VII. EM&V ACTIVITIES

Q. CAN YOU PROVIDE INFORMATION ON THE COMPANY'S EM&V ACTIVITIES?

A. Yes. Evans Exhibit 11 provides a summary of the estimated activities and timeframe for completion of EM&V by program. Evans Exhibit 12 provides the actual and expected dates when the EM&V for each program or measure will become effective. Evans Exhibits A through F provide the detailed completed EM&V reports or updates for the following programs:

Evans Exhibit	EM&V Reports	Report Finalization Date	Evaluation Type
A	Power Manager	9/16/2015	Impact
B	EE in Schools	11/2/2015, Rev. 2/29/2016	Process and Impact
C	Multi-Family EE	11/3/2015	Process and Impact
D	Energy Efficient Appliances and Devices: CFL Bulbs	11/5/2015	Process and Impact
E	Energy Efficient Appliances and Devices: Save Energy and Water Kit	11/18/2015	Process and Impact
F	Appliance Recycling Program	11/25/2015	Impact

Q. HOW WERE EM&V RESULTS UTILIZED IN DEVELOPING THE PROPOSED RIDER 8?

A. The Company has applied EM&V in accordance with the process as agreed upon by DEC, SACE, and the Public Staff and approved by the Commission in its *Order Approving DSM/EE Rider and Requiring Filing of Proposed Customer Notice* issued on November 8, 2011, in Docket No. E-7, Sub 979

1 (“EM&V Agreement”). In accordance with the Sub 1032 Order, DEC
2 continues to apply EM&V in accordance with the EM&V Agreement.

3 Actual participation and evaluated load impacts are used prospectively
4 to update net lost revenues estimated for 2016. In addition, the EM&V
5 Agreement provides that initial EM&V results shall be applied retrospectively
6 to program impacts that were based upon estimated impact assumptions
7 derived from industry standards (rather than EM&V results for the program in
8 the Carolinas), in particular the DSM/EE programs initially approved by the
9 Commission in Docket No. E-7, Sub 831 (“Sub 831 Programs”), with the
10 exception of the Non-Residential Smart Saver Custom Rebate Program and
11 the Low Income EE and Weatherization Assistance Program.

12 For purposes of the vintage true-ups and forecast, initial EM&V
13 results are considered actual results for a program and continue to apply until
14 superseded by new EM&V results, if any. For all new programs and pilots
15 approved after the Sub 831 Programs, DEC will use the initial estimates of
16 impacts until it has EM&V results, which will then be applied retrospectively
17 back to the beginning of the offering and will be considered actual results
18 until a second EM&V is performed.

19 All program impacts from EM&V apply only to the programs for
20 which the analysis was directly performed, though DEC’s new product
21 development may utilize actual impacts and research about EE and
22 conservation behavior directly attributed to existing DEC program offerings.

The level of EM&V required varies by program and depends on that program's contribution to total portfolio, the duration the program has been in the portfolio without material change, and whether the program and administration is new and different in the energy industry. DEC estimates, however, that no additional costs above 5 percent of total program costs will be associated with performing EM&V for all measures in the portfolio.

A. The following programs have Carolinas-based EM&V applied and have been provided as Evans Exhibits A through F.

- Power Manager Program (*Evans Exhibit A*)
- EE in Schools Program (*Evans Exhibit B*)
- Multi-Family EE Program (*Evans Exhibit C*)
- Energy Efficient Appliances and Devices: CFL Bulbs (*Evans Exhibit D*)
- Save Energy and Water Kit Program (*Evans Exhibit E*)
- Appliance Recycling Program (*Evans Exhibit F*)

VIII. RIDER IMPACTS

1 **Q. HAVE THE PARTICIPATION RESULTS AFFECTED THE VINTAGE**
2 **2015 EXPERIENCE MODIFICATION FACTOR?**

3 A. Yes. The EMF in Rider 8 accounts for changes to actual participation relative
4 to the forecasted participation levels utilized in DEC's Vintage 2015 Rider
5 EE. As DEC receives actual participation information, it is then able to
6 update participation-driven actual avoided cost benefits and the net lost
7 revenues derived from its EE and DSM programs. For example, as previously
8 mentioned, the Appliance Recycling Program and Income-Qualified EE and
9 Weatherization Program underperformed relative to their original
10 participation targets. As a result, the EMF will be reduced to reflect the lower
11 costs, net lost revenues, and shared savings incentive associated with these
12 programs. On the other hand, higher-than-expected participation in programs,
13 such as the Energy Assessments, Energy Efficient Appliances & Devices, and
14 MyHER programs, cause the EMF to reflect higher program costs, net lost
15 revenues, and shared savings incentive. In addition to the above, the EMF is
16 impacted by the application of EM&V results.

17 **Q. HOW WILL EM&V BE INCORPORATED INTO THE VINTAGE 2015**
18 **TRUE-UP COMPONENT OF RIDER 8?**

19 A. All of the final EM&V results that have been received by DEC as of
20 December 31, 2015, have been applied prospectively from the first day of the
21 month immediately following the month in which the study participation
22 sample for the EM&V was completed in accordance with the EM&V
23 Agreement. Accordingly, for any program for which DEC has received

1 EM&V results, the per participant impact applied to the projected program
2 participation in Vintage 2015 is based upon the actual EM&V results that
3 have been received.

4 **Q. PLEASE DESCRIBE HOW DEC CALCULATED FOUND REVENUES.**

5 A. Consistent with the Sub 1032 Order and with the “Decision Tree” found in
6 Appendix A of the Commission’s February 8, 2011 order in Docket No. E-7,
7 Sub 831, and approved for the new portfolio in the Sub 1032 Order, possible
8 found revenue activities were identified, categorized, and netted against the
9 net lost revenues created by DEC’s EE programs. Found revenues may result
10 from activities that directly or indirectly result in an increase in customer
11 demand or energy consumption within DEC’s service territory. Load-building
12 activities such as these, however, would not be considered found revenues if
13 they (1) would have occurred regardless of DEC’s activity, (2) were a result of
14 a Commission-approved economic development activity not determined to
15 produce found revenues, or (3) were part of an unsolicited request for DEC to
16 engage in an activity that supports efforts to grow the economy. On the other
17 hand, found revenues would occur for load growth that did not fall into the
18 previous categories but was directly or indirectly a result of DEC’s activities.
19 Based on the results of this work, all potential found revenue-related activities
20 are identified and categorized in Evans Exhibit 4. Additionally, consistent
21 with the methodology employed and approved in Docket No. E-7, Sub 1073,
22 as discussed in detail in the testimony of Company witness Timothy J. Duff in
23 Docket No. E-7, Sub 1050, DEC also proposes to adjust calculation of found

1 revenues to account for the impacts of activities outside of its EE programs
2 that it undertakes that reduce customer consumption – i.e., “negative found
3 revenues.”

4 **Q. PLEASE DISCUSS THE ADJUSTMENT THAT DEC PROPOSES TO**
5 **MAKE TO ITS FOUND REVENUE CALCULATION TO ACCOUNT**
6 **FOR NEGATIVE FOUND REVENUES.**

7 A. DEC has begun to aggressively pursue, with its outdoor lighting customers,
8 the replacement of aging Mercury Vapor lights with Light Emitting Diode
9 (“LED”) fixtures. By moving customers past the standard High Pressure
10 Sodium (“HPS”) fixture to an LED fixture in this replacement process, DEC
11 is generating significant energy savings. These energy savings, since they
12 come outside of DEC’s EE programs, are not captured in DEC’s calculation
13 of lost revenues. Since one of the activities that DEC includes in the
14 calculation of found revenues is the increase in consumption from new
15 outdoor lighting fixtures added by DEC, it is logical and symmetrical to count
16 the energy consumption reduction realized in outdoor lighting efficiency
17 upgrades. The Company does not take credit for the entire efficiency gain
18 from replacing Mercury Vapor lights, but rather only the efficiency gain from
19 replacing HPS with LED fixtures. Also, DEC has not recognized any
20 negative found revenues in excess of the found revenues calculated; in other
21 words, the net found revenues number will never be negative and have the
22 effect of increasing net lost revenue calculations. In the Sub 1073 Order, the
23 Commission found inclusion of negative found revenues associated with the

1 Company's initiative to replace Mercury Vapor lighting with LED fixtures in
2 the calculation of net found revenues to be reasonable, and the Company
3 proposes to continue to this practice in Rider 8.

4 **Q. HAS THE OPT-OUT OF NON-RESIDENTIAL CUSTOMERS**
5 **AFFECTED THE RESULTS FROM THE PORTFOLIO OF**
6 **APPROVED PROGRAMS?**

7 A. Yes, the opt-out of qualifying non-residential customers has had a negative
8 effect on DEC's overall non-residential impacts. For Vintage 2015, DEC had
9 2,727 eligible customer accounts opt out of participating in DEC's non-
10 residential portfolio of EE programs. In addition, DEC had 3,436 eligible
11 customer accounts opt out of participating in DEC's non-residential DSM
12 programs.

13 **Q. PLEASE EXPLAIN THE SIGNIFICANT INCREASE IN THE OPT-**
14 **OUT IN 2015 COMPARED TO 2014.**

15 A. The primary driver for the increase was an error in the 2014 opt-out numbers
16 discussed in Company witness Conitsha Barnes' Direct Testimony and
17 reported in Barnes Exhibit 9a in last year's Rider 7 filing in Docket No. E-7,
18 Sub 1073. Subsequent to the Company's filing, it discovered that the database
19 from which it pulled the reported customer opt-out information was not
20 accurate. In the course of investigating the issue, the Company discovered the
21 database was not capturing the accounts associated with the new opt-out
22 eligibility rules established in Docket No. E-7, Sub 1032. This error in the
23 database has since been corrected, and the accurate customer opt-out

1 information for 2014 has been included as Evans Exhibit 9a in this year's
2 filing.

3 **Q. IS THE COMPANY CONTINUING ITS EFFORTS TO ATTRACT**
4 **THE PROGRAM PARTICIPATION OF OPT-OUT ELIGIBLE**
5 **CUSTOMERS?**

6 A. Yes. Increasing the participation of opt-out eligible customers in EE and
7 DSM programs is very important to the Company. As discussed earlier, DEC
8 continues to evaluate and revise its non-residential portfolio of programs to
9 accommodate new technologies, eliminate product gaps, remove barriers to
10 participation and make its programs more attractive. It also continues to
11 leverage its Large Account Management Team to make sure customers are
12 informed about product offerings and the March Opt-in Window.

13 **IX. PPI CALCULATION**

14 **Q. PLEASE PROVIDE AN OVERVIEW OF THE SHARED SAVINGS**
15 **RECOVERY MECHANISM APPROVED IN DOCKET NO. E-7, SUB**
16 **1032.**

17 A. Pursuant to the Sub 1032 Order, DEC's cost recovery mechanism allows it to
18 (1) recover the reasonable and prudent costs incurred for adopting and
19 implementing DSM and EE measures in accordance with N.C. Gen. Stat. §
20 62-133.9 and Commission Rules R8-68 and R8-69; (2) recover net lost
21 revenues incurred for up to 36 months of a measure's life for EE programs;
22 and (3) earn a PPI based upon the sharing of 11.5% of the net savings
23 achieved through DEC's DSM/EE programs on an annual basis.

1 **Q. PLEASE EXPLAIN HOW DEC DETERMINES THE PPI.**

2 A. First, DEC determines the net savings eligible for incentive by subtracting the
3 present value of the annual lifetime DSM/EE program costs (excluding
4 approved low-income programs as described below) from the net present
5 value of the annual lifetime avoided costs achieved through the Company's
6 programs (again, excluding approved low-income programs). The Company
7 then multiplies the net savings eligible for incentive by the 11.5% shared
8 savings percentage to determine its pretax incentive.

9 **Q. PLEASE EXPLAIN IF DEC EXCLUDES ANY PROGRAMS FROM**
10 **THE DETERMINATION OF ITS PPI CALCULATION.**

11 A. Consistent with the Sub 1032 Order, DEC has excluded the impacts and costs
12 associated with the Income-Qualified EE and Weatherization Program from
13 its calculation of the PPI. At the time the program was approved, it was not
14 cost-effective, but was approved based on its societal benefit. As such,
15 although DEC is eligible to recover the program costs and 36 months of the
16 net lost revenues associated with the impacts of the program, it does not earn
17 an incentive, and the negative net savings associated with these types of
18 programs is not factored into the calculation of the annual shared savings PPI.

19 **Q. PLEASE EXPLAIN HOW PROGRAMS THAT ARE DETERMINED**
20 **NOT TO BE COST-EFFECTIVE, BUT ARE OFFERED BY THE**
21 **COMPANY, ARE TREATED.**

22 A. DEC recognizes that there are certain EE programs that may not be cost-
23 effective at an annual view, but are nevertheless offered as DEC evaluates

1 opportunities to redesign the program to restore the program offerings to cost-
2 effectiveness. As discussed previously, the Residential HVAC EE Program is
3 not currently cost-effective under the certain cost-effectiveness tests, but DEC
4 continues to offer it. For this program, because it was approved as a cost-
5 effective program offering, DEC is eligible to recover the program costs and
6 36 months of the net lost revenues and PPI associated with the impacts of the
7 program. It is important to note that the Company will forgo recovery of net
8 lost revenues and PPI, associated with DEC's Residential HVAC EE Program
9 for Vintage Years 2016 and 2017 (if applicable), if the program: (1) proves
10 not to be cost-effective under the TRC; or (2) is not projected to be cost-
11 effective over the life over the life of the program under the TRC.

12 **X. CONCLUSION**

13 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

14 **A. Yes.**

Evans Exhibit 1, page 1

Duke Energy Carolinas, LLC
EE Vintage 1 (June 1, 2009 - December 31, 2009)
Docket Number E-7, Sub 1105
Load Impacts and Avoided Cost Revenue Requirements by Program

		A	B	C	D		
		NC Residential Avoided Costs					
		System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System Avoided Cost Revenue Requirement @50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C
Residential Programs							
Line	EE Programs (at 50% Avoided Cost)						
1	Residential Energy Assessments	1,057	8,369,462	\$ 1,106,481	\$ 2,212,962	73.0077318%	\$ 807,817
2	Smart Saver® for Residential Customers	1,592	12,547,819	1,940,744	3,881,488	73.0077318%	1,416,893
3	Low Income Energy Efficiency and Weatherization Assistance	143	1,354,096	141,337	282,675	73.0077318%	103,187
4	Energy Efficiency Education Program for Schools	56	303,763	55,373	110,746	73.0077318%	40,427
5	Total for Residential Conservation Programs	2,849	22,575,141	\$ 3,243,936	\$ 6,487,871		\$ 2,368,324
				System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Residential Peak Demand Allocation Factor	A6 * C6
6	Total DSM Programs (at 75% Avoided Cost)	116,172		\$ 4,655,124	\$ 6,206,832	33.9010659%	\$ 1,578,137
							NC Non-Residential Avoided Costs
		System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System Avoided Cost Revenue Requirement @50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C
Non-Residential Programs							
EE Programs (at 50% Avoided Cost)							
7	Smart Saver® for Non-Residential Customers Lighting	5,267	28,004,505	\$ 5,247,545	\$ 10,495,089	73.0077318%	\$ 3,831,113
8	Smart Saver® for Non-Residential Customers Motors	124	624,404	183,846	367,691	73.0077318%	134,222
9	Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	-	-	-	-	73.0077318%	-
10	Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	46	257,738	67,096	134,192	73.0077318%	48,985
11	Smart Saver® for Non-Residential Customers - HVAC	267	765,127	295,533	591,065	73.0077318%	215,762
12	Smart Saver® for Non-Residential Customers - Custom Rebate	19	232,797	30,165	60,330	73.0077318%	22,023
13	Total for Non-Residential Conservation Programs	5,724	29,884,571	\$ 5,824,184	\$ 11,648,368		\$ 4,252,105
				System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Non-Residential Peak Demand Allocation Factor (Miller Exhibit 5, Pg. 1)	A14* C14
14	Total DSM Programs (at 75% Avoided Cost)	116,172		\$ 4,655,124	\$ 6,206,832	39.9179344%	\$ 1,858,229
				System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Retail Peak Demand Allocation Factor	A17* C17
Total DSM Program Breakdown							
15	Power Manager (Residential)	57,494	-	\$ 3,082,269	\$ 4,109,692		
16	Power Share (Non-Residential)	58,678	-	1,572,855	2,097,140		
17	Total DSM	116,172	-	\$ 4,655,124	\$ 6,206,833	73.8190004%	\$ 3,436,366

(1) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak
Note: Schedule may not foot due to rounding

Evans Exhibit 1, page 2

Duke Energy Carolinas, LLC
EE Vintage 1 (January 1, 2010 - December 31, 2010)
Docket Number E-7, Sub 1105
Load Impacts and Avoided Cost Revenue Requirements by Program

		A	B	C	D		
					NC Residential Avoided Costs		
		System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System Avoided Cost Revenue Requirement @50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C
Residential Programs							
Line	EE Programs (at 50% Avoided Cost)						
1	Residential Energy Assessments	1,563	11,178,033	\$ 1,549,012	\$ 3,098,024	72.7072718%	\$ 1,126,244
2	Smart Saver® for Residential Customers	41,497	381,777,103	42,560,548	85,121,096	72.7072718%	30,944,613
3	Low Income Energy Efficiency and Weatherization Assistance	599	5,663,263	591,118	1,182,236	72.7072718%	429,786
4	Energy Efficiency Education Program for Schools	469	2,526,416	460,540	921,080	72.7072718%	334,846
5	Residential Retrofit Pilot	-	-	-	-	72.7072718%	-
6	Home Energy Comparison Report (My Home Energy Report)	159	854,645	24,503	49,006	72.7072718%	17,815
7	Total for Residential Conservation Programs	44,287	401,999,460	\$ 45,185,721	\$ 90,371,442		\$ 32,853,305
				System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Residential Peak Demand Allocation Factor	A8 * C8
8	Total DSM Programs (at 75% Avoided Cost)	438,002		\$ 23,481,287	\$ 31,308,383	34.4404513%	\$ 8,087,061
				System Avoided Cost Revenue Requirement @50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	NC Non-Residential Avoided Costs
		System kW Reduction - Summer Peak	System Energy Reduction (kWh)				A * C
Non-Residential Programs							
EE Programs (at 50% Avoided Cost)							
9	Smart Saver® for Non-Residential Customers Lighting	13,466	68,411,677	\$ 13,710,093	\$ 27,420,185	72.7072718%	\$ 9,968,234
10	Smart Saver® for Non-Residential Customers Motors	533	2,724,749	798,480	1,596,959	72.7072718%	580,553
11	Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	0	380	44	87	72.7072718%	32
12	Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	155	788,310	191,588	383,176	72.7072718%	139,298
13	Smart Saver® for Non-Residential Customers - HVAC	1,586	3,964,553	1,734,583	3,469,166	72.7072718%	1,261,168
14	Smart Saver® for Non-Residential Customers - Custom Rebate	2,716	21,205,380	3,608,163	7,216,325	72.7072718%	2,623,397
15	Total for Non-Residential Conservation Programs	18,456	97,095,050	\$ 20,042,949	\$ 40,085,899		\$ 14,572,682
				System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Non-Residential Peak Demand Allocation Factor	A16* C16
16	Total DSM Programs (at 75% Avoided Cost)	438,002		\$ 23,481,287	\$ 31,308,383	40.3489126%	\$ 9,474,444
				System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Retail Peak Demand Allocation Factor (Miller Exhibit 5, Pg.2)	A19* C19
Total DSM Program Breakdown							
17	Power Manager (Residential)	228,421	-	\$ 12,245,662	\$ 16,327,550		
18	Power Share (Non-Residential)	209,581	-	11,235,625	14,980,833		
19	Total DSM	438,002	-	\$ 23,481,287	\$ 31,308,383	74.7893638%	\$ 17,561,505

(1) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak
Note: Schedule may not foot due to rounding

Evans Exhibit 1, page 3

Duke Energy Carolinas, LLC
EE Vintage 2 (January 1, 2011 - December 31, 2011)
Docket Number E-7, Sub 1105
Load Impacts and Avoided Cost Revenue Requirements by Program

		A	B	C	D		
		NC Residential Avoided Costs					
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System Avoided Cost Revenue Requirement @ 50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C	
Residential Programs							
EE Programs (at 50% Avoided Cost)							
1	Residential Energy Assessments	1,306	9,227,946	\$ 1,314,136	\$ 2,628,271	72.6972151%	\$ 955,340
2	Smart Saver® for Residential Customers	39,712	367,409,449	40,319,118	80,638,236	72.6972151%	29,310,876
3	Low Income Energy Efficiency and Weatherization Assistance	52	488,949	50,792	101,583	72.6972151%	36,924
4	Energy Efficiency Education Program for Schools	262	1,413,208	265,292	530,585	72.6972151%	192,860
5	Residential Retrofit Pilot	21	126,564	40,936	81,871	72.6972151%	29,759
6	Home Energy Comparison Report (My Home Energy Report)	66	356,218	30,711	61,423	72.6972151%	22,326
7	Total for Residential Conservation Programs	41,419	379,022,334	\$ 42,020,984	\$ 84,041,969		\$ 30,548,085
			System Avoided Cost Revenue Requirement @ 75%	System Avoided Cost @ 100%	NC Residential Peak Demand Allocation Factor	A8 * C8	
8	Total DSM Programs (at 75% Avoided Cost)	547,804	\$ 30,101,993	\$ 40,135,991	32.2293181%	\$ 9,701,667	
			System Avoided Cost Revenue Requirement @ 50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C	
Non-Residential Programs							
EE Programs (at 50% Avoided Cost)							
9	Smart Saver® for Non-Residential Customers Lighting	11,329	64,190,217	\$ 13,497,639	\$ 26,995,278	72.6972151%	\$ 9,812,407
10	Smart Saver® for Non-Residential Customers Motors	1,107	5,750,908	1,286,403	2,572,806	72.6972151%	935,179
11	Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	82	503,823	54,884	109,767	72.6972151%	39,899
12	Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	184	1,012,402	263,359	526,717	72.6972151%	191,454
13	Smart Saver® for Non-Residential Customers - HVAC	1,869	4,987,231	2,094,930	4,189,860	72.6972151%	1,522,956
14	Smart Saver® for Non-Residential Customers - Custom Rebate	6,585	55,974,704	11,605,896	23,211,792	72.6972151%	8,437,163
15	Smart Energy Now	419	13,335,749	1,317,867	2,635,734	72.6972151%	958,053
16	Total for Non-Residential Conservation Programs	21,575	145,755,034	\$ 30,120,977	\$ 60,241,953		\$ 21,897,111
			System Avoided Cost Revenue Requirement @ 75%	System Avoided Cost @ 100%	NC Non-Residential Peak Demand Allocation Factor	A17* C17	
17	Total DSM Programs (at 75% Avoided Cost)	547,804	\$ 30,101,993	\$ 40,135,991	42.2350050%	\$ 12,713,578	
			System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Retail Peak Demand Allocation Factor	A20* C20	
18	Power Manager (Residential)	226,935	-	\$ 12,470,132	\$ 16,626,843		
19	Power Share (Non-Residential)	320,870	-	\$ 17,631,861	\$ 23,509,148		
20	Total DSM	547,804	-	\$ 30,101,993	\$ 40,135,991	74.4643230%	\$ 22,415,245

(1) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak
Note: Schedule may not foot due to rounding

Evans Exhibit 1, page 4

Duke Energy Carolinas, LLC
EE Vintage 3 (January 1, 2012 - December 31, 2012)
Docket Number E-7, Sub 1105
Load Impacts and Avoided Cost Revenue Requirements by Program

		A	B	C	D		
					NC Residential Avoided Costs		
Line	Residential Programs	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System Avoided Cost Revenue Requirement @ 50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C
	EE Programs (at 50% Avoided Cost)						
1	Appliance Recycling	143	1,038,548	\$ 145,177	\$ 290,354	72.7194575%	\$ 105,572
2	Residential Energy Assessments	1,607	10,486,549	1,773,940	3,547,879	72.7194575%	1,289,999
3	Smart Saver® for Residential Customers	24,247	224,336,833	25,851,451	51,702,902	72.7194575%	18,799,035
4	Low Income Energy Efficiency and Weatherization Assistance	-	-	-	-	72.7194575%	-
5	Energy Efficiency Education Program for Schools	1,748	9,422,807	1,781,282	3,562,564	72.7194575%	1,295,338
6	Residential Retrofit Pilot	47	283,678	94,987	189,973	72.7194575%	69,074
7	Home Energy Comparison Report (My Home Energy Report)	10,461	49,339,464	1,428,665	2,857,330	72.7194575%	1,038,918
8	Total for Residential Conservation Programs	38,253	294,907,880	\$ 31,075,501	\$ 62,151,002		\$ 22,597,936
				System Avoided Cost Revenue Requirement @ 75%	System Avoided Cost @ 100%	NC Residential Peak Demand Allocation Factor	A9 * C9
9	Total DSM Programs (at 75% Avoided Cost)	645,041		\$ 36,331,282	\$ 48,441,710	34.8388691%	\$ 12,657,408

(1) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak
Note: Schedule may not foot due to rounding

Evans Exhibit 1, page 5

Duke Energy Carolinas, LLC
EE Vintage 4 (January 1, 2013 - December 31, 2013)
Docket Number E-7, Sub 1105
Load Impacts and Avoided Cost Revenue Requirements by Program

Line			A	B	C	D
			System Avoided Cost Revenue Requirement @ 50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	NC Residential Avoided Costs A * C
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)				
	Residential Programs					
	EE Programs (at 50% Avoided Cost)					
1	Appliance Recycling	668	\$ 716,869	\$ 1,433,738	72.9600473%	\$ 523,028
2	Residential Energy Assessments	1,426	2,022,135	4,044,269	72.9600473%	1,475,350
3	Smart Saver® for Residential Customers	13,348	15,299,257	30,598,514	72.9600473%	11,162,345
4	Low Income Energy Efficiency and Weatherization Assistance	212	209,005	418,010	72.9600473%	152,490
5	Residential Neighborhood Program	-	-	-	72.9600473%	-
6	Energy Efficiency Education Program for Schools	1,011	998,224	1,996,448	72.9600473%	728,305
7	Home Energy Comparison Report (My Home Energy Report)	23,002	4,695,898	9,391,796	72.9600473%	3,426,129
8	Total for Residential Conservation Programs	39,667	\$ 23,941,388	\$ 47,882,775		\$ 17,467,647
			System Avoided Cost Revenue Requirement @ 75%	System Avoided Cost @ 100%	NC Residential Peak Demand Allocation Factor	A * C
9	Total DSM Programs (at 75% Avoided Cost)	706,711	\$ 40,799,886	\$ 54,399,848	34.0209980%	\$ 13,880,528
						NC Non-Residential Avoided Costs
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System Avoided Cost Revenue Requirement @ 50%	System Avoided Cost @ 100%	NC Retail kWh Sales Allocation Factor	A * C
	Non-Residential Programs					
	EE Programs (at 50% Avoided Cost)					
10	Smart Saver® for Non-Residential Customers Lighting	13,096	\$ 16,327,527	\$ 32,655,054	72.9600473%	\$ 11,912,571
11	Smart Saver® for Non-Residential Customers Motors	1,570	1,965,520	3,931,040	72.9600473%	1,434,044
12	Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	32	44,887	89,774	72.9600473%	32,750
13	Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	209	335,181	670,363	72.9600473%	244,549
14	Smart Saver® for Non-Residential Customers - HVAC	1,912	2,277,985	4,555,969	72.9600473%	1,662,019
15	Smart Saver® for Non-Residential Customers - Custom Rebate	13,250	22,278,186	44,556,371	72.9600473%	16,254,175
16	Total for Non-Residential Conservation Programs	30,070	\$ 43,229,285	\$ 86,458,571		\$ 31,540,107
			System Avoided Cost Revenue Requirement @ 75%	System Avoided Cost @ 100%	NC Non-Residential Peak Demand Allocation Factor	A * C
17	Total DSM Programs (at 75% Avoided Cost)	706,711	\$ 40,799,886	\$ 54,399,848	41.2108021%	\$ 16,813,960
			System Avoided Cost Revenue Requirement @75%	System Avoided Cost @ 100%	NC Retail Peak Demand Allocation Factor	A * C
	Total DSM Program Breakdown					
18	Power Manager (Residential)	328,993	\$ 18,993,470	\$ 25,324,627		
19	Power Share (Non-Residential)	377,717	\$ 21,806,416	\$ 29,075,221		
20	Total DSM	706,711	\$ 40,799,886	\$ 54,399,848	75.2318001%	\$ 30,694,489

(1) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak
Note: Schedule may not foot due to rounding

Evans Exhibit 1, page 6

Duke Energy Carolinas, LLC
Vintage 2014 True-up for January 1, 2014 to December 31, 2014
Docket Number E-7, Sub 1105
Load Impacts and Estimated Revenue Requirements, excluding Lost Revenue by Program

									NC Residential Revenue Requirement	
									E NC Retail kWh Sales Allocation Factor (Miller Exhibit 5, pg. 1)	
									D * E	
</										

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintage

(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

Evans Exhibit 1 pg. 7

Duke Energy Carolinas, LLC
Vintage 2015 Estimate for January 1, 2015 to December 31, 2015
Docket Number E-7, Sub 1105
Load Impacts and Estimated Revenue Requirements, excluding Lost Revenue by Program

			A	B	C	D= B+C	E	NC Residential Revenue Requirement
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Cost	System Cost	Earned Utility Incentive	System Cost Plus Incentive	NC Retail kWh Sales Allocation Factor (Miller Exhibit 5 pg. 2)	D * E
Residential Programs								
EE Programs								
1 Appliance Recycling Program	748	5,536,007	\$ 1,901,700	\$ 1,537,318	\$ 41,904	\$ 1,579,222	72.9564706%	\$ 1,152,144
2 Energy Efficiency Education	827	4,417,898	\$ 2,495,948	\$ 2,054,774	\$ 50,735	\$ 2,105,509	72.9564706%	\$ 1,536,105
3 Energy Efficient Appliances and Devices	14,746	126,600,461	\$ 48,029,627	\$ 12,051,083	\$ 4,137,533	\$ 16,188,616	72.9564706%	\$ 11,810,643
4 HVAC Energy Efficiency	2,663	4,763,631	\$ 6,816,479	\$ 5,417,102	\$ 160,928	\$ 5,578,030	72.9564706%	\$ 4,069,534
5 Income Qualified Energy Efficiency and Weatherization Assistance	595	2,750,969	\$ 1,531,588	\$ 2,238,887	\$ -	\$ 2,238,887	72.9564706%	\$ 1,633,413
6 Multi-Family Energy Efficiency	1,339	13,988,109	\$ 7,431,163	\$ 2,093,039	\$ 613,884	\$ 2,706,923	72.9564706%	\$ 1,974,875
7 Energy Assessments	1,275	10,293,765	\$ 10,115,222	\$ 3,086,327	\$ 808,323	\$ 3,894,650	72.9564706%	\$ 2,841,399
8 Subtotal	22,192	168,350,840	\$ 78,321,728	\$ 28,478,529	\$ 5,813,307	\$ 34,291,836		\$ 25,018,114
9 My Home Energy Report (1)	61,770	228,776,428	\$ 16,583,325	\$ 9,846,384	\$ 774,748	\$ 10,621,132	72.9564706%	\$ 7,748,803
10 Total for Residential Energy Efficiency Programs	83,963	397,127,268	\$ 94,905,053	\$ 38,324,913	\$ 6,588,055	\$ 44,912,969		\$ 32,766,917
NC Residential Peak Demand Allocation Factor (Miller Exhibit 5 pg. 2)								
								D11* E11
11 Total DSM Programs (2)	874,817	41,585	101,459,970	\$ 31,805,956	\$ 8,010,212	\$ 39,816,168	32.5218612%	\$ 12,948,959
12 Total Residential Revenue Requirement								\$ 45,715,876
NC Non-Residential Revenue Requirement								
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Cost	System Cost	Earned Utility Incentive	System Cost Plus Incentive	NC Retail kWh Sales Allocation Factor (Miller Exhibit 5 pg. 2)	D * E
Non-Residential Programs								
EE Programs								
13 Non Residential Smart Saver Custom Energy Assessments	87	765,303	\$ 321,686	\$ 662,134	\$ (39,151)	\$ 622,982	72.9564706%	\$ 454,506
14 Non Residential Smart Saver Custom	11,108	76,142,627	\$ 53,882,448	\$ 9,933,078	\$ 5,054,177	\$ 14,987,256	72.9564706%	\$ 10,934,173
15 Non Residential Smart Saver Energy Efficient Food Service Products	1,205	7,483,897	\$ 5,380,937	\$ 194,429	\$ 596,448	\$ 790,877	72.9564706%	\$ 576,996
16 Non Residential Smart Saver Energy Efficient HVAC Products	1,611	5,405,220	\$ 6,221,217	\$ 1,142,545	\$ 584,047	\$ 1,726,592	72.9564706%	\$ 1,259,661
17 Non Residential Smart Saver Energy Efficient Lighting Products	11,421	66,480,792	\$ 41,971,790	\$ 11,336,027	\$ 3,523,113	\$ 14,859,140	72.9564706%	\$ 10,840,704
18 Non Residential Smart Saver Energy Efficient Pumps and Drives Products	562	4,345,750	\$ 2,516,011	\$ 466,488	\$ 235,695	\$ 702,183	72.9564706%	\$ 512,288
19 Non Residential Smart Saver Energy Efficient IT Products	540	5,196,710	\$ 1,130,386	\$ 716,556	\$ 47,590	\$ 764,147	72.9564706%	\$ 557,495
20 Non Residential Smart Saver Energy Efficient Process Equipment Products	170	813,335	\$ 711,566	\$ 88,825	\$ 71,615	\$ 160,440	72.9564706%	\$ 117,052
21 Small Business Energy Saver	13,123	60,206,337	\$ 39,129,354	\$ 13,969,072	\$ 2,893,432	\$ 16,862,505	72.9564706%	\$ 12,302,288
22 Smart Energy in Offices	5,297	25,450,074	\$ 2,838,803	\$ 1,463,269	\$ 158,186	\$ 1,621,456	72.9564706%	\$ 1,182,957
23 Business Energy Report				\$ 126,407	\$ (14,537)	\$ 111,870	72.9564706%	\$ 81,616
24 Total for Non-Residential Energy Efficiency Programs	45,124	252,290,045	\$ 154,104,198	\$ 40,098,830	\$ 13,110,617	\$ 53,209,447		\$ 38,819,735
NC Non-Residential Peak Demand Allocation Factor (Miller Exhibit 5 pg. 2)								
								D23* E23
25 Total DSM Programs(2)	874,817	41,585	\$ 101,459,970	\$ 31,805,956	\$ 8,010,212	\$ 39,816,168	42.4483655%	\$ 16,901,312
26 Total Non-Residential Revenue Requirement								\$ 55,721,047
NC Retail Peak Demand Allocation Factor (Miller Exhibit 5 pg. 2)								
								D28* E28
Total DSM Program Breakdown								
27 Power Manager (Residential)	457,528	-	\$ 53,050,890	\$ 14,628,923	\$ 4,418,526	\$ 19,047,450		
28 EnergyWise for Business	14	41,585	\$ 25,458	\$ 1,549,305	\$ (175,242)	\$ 1,374,062		
29 Power Share CallOption (Non-Residential)	-	-	\$ -	\$ -	\$ -	\$ -		
30 Power Share (Non-Residential)	417,276	-	\$ 48,383,622	\$ 15,627,728	\$ 3,766,928	\$ 19,394,656		
31 Total DSM	874,817	41,585	\$ 101,459,970	\$ 31,805,956	\$ 8,010,212	\$ 39,816,168	74.9702266%	\$ 29,850,271

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintage

Evans Exhibit 1, page 8

Duke Energy Carolinas, LLC
Vintage 2017 Estimate for January 1, 2017 to December 31, 2017
Docket Number E-7, Sub 1105
Load Impacts and Estimated Revenue Requirements, excluding Lost Revenue by Program

	A		B		C = (A-B) *11.5%		D= B+C	E	NC Residential Revenue Requirement
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Cost	System Cost	Earned Utility Incentive	System Cost Plus Incentive	NC Retail kWh Sales Allocation Factor (Miller Exhibit 5 pg. 6)		D * E
Residential Programs									
EE Programs									
1 Appliance Recycling Program	-	-	\$ -	\$ -	\$ -	\$ -	72.9564706%	\$	-
2 Energy Efficiency Education	1,316	5,604,364	3,416,523	2,282,458	130,417	2,412,876	72.9564706%		1,760,349
3 Energy Efficient Appliances and Devices	8,139	63,591,491	46,581,124	16,694,730	3,436,935	20,131,665	72.9564706%		14,687,352
4 HVAC Energy Efficiency	-	-	-	-	-	-	72.9564706%		-
5 Income Qualified Energy Efficiency and Weatherization Assistance	1,048	5,309,863	3,597,524	10,141,446	-	10,141,446	72.9564706%		7,398,841
6 Multi-Family Energy Efficiency	1,190	12,687,532	9,215,222	2,422,689	781,141	3,203,830	72.9564706%		2,337,401
7 Energy Assessments	981	7,923,133	8,725,992	2,568,858	708,070	3,276,928	72.9564706%		2,390,731
8 Subtotal	12,674	95,116,383	\$ 71,536,385	\$ 34,110,180	\$ 5,056,565	\$ 39,166,745		\$	28,574,675
9 My Home Energy Report (1)	56,979	211,047,528	17,277,041	11,792,498	630,722	12,423,220	72.9564706%		9,063,543
10 Total for Residential Energy Efficiency Programs	69,653	306,163,911	\$ 88,813,426	\$ 45,902,678	\$ 5,687,287	\$ 51,589,965		\$	37,638,218
							NC Residential Peak Demand Allocation Factor (Miller Exhibit 5 pg. 6)		D11* E11
11 Total DSM Programs (2)	883,305	1,757,389	107,403,096	\$ 31,544,171	\$ 8,723,776	\$ 40,267,947	32.5218612%	\$	13,095,886
12 Total Residential Revenue Requirement								\$	50,734,104
								NC Non-Residential Revenue Requirement	
	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Cost	System Cost	Earned Utility Incentive	System Cost Plus Incentive	NC Retail kWh Sales Allocation Factor (Miller Exhibit 5 pg. 6)		D * E
Non-Residential Programs									
EE Programs									
13 Non Residential Smart Saver Custom Energy Assessments	1,516	13,280,913	\$ 7,108,744	\$ 3,276,235	\$ 440,739	\$ 3,716,973	72.9564706%	\$	2,711,773
14 Non Residential Smart Saver Custom	10,286	90,101,969	52,563,455	14,005,768	4,434,134	18,439,902	72.9564706%		13,453,102
15 Non Residential Smart Saver Energy Efficient Food Service Products	420	3,968,253	2,603,013	795,715	207,839	1,003,554	72.9564706%		732,158
16 Non Residential Smart Saver Energy Efficient HVAC Products	2,791	6,253,763	7,510,299	3,318,330	482,076	3,800,406	72.9564706%		2,772,642
17 Non Residential Smart Saver Energy Efficient Lighting Products	11,286	68,582,518	41,391,122	11,101,779	3,483,274	14,585,053	72.9564706%		10,640,740
18 Non Residential Smart Saver Energy Efficient Pumps and Drives Products	599	4,745,697	2,670,921	748,874	221,035	969,910	72.9564706%		707,612
19 Non Residential Smart Saver Energy Efficient IT Products	25	3,184,721	1,443,639	416,241	118,151	534,392	72.9564706%		389,874
20 Non Residential Smart Saver Energy Efficient Process Equipment Products	131	564,086	741,922	103,511	73,417	176,928	72.9564706%		129,081
21 Small Business Energy Saver	12,840	61,629,002	43,888,444	17,505,451	3,034,044	20,539,495	72.9564706%		14,984,891
22 Smart Energy in Offices	8,778	42,174,681	4,382,785	1,742,603	303,621	2,046,224	72.9564706%		1,492,853
23 Business Energy Report	395	5,663,041	279,065	156,379	14,109	170,488	72.9564706%		124,382
24 Total for Non-Residential Energy Efficiency Programs	49,067	300,148,645	\$ 164,583,408	\$ 53,170,885	\$ 12,812,440	\$ 65,983,325		\$	48,139,105
							NC Non-Residential Peak Demand Allocation Factor (Miller Exhibit 5 pg. 6)		D24* E24
25 Total DSM Programs(2)	883,305	1,757,389	\$ 107,403,096	\$ 31,544,171	\$ 8,723,776	\$ 40,267,947	42.4483654%	\$	17,093,085
26 Total Non-Residential Revenue Requirement								\$	65,232,191
							NC Retail Peak Demand Allocation Factor (Miller Exhibit 5 pg. 6)		D29* E29
Total DSM Program Breakdown									
27 Power Manager (Residential)	502,972	-	\$ 59,689,077	\$ 13,899,748	\$ 5,265,773	\$ 19,165,521	-		
26 EnergyWise for Business (Non-Residential)	8,966	1,757,389	\$ 2,453,435	\$ 1,482,746	\$ 111,629	\$ 1,594,376	-		
28 Power Share CallOption (Non-Residential)	-	-	\$ -	\$ -	\$ -	\$ -	-		
29 Power Share (Non-Residential)	371,367	-	\$ 45,260,584	\$ 16,161,676	\$ 3,346,374	\$ 19,508,051	-		
30 Total DSM	883,305	1,757,389	\$ 107,403,096	\$ 31,544,171	\$ 8,723,776	\$ 40,267,947	74.9702266%	\$	30,188,971

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintage
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

Evans Exhibit 2, page 1

Duke Energy Carolinas, LLC
For the Period June 1, 2009 - December 31, 2015
Docket Number E-7, Sub 1105
North Carolina Net Lost Revenues Summary

Vintage 1	Years 1 - 2									
	2009	2010	2011	1 Mth 2012	2012	2013	2014	2015	2016	Total
Residential										
1 Residential Energy Assessments	\$ 44,297	\$ 669,511	\$ 752,197	\$ 66,386	\$ -	\$ -	\$ -	\$ -	\$ -	1,532,391
2 Smart Saver® for Residential Customers	92,993	5,073,454	15,613,579	1,378,657	-	-	-	-	-	22,158,682
3 Low Income Energy Efficiency and Weatherization Assistance	8,111	184,626	298,617	26,374	-	-	-	-	-	517,729
4 Energy Efficiency Education Program for Schools	980	52,034	109,867	9,700	-	-	-	-	-	172,582
5 Total Lost Revenues	146,381	5,979,625	16,774,260	1,481,117	-	-	-	-	-	24,381,383
6 Found Residential Revenues	18,544	103,664	149,220	12,435	-	(0)	-	-	-	283,862
7 Net Lost Residential Revenues	\$ 127,836	\$ 5,875,961	\$ 16,625,041	\$ 1,468,682	\$ -	\$ 0	\$ -	\$ -	\$ -	\$ 24,097,520
Non-Residential										
8 Smart Saver® for Non-Residential Customers Lighting	\$ 267,995	\$ 1,568,968	\$ 2,140,019	\$ 179,572	\$ -	\$ -	\$ -	\$ -	\$ -	4,156,555
9 Smart Saver® for Non-Residential Customers Motors	1,508	34,581	47,849	4,389	-	-	-	-	-	88,327
10 Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	-	4	10	1	-	-	-	-	-	15
11 Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	1,873	24,316	31,396	2,792	-	-	-	-	-	60,377
12 Smart Saver® for Non-Residential Customers - HVAC	4,441	61,038	114,704	10,212	-	-	-	-	-	190,394
13 Smart Saver® for Non-Residential Customers - Custom Rebate	170	129,797	423,378	38,673	-	-	-	-	-	592,018
14 Total Lost Revenues	275,987	1,818,705	2,757,356	235,639	-	-	-	-	-	5,087,686
15 Found Non-Residential Revenues	196,302	1,171,619	1,621,460	135,122	-	0	-	-	-	3,124,503
16 Net Lost Non-Residential Revenues	\$ 79,685	\$ 647,086	\$ 1,135,896	\$ 100,517	\$ -	\$ (0)	\$ -	\$ -	\$ -	\$ 1,963,183
Years 1 - 3										
Vintage 2	2009	2010	2011 (1/2 year)	1 Mth 2012	2012	2013 ^(a)	2014	2015	2016	Total
Residential										
17 Residential Energy Assessments	\$ -	\$ -	\$ 199,106	\$ -	\$ 416,418	\$ 307,665	\$ -	\$ -	\$ -	923,189
18 Smart Saver® for Residential Customers	-	-	7,082,986	-	17,639,492	13,038,388	-	-	-	37,760,866
19 Low Income Energy Efficiency and Weatherization Assistance	-	-	8,604	-	25,327	18,723	-	-	-	52,654
20 Energy Efficiency Education Program for Schools	-	-	26,046	-	56,110	41,483	-	-	-	123,639
21 Total Lost Revenues	-	-	7,316,742	-	18,137,348	13,406,259	-	-	-	38,860,348
22 Found Residential Revenues	-	-	46,409	-	91,169	68,377	(0)	-	-	205,955
23 Net Lost Residential Revenues	\$ -	\$ -	\$ 7,270,333	\$ -	\$ 18,046,179	\$ 13,337,882	\$ 0	\$ -	\$ -	\$ 38,654,393
Non-Residential										
24 Smart Saver® for Non-Residential Customers Lighting	\$ -	\$ -	\$ 1,000,289	\$ -	\$ 2,128,947	\$ 1,513,436	\$ -	\$ -	\$ -	4,642,672
25 Smart Saver® for Non-Residential Customers Motors	-	-	42,267	-	92,407	68,717	-	-	-	203,390
26 Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	-	-	6,600	-	16,682	12,451	-	-	-	35,733
27 Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	-	-	14,315	-	33,354	24,736	-	-	-	72,405
28 Smart Saver® for Non-Residential Customers - HVAC	-	-	53,349	-	151,187	112,123	-	-	-	316,659
29 Smart Saver® for Non-Residential Customers - Custom Rebate	-	-	595,732	-	1,414,842	1,051,484	-	-	-	3,062,058
30 Smart Energy Now	-	-	75,977	-	516,386	383,044	-	-	-	975,407
31 Total Lost Revenues	-	-	1,788,530	-	4,353,804	3,165,990	-	-	-	9,308,325
32 Found Non-Residential Revenues	-	-	403,306	-	1,373,820	1,030,365	(0)	-	-	2,807,490
33 Net Lost Residential Revenues	\$ -	\$ -	\$ 1,385,224	\$ -	\$ 2,979,985	\$ 2,135,625	\$ 0	\$ -	\$ -	\$ 6,500,835

Evans Exhibit 2, page 2

Vintage 3	Year 1, 2 and 3 Actuals and Year 4 estimated									
	2009	2010	2011	1 Mth 2012	2012 (1/2 year)	2013 ^(b)	2014	2015 ^(c)	2016	Total
Residential										
34 Appliance Recycling	\$ -	\$ -	\$ -	\$ -	\$ 10,266	\$ 45,180	\$ 46,293	\$ 35,330	\$ -	137,069
35 Residential Energy Assessments	-	-	-	-	254,784	425,879	235,103	156,970	-	1,072,737
36 Smart Saver® for Residential Customers	-	-	-	-	6,953,370	8,775,483	3,841,455	2,603,636	-	22,173,943
37 Energy Efficiency Education Program for Schools	-	-	-	-	239,392	347,698	160,798	125,638	-	873,526
38 Home Energy Comparison Report	-	-	-	-	1,523,842	-	-	-	-	1,523,842
39 Residential Retrofit Pilot	-	-	-	-	-	-	-	-	-	-
40 Total Lost Revenues	-	-	-	-	8,981,654	9,594,241	4,283,649	2,921,574	-	25,781,118
41 Found Residential Revenues	-	-	-	-	32,870	39,068	7,442	2,511	-	81,891
42 Net Lost Residential Revenues	\$ -	\$ -	\$ -	\$ -	\$ 8,948,784	\$ 9,555,173	\$ 4,276,207	\$ 2,919,062	\$ -	\$ 25,699,227
Non-Residential										
	2009	2010	2011	1 Mth 2012	2012 (1/2 year)	2013 ^(b)	2014	2015 ^(c)	2016	Total
43 Smart Saver® for Non-Residential Customers Lighting	\$ -	\$ -	\$ -	\$ -	\$ 978,762	\$ 1,798,752	\$ 1,157,277	\$ 854,416	\$ -	4,789,207
44 Smart Saver® for Non-Residential Customers Motors	-	-	-	-	64,385	149,063	113,632	94,215	-	421,295
45 Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	-	-	-	-	-	-	-	-	-	-
46 Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	-	-	-	-	14,096	33,415	32,665	20,026	-	100,202
47 Smart Saver® for Non-Residential Customers - HVAC	-	-	-	-	70,330	119,862	75,924	54,637	-	320,754
48 Smart Saver® for Non-Residential Customers - Custom Rebate	-	-	-	-	1,656,364	3,185,396	2,077,602	1,672,959	-	8,592,321
49 Smart Energy Now	-	-	-	-	294,199	203,098	-	-	-	497,298
50 Total Lost Revenues	-	-	-	-	3,078,136	5,489,587	3,457,100	2,696,253	-	14,721,077
51 Found Non-Residential Revenues	-	-	-	-	444,844	760,962	144,945	78,219	-	1,428,970
52 Net Lost Non-Residential Revenues	\$ -	\$ -	\$ -	\$ -	\$ 2,633,292	\$ 4,728,625	\$ 3,312,155	\$ 2,618,034	\$ -	\$ 13,292,107
Year 1 and 2 actual, Year 3 and 4 Estimated										
Vintage 4	2009	2010	2011	1 Mth 2012	2012	2013 (1/2 year)	2014	2015	2016 ^(d)	Total
Residential										
53 Appliance Recycling	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 101,998	\$ 240,815	\$ 238,449	\$ 136,270	717,531
54 Residential Energy Assessments	-	-	-	-	-	178,126	358,256	354,699	175,570	1,066,651
55 Smart Saver® for Residential Customers	-	-	-	-	-	3,015,924	5,890,655	5,829,586	2,792,637	17,528,801
56 Low Income Energy Efficiency and Weatherization Assistance	-	-	-	-	-	12,238	44,504	44,084	31,908	132,734
57 Energy Efficiency Education Program for Schools	-	-	-	-	-	136,637	246,083	243,620	105,938	732,278
58 Home Energy Comparison Report	-	-	-	-	-	7,042,473	-	-	-	7,042,473
59 Total Lost Revenues	-	-	-	-	-	10,487,396	6,780,312	6,710,438	3,242,322	27,220,467
60 Found Residential Revenues	-	-	-	-	-	37,737	62,416	62,416	24,679	187,249
61 Net Lost Residential Revenues	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 10,449,659	\$ 6,717,896	\$ 6,648,022	\$ 3,217,642	\$ 27,033,219
Non-Residential										
	2009	2010	2011	1 Mth 2012	2012	2013 (1/2 year)	2014	2015	2016 ^(d)	Total
62 Smart Saver® for Non-Residential Customers Lighting	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,382,839	\$ 2,760,118	\$ 2,769,348	\$ 1,362,938	8,275,243
63 Smart Saver® for Non-Residential Customers Motors	-	-	-	-	-	82,592	171,814	173,141	89,216	516,762
64 Smart Saver® for Non-Residential Customers - Other Prescriptive (Process Equipment)	-	-	-	-	-	1,852	6,401	6,423	4,595	19,271
65 Smart Saver® for Non-Residential Customers - Energy Star Food Service Products	-	-	-	-	-	14,181	37,136	37,387	23,154	111,859
66 Smart Saver® for Non-Residential Customers - HVAC	-	-	-	-	-	91,920	210,322	210,626	117,888	630,757
67 Smart Saver® for Non-Residential Customers - Custom Rebate	-	-	-	-	-	1,322,386	2,957,110	2,977,938	1,630,601	8,888,034
68 Smart Energy Now	-	-	-	-	-	-	-	-	-	-
69 Total Lost Revenues	-	-	-	-	-	2,895,770	6,142,901	6,174,862	3,228,392	18,441,925
70 Found Non-Residential Revenues	-	-	-	-	-	256,062	391,840	391,840	135,778	1,175,520
71 Net Lost Non-Residential Revenues	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,639,708	\$ 5,751,061	\$ 5,783,022	\$ 3,092,613	\$ 17,266,405

(a) Vintage 2 Year 3 Lost Revenues represent January - September 24, 2013 lost revenues.

(b) Vintage 3 Year 2 Lost Revenues were based on Participants Jan-Jun'12 for Lost revenues until Sept. 24, 2013 and participants July - December 2012 for full year

(c) Vintage 3 Year 4 Lost Revenues represent only a 1/2 year for July - December 2012 participants due to half year convention used for Year 1 lost revenues

(d) Lost revenues were estimated by applying forecasted lost revenue rates for residential and non-residential customers to state specific program participation.

Duke Energy Carolinas, LLC
For the Period January 1, 2015 - December 31, 2015
Docket Number E-7, Sub 1105
North Carolina Net Lost Revenue Estimates for Vintages 2014 - 2017

Line	Residential	Vintage 2014				Total
		2014	2015	2016 ^(a)	2017 ^(a)	
1	Energy Assessments	\$ 310,206	\$ 500,893	497,583	\$ 190,675	\$ 1,499,356
2	My Home Energy Report	6,638,564	-	-	-	6,638,564
3	Energy Efficient Appliances and Devices	3,920,894	8,151,137	8,015,920	3,968,600	24,056,551
4	HVAC Energy Efficiency	117,002	219,689	71,466	122,471	530,627
5	Appliance Recycle Program	107,895	256,676	255,086	133,279	752,936
6	Income Qualified Energy Efficiency and Weatherization Assistance	85,575	159,286	158,572	75,709	479,143
7	Multi-Family Energy Efficiency	179,326	500,657	574,281	337,939	1,592,203
8	Energy Efficiency Education	130,480	321,735	322,985	176,708	951,908
9	Total Lost Revenues	11,489,942	10,110,074	9,895,892	5,005,380	36,501,288
10	Found Residential Revenues *	-	-	-	-	-
11	Net Lost Residential Revenues	\$ 11,489,942	\$ 10,110,074	\$ 9,895,892	\$ 5,005,380	\$ 36,501,288

Line	Non-Residential	Vintage 2014				Total
		2014	2015	2016 ^(a)	2017 ^(a)	
12	Nonresidential Smart Saver Custom Energy Assessments	\$ 166,013	\$ 225,057	\$ 226,174	\$ 51,043	\$ 668,287
13	Non Residential Smart Saver Custom	1,187,785	1,948,359	1,973,711	743,821	5,853,676
14	Energy Management Information Systems	-	-	-	-	-
15	Non Residential Smart Saver Energy Efficient Food Service Products	44,071	74,245	75,852	36,422	230,590
16	Non Residential Smart Saver Energy Efficient HVAC Products	97,955	173,450	178,827	73,619	523,851
17	Non Residential Smart Saver Energy Efficient Lighting Products	1,307,484	2,400,519	2,443,628	1,122,841	7,274,472
18	Non Residential Smart Saver Energy Efficient Pumps and Drives Products	94,155	167,940	172,849	103,506	538,450
19	Non Residential Smart Saver Energy Efficient IT Products	419	3,025	3,133	2,327	8,903
20	Non Residential Smart Saver Energy Efficient Process Equipment Products	19,557	29,054	28,995	18,041	95,646
21	Smart Business Energy Saver	15,777	188,878	191,647	172,896	569,198
22	Smart Energy in Offices	141,430	811,455	799,334	825,755	2,577,974
23	Total Lost Revenues	3,074,646	6,021,983	6,094,150	3,150,271	18,341,049
24	Found Non-Residential Revenues *	1,512	-	-	-	1,512
25	Net Lost Non-Residential Revenues	\$ 3,073,134	\$ 6,021,983	\$ 6,094,150	\$ 3,150,271	\$ 18,339,537

Line	Residential	2014	Vintage 2015			Total			
			2015	2016 ^(a)	2017 ^(a)				
26	Residential Energy Assessments	\$	283,820	\$	333,375	\$	479,509	\$	1,096,704
27	My Home Energy Report		10,047,270		-		-		10,047,270
28	Energy Efficient Appliances and Devices		3,628,684		2,257,784		6,059,875		11,946,343
29	HVAC Energy Efficiency		132,103		221,848		235,585		589,536
30	Appliance Recycle Program		150,816		262,360		281,052		694,227
31	Income Qualified Energy Efficiency and Weatherization Assistance		63,867		232,432		132,791		429,090
32	Multi-Family Energy Efficiency		336,658		485,043		680,181		1,501,882
33	Energy Efficiency Education		89,807		279,113		221,372		590,292
34	Total Lost Revenues		14,733,024		4,071,955		8,090,365		26,895,344
35	Found Residential Revenues *								-
36	Net Lost Residential Revenues	\$	14,733,024	\$	4,071,955	\$	8,090,365	\$	26,895,344

	Non-Residential	2014	2015	2016 ^(a)	2017 ^(a)	Total			
37	Nonresidential Smart Saver Custom Energy Assessments	\$	5,659	\$	290,657	\$	22,737	\$	319,053
38	Non Residential Smart Saver Custom		1,429,871		1,946,849		2,511,341		5,888,061
39	Energy Management Information Services		-		-		-		-
40	Non Residential Smart Saver Energy Efficient Food Service Products		52,147		38,177		288,740		379,063
41	Non Residential Smart Saver Energy Efficient HVAC Products		110,414		192,709		200,180		503,303
42	Non Residential Smart Saver Energy Efficient Lighting Products		1,418,944		2,383,702		2,371,512		6,174,157
43	Non Residential Smart Saver Energy Efficient Pumps and Drives Products		61,602		184,145		118,968		364,715
44	Non Residential Smart Saver Energy Efficient IT Products		58,585		100,222		177,273		336,080
45	Non Residential Smart Saver Energy Efficient Process Equipment Products		16,950		3,070		35,411		55,431
46	Smart Business Energy Saver		1,418,778		1,986,875		2,802,670		6,208,323
47	Smart Energy in Offices		495,692		1,070,349		954,597		2,520,638
48	EnergyWise for Business		-		-		-		-
49	Total Lost Revenues		5,068,642		8,196,755		9,483,428		22,748,824
50	Found Non-Residential Revenues *		-		-		-		-
51	Net Lost Non-Residential Revenues	\$	5,068,642	\$	8,196,755	\$	9,483,428	\$	22,748,824

Line	Residential	Vintage 2016		2016 ^(a)	2017 ^(a)	Total
		2014	2015			
52	Residential Energy Assessments			\$ 180,515	\$ 365,002	\$ 545,517
53	My Home Energy Report			10,000,374	-	10,000,374
54	Energy Efficient Appliances and Devices			885,431	3,970,834	4,856,265
55	HVAC Energy Efficiency			79,543	-	79,543
56	Appliance Recycle Program			138,883	327,591	466,474
57	Income Qualified Energy Efficiency and Weatherization Assistance			117,454	268,624	386,078
58	Multi-Family Energy Efficiency			318,146	527,652	845,798
59	Energy Efficiency Education			153,421	264,212	417,633
60	Total Lost Revenues			-	11,873,767	17,597,683
61	Found Residential Revenues *					
62	Net Lost Residential Revenues			\$ -	\$ 11,873,767	\$ 17,597,683

Line	Non-Residential	Vintage 2016		2016 ^(a)	2017 ^(a)	Total
		2014	2015			
63	Nonresidential Smart Saver Custom Energy Assessments			\$ 213,540	\$ 347,624	\$ 561,164
64	Non Residential Smart Saver Custom			1,008,577	2,558,214	3,566,791
65	Energy Management Information Services			-	-	-
66	Non Residential Smart Saver Energy Efficient Food Service Products			18,783	109,628	128,411
67	Non Residential Smart Saver Energy Efficient HVAC Products			105,952	193,142	299,094
68	Non Residential Smart Saver Energy Efficient Lighting Products			1,249,795	2,070,736	3,320,531
69	Non Residential Smart Saver Energy Efficient Pumps and Drives Products			70,833	124,718	195,551
70	Non Residential Smart Saver Energy Efficient IT Products			74,932	92,546	167,478
71	Non Residential Smart Saver Energy Efficient Process Equipment Products			1,497	25,844	27,341
72	Small Business Energy Saver			1,210,438	2,542,422	3,752,860
73	Smart Energy in Offices			792,359	202,104	994,463
74	EnergyWise for Business			42,467		42,467
75	Total Lost Revenues			4,746,706	8,309,444	13,056,150
76	Found Non-Residential Revenues *					-
77	Net Lost Non-Residential Revenues			\$ 4,746,706	\$ 8,309,444	\$ 13,056,150

Line	Residential	Vintage 2017		2016 ^(a)	2017 ^(a)	Total
		2014	2015			
77	Residential Energy Assessments				\$ 191,626	\$ 191,626
78	My Home Energy Report				10,414,784	10,414,784
79	Energy Efficient Appliances and Devices				1,518,576	1,518,576
80	HVAC Energy Efficiency				-	-
81	Appliance Recycle Program				-	-
82	Income Qualified Energy Efficiency and Weatherization Assistance				122,111	122,111
83	Multi-Family Energy Efficiency				319,916	319,916
84	Energy Efficiency Education				132,106	132,106
85	Total Lost Revenues			-	-	12,699,119
86	Found Residential Revenues *					-
87	Net Lost Residential Revenues			\$ -	\$ 12,699,119	\$ 12,699,119

Line	Non-Residential	Vintage 2017		2016 ^(a)	2017 ^(a)	Total
		2014	2015			
88	Nonresidential Smart Saver Custom Energy Assessments				\$ 182,503	\$ 182,503
89	Non Residential Smart Saver Custom				1,349,462	1,349,462
90	Energy Management Information Services				-	-
91	Non Residential Smart Saver Energy Efficient Food Service Products				57,555	57,555
92	Non Residential Smart Saver Energy Efficient HVAC Products				99,640	99,640
93	Non Residential Smart Saver Energy Efficient Lighting Products				1,087,136	1,087,136
94	Non Residential Smart Saver Energy Efficient Pumps and Drives Products				65,477	65,477
95	Non Residential Smart Saver Energy Efficient IT Products				48,587	48,587
96	Non Residential Smart Saver Energy Efficient Process Equipment Products				13,568	13,568
97	Small Business Energy Saver				1,102,111	1,102,111
98	Smart Energy in Offices				1,812,965	1,812,965
99	Business Energy Report				188,577	188,577
100	EnergyWise for Business				32,311	32,311
101	Total Lost Revenues			-	6,039,892	6,039,892
102	Found Non-Residential Revenues *					-
103	Net Lost Non-Residential Revenues			\$ -	\$ 6,039,892	\$ 6,039,892

* Found Revenues - See Evans Exhibit 4

(a) Lost revenues were estimated by applying forecasted lost revenue rates for residential and non-residential customers to state specific forecasted program participation.

Evans Exhibit 3, page 1

Duke Energy Carolinas, LLC
For the Period June 1, 2009 - December 31, 2013
Docket Number E-7 Sub 1105
Actual Program Costs for SAW programs

Line	SAW PROGRAMS		Carolinas System Costs - 6/1/2009 - 12/31/2009	Carolinas System Costs - 12 Months Ended 12/31/2010	Carolinas System Costs - 12 Months Ended 12/31/2011	Carolinas System Costs - 12 Months Ended 12/31/2012	Carolinas System Costs - 12 Months Ended 12/31/2013
1	Residential Energy Assessments		\$ 2,003,480	\$ 2,632,637	\$ 2,668,577	\$ 2,807,908	\$ 2,709,166
2	Residential Home Retrofit		-	-	118,811	157,393	5,792
3	Residential Neighborhood Program		-	-	-	110,001	600,407
4	Home Energy Comparison Report		-	-	711,131	3,012,860	7,441,231
5	Residential Smart Saver		2,639,505	25,972,993	23,006,146	19,502,040	14,341,695
6	Appliance Recycle Program		-	-	-	302,588	1,808,141
7	Low Income Services		106,530	396,691	1,296	20,167	9,812
8	Energy Efficiency Education		2,137,748	2,273,809	791,598	2,893,919	2,030,442
9	Nonresidential Energy Assessments		161,826	1,110,853	2,519,394	1,467,001	750,949
10	Nonresidential Smart Energy Now		-	-	2,069,672	1,062,135	1,477,300 (1)
11	Nonresidential Smart Saver		1,831,197	6,988,330	12,145,531	18,984,876	17,610,411
12	Power Manager		2,322,903	9,422,232	14,392,260	12,541,114	12,715,817
13	Power Share		759,147	7,964,184	13,774,440	15,379,288	15,005,089
14	Total Energy Efficiency & Demand Side Program Costs	Sum (Lines 1-13)	\$ 11,962,336	\$ 56,761,729	\$ 72,198,856	\$ 78,241,290	\$ 76,506,252
15	NC Allocation Factor for EE programs	Miller Exhibit 5	73.0077318%	72.7072722%	72.6972151%	72.7194575%	72.9600473%
16	NC Allocation Factor for DSM programs-Residential	Miller Exhibit 5	33.9010659%	34.4404513%	32.2293181%	34.8388691%	34.0209980%
17	NC Allocation Factor for DSM programs-Non-Residential	Miller Exhibit 5	39.9179344%	40.3489126%	42.2350050%	39.8808428%	41.2108021%
			NC Allocated Costs - 6/1/2009 - 12/31/2009	NC Allocated Costs - 12 Months Ended 12/31/2010	NC Allocated Costs - 12 Months Ended 12/31/2011	NC Allocated Costs - 12 Months Ended 12/31/2012	NC Allocated - 12 Months Ended 12/31/2013
18	Residential Energy Assessments	Line 1*Line 15	\$ 1,462,695	\$ 1,914,119	\$ 1,939,981	\$ 2,041,895	\$ 1,976,609
19	Residential Home Retrofit	Line 2*Line 15	-	-	86,372	114,455	4,226
20	Residential Neighborhood Program	Line 3*Line 15	-	-	-	79,992	438,057
21	Home Energy Comparison Report	Line 4*Line 15	-	-	516,972	2,190,935	5,429,126
22	Residential Smart Saver	Line 5*Line 15	1,927,043	18,884,255	16,724,827	14,181,778	10,463,707
23	Appliance Recycle Program	Line 6*Line 15	-	-	-	220,040	1,319,221
24	Low Income Services	Line 7*Line 15	77,775	288,423	942	14,665	7,159
25	Energy Efficiency Education	Line 8*Line 15	1,560,721	1,653,224	575,470	2,104,442	1,481,411
26	Nonresidential Energy Assessments	Line 9*Line 15	118,145	807,671	1,831,529	1,066,795	547,893
27	Nonresidential Smart Energy Now	Line 10*Line 15	-	-	1,504,594	772,379	1,077,839
28	Nonresidential Smart Saver	Line 11 * Line 15	1,336,915	5,081,024	8,829,463	13,805,699	12,848,564
29	Power Manager	(Line 12+ Line 13)*Line 16	1,044,848	5,987,960	9,077,935	9,727,152	9,430,929
30	Power Share	(Line 12+ Line 13)*Line 17	1,230,291	7,015,230	11,896,207	11,134,892	11,424,008
31	Total Energy Efficiency & Demand Side Program Costs	Sum (Lines 18-30)	\$ 8,758,434	\$ 41,631,906	\$ 52,984,294	\$ 57,455,121	\$ 56,448,748

(1) Represents January and February 2014 program costs related to the Smart Energy in Offices pilot program.

Duke Energy Carolinas, LLC
For the Period January 1, 2015 - December 31, 2015
Docket Number E-7 Sub 1105
Actual Program Costs for Vintage Years 2015

		Carolinas System - 12 Months Ended 12/31/2014	Carolinas System - 12 Months Ended 12/31/2015
1	Residential Energy Assessments	\$ 3,605,737	\$ 3,086,327
2	My Home Energy Report	8,285,066	9,846,384
3	Energy Efficient Appliances and Devices	14,738,129	12,051,083
4	HVAC Energy Efficiency	4,786,807	5,417,102
5	Appliance Recycle Program	1,515,867	1,537,318
6	Income Qualified Energy Efficiency and Weatherization Assistance	1,917,192	2,238,887
7	Multi family Energy Efficiency	1,442,533	2,093,039
8	Energy Efficiency Education	1,963,153	2,054,774
9	Nonresidential Smart Saver Custom Energy Assessments	1,458,195	662,134
10	Energy Management Information Systems	74,855	-
11	Non-Residential Smart Saver Custom	8,136,712	9,933,078
12	Non-Residential Energy Efficient Food Service Products	199,350	194,429
13	Non-Residential Smart Saver Energy Efficient HVAC Products	815,339	1,142,545
14	Non-Residential Smart Saver Energy Efficient Lighting Products	6,727,675	11,336,027
15	Nonresidential Energy Efficient Pumps and Drives Products	584,874	466,488
16	Nonresidential Energy Efficient ITEE	25,730	716,556
17	Nonresidential Energy Efficient Process Equipment Products	89,809	88,825
18	Smart Energy In Offices	1,156,497	1,463,269
19	Small Business Energy Saver	1,026,607	13,969,072
20	Business Energy Report	-	126,407
21	Power Manager	15,662,693	14,628,923
22	EnergyWise for Business	-	1,549,305
23	Power Share	15,520,492	15,627,728
24	Total Energy Efficiency & Demand Side Program Costs	\$ 89,733,313	\$ 110,229,700
Sum(Lines 1-23)			

25	NC Allocation Factor for EE programs	Miller Exhibit 5 Pg. 2, Line 4	72.9600473%	72.9564706%
26	NC Allocation Factor for DSM programs-Residential	Miller Exhibit 5 Pg. 2, Line 9	34.0209980%	32.5218612%
27	NC Allocation Factor for DSM programs-Non-Residential	Miller Exhibit 5 Pg. 2, Line 10	41.2108021%	42.4483655%

		NC Allocated - 12 Months Ended 12/31/2014	NC Allocated - 12 Months Ended 12/31/2015
28	Residential Energy Assessments	\$ 2,630,748	\$ 2,251,675
29	My Home Energy Report	6,044,788	7,183,574
30	Energy Efficient Appliances and Devices	10,752,946	8,792,045
31	HVAC Energy Efficiency	3,492,457	3,952,126
32	Appliance Recycle Program	1,105,977	1,121,573
33	Income Qualified Energy Efficiency and Weatherization Assistance	1,398,784	1,633,413
34	Multi family Energy Efficiency	1,052,473	1,527,007
35	Energy Efficiency Education	1,432,317	1,499,090
36	Nonresidential Smart Saver Custom Energy Assessments	1,063,900	483,069
37	Energy Management Information Systems	54,614	-
38	Non-Residential Smart Saver Custom	5,936,549	7,246,823
39	Non-Residential Energy Efficient Food Service Products	145,446	141,848
40	Non-Residential Smart Saver Energy Efficient HVAC Products	594,872	833,560
41	Non-Residential Smart Saver Energy Efficient Lighting Products	4,908,515	8,270,365
42	Nonresidential Energy Efficient Pumps and Drives Products	426,724	340,333
43	Nonresidential Energy Efficient ITEE	18,773	522,774
44	Nonresidential Energy Efficient Process Equipment Products	65,525	64,804
45	Smart Energy In Offices	843,781	1,067,550
46	Small Business Energy Saver	749,013	10,191,342
47	Business Energy Report	-	92,222
48	Power Manager	(Line 21 + Line 22 + Line 23)* Line 26	10,343,889
49	EnergyWise for Business	(Line 21 + Line 22 + Line 23)* Line 27	1,217,750
50	Power Share	(Line 21 + Line 22 + Line 23)* Line 27	12,283,359
49	Total Energy Efficiency & Demand Side Program Costs	\$ 66,177,873	\$ 81,060,193
Sum (Lines 25-44)			

Duke Energy Carolinas, LLC
January 2014 - December 2015 Actuals
January 2016 - December 2017 Estimates
Docket Number E-7, Sub 1105
North Carolina Found Revenues

	Actual KWH		Estimated KWH		Decision Tree Node
	2014	2015	2016	2017	
Boilers (unmetered)	-	-	-	-	Box 6 - include
Boilers (metered)	-	-	-	-	Box 6 - include
Economic Development	166,234,550	464,610,000	-	-	Box 5 - exclude
Plug-in Electric Charging Station Pilot	238,696	-	-	-	Box 3 - exclude
Food Service	-	-	-	-	Box 6 - include
Process Heat	-	-	-	-	Box 6 - include
Lighting					
Residential	105,354	90,653	90,653	90,653	Box 6 - include
Non Residential (Regulated)	95,391	76,081	76,081	76,081	Box 6 - include
MV to LED Credit - Residential (Regulated)	(156,381)	(171,375)	(158,282)	(158,282)	Box 6 - include
MV to LED Credit - Non-Residential (Regulated)	(104,331)	(160,589)	(148,320)	(148,320)	Box 6 - include
Non Residential (Non Regulated)	-	-	-	-	Box 6 - include
Total KWH	166,413,279	464,444,770	(139,868)	(139,868)	
Total KWH Included	(59,967)	(165,230)	(139,868)	(139,868)	
Total KWH Included (net of Free Riders 15%)	\$ (50,972)	\$ (140,446)	\$ (118,887)	\$ (118,887)	
Annualized Found Revenue - Non Residential	\$ (3,611)	\$ (37,622)	\$ (35,879)	\$ (35,879)	
Annualized Found Revenue - Residential	\$ (34,952)	\$ (55,345)	\$ (47,104)	\$ (47,104)	
	2014	2015	2016	2017	
Vintage 1 -2009 - Non Res					
Vintage 1 -2010 - Non Res					
Vintage 2011 - Non Res	\$ 970,514	-	-	-	
Vintage 2012 - Non Res	966,301	\$ 521,457	-	-	
Vintage 2013 - Non Res	391,840	391,840	\$ 135,778	-	
Vintage 2014 - Non Res	1,512	(3,611)	(3,611)	\$ (5,123)	
Vintage 2015 - Non Res		(21,521)	(37,622)	(37,622)	
Vintage 2016 - Non Res			(19,434)	(35,879)	
Vintage 2017 - Non Res				(19,434)	
Rate Case Adjustment - Non Res **	(1,791,870)	(443,239)			
Net Negative Found Revenues to Zero*	-	-	-	98,058	
Subtotal - Non Res	\$ 538,297	\$ 444,927	\$ 75,111	\$ -	
Net Negative Found Revenues to Zero*					
Vintage 1 -2009 - Residential					
Vintage 1 -2010 - Residential					
Vintage 2011 - Res	\$ 44,760				
Vintage 2012 - Res	49,611	\$ 16,741			
Vintage 2013 - Res	62,416	62,416	\$ 24,679		
Vintage 2014 - Res	(12,947)	(34,952)	(34,952)	\$ (22,006)	
Vintage 2015 - Res		(32,357)	(55,345)	(55,345)	
Vintage 2016 - Res			(25,515)	(47,104)	
Vintage 2017 - Res				(25,515)	
Rate Case Adjustment - Non Res **	(86,929)	(14,230)	-	-	
Net Negative Found Revenues to Zero*	-	2,382	91,132	149,969	
Subtotal - Residential	\$ 56,911	\$ -	\$ -	\$ -	
Total Found Revenues	\$ 595,208	\$ 444,927	\$ 75,111	\$ -	

* Eliminates the inclusion of total negative found revenues at the Residential and Non-Residential Level

** Removes amounts to be recovered in base rates.

Duke Energy Carolinas
System Event Based Demand Response January 1, 2015 - December 31, 2015
Docket Number E-7, Sub 1105

Date	State	Program Name	Event Trigger	High / Low Temperature	Customers Notified /Switched Dispatched	MW Reduction
1/8/2015	NC and SC	IS	Emergency	H 28 L 9	56	115.7
1/8/2015	NC and SC	SG	Emergency	H 28 L 9	30	14.7
1/8/2015	NC and SC	PowerShare Mandatory	Emergency	H 28 L 9	169	318.3
1/8/2015	NC and SC	PowerShare Voluntary	Emergency	H 28 L 9	3	-
1/9/2015	NC and SC	IS	Emergency	H 44 L 24	56	118.2
1/9/2015	NC and SC	SG	Emergency	H 44 L 24	30	14.5
1/9/2015	NC and SC	PowerShare Mandatory	Emergency	H 44 L 24	169	303.4
1/9/2015	NC and SC	PowerShare Voluntary	Emergency	H 44 L 24	3	-
2/19/2015	NC and SC	IS	Emergency	H 24 L 12	56	102.8
2/19/2015	NC and SC	SG	Emergency	H 24 L 12	30	15.2
2/19/2015	NC and SC	PowerShare Mandatory	Emergency	H 24 L 12	168	331.6
2/19/2015	NC and SC	PowerShare Voluntary	Emergency	H 24 L 12	3	-
2/20/2015	NC and SC	Power Share Generator	Emergency	H 30 L 8	33	32.7
2/20/2015	NC and SC	IS	Emergency	H 30 L 8	56	87.3
2/20/2015	NC and SC	SG	Emergency	H 30 L 8	30	15.5
2/20/2015	NC and SC	PowerShare Mandatory	Emergency	H 30 L 8	168	304.1
2/20/2015	NC and SC	PowerShare Voluntary	Emergency	H 30 L 8	3	-
6/16/2015	NC and SC	Power Manager	Economic	H 96 L73	163,633/196,105	284.2
6/23/2015	NC and SC	Power Manager	Economic	H 96 L73	163,716/196,267	276.3
7/20/2015	NC and SC	Power Manager	Economic	H 96 L73	121,245/144,208	207.3
8/5/2015	NC and SC	Power Manager	Economic	H 95 L 72	166,697/199,615	266.8

Notes:

- The 'High Temperature' is the average of the daily high temperatures from 3 weather stations (Charlotte, Greensboro, Greenville/Spartanburg)
- 'Customers Notified' is the number of participants notified to participate in the event
- 'Switches Dispatched' values represent the monthly active switch counts
- 'MW Reduction' values are based on the average across all hours of the event
- A loss adjustment of 1.0622 has been included in the 'MW Reduction' values.

A. Description

During the first quarter 2016 Duke Energy Carolinas Collaborative meeting, Duke Energy Carolinas, LLC (the "Company") will provide an update on the performance of its energy efficiency and demand side management programs/pilots for the timeframe of January 2015 to December 2015. The Company's product managers prepared reports on each program/pilot describing the offerings and detailing each program's performance. This Executive Summary describes how the Company performed in regards to the energy efficiency and demand side management program/pilot performance at an aggregate level during the entire year of Vintage 2015 in comparison to as filed information. Program-specific details are provided in the individual reports.

Program reports include:

Program	Category	Customer
Non-Residential Smart \$aver Prescriptive	EE	Non-residential
Non-Residential Smart \$aver Custom	EE	Non-residential
Non-Residential Smart \$aver Custom Assessment	EE	Non-residential
Smart Energy in Offices	EE	Non-residential
Small Business Energy Saver	EE	Non-residential
PowerShare	DSM	Non-residential
Energy Assessments	EE	Residential
HVAC Energy Efficiency Program	EE	Residential
Income Qualified Energy Efficiency and Weatherization Assistance	EE	Residential
Energy Efficiency Education Programs	EE	Residential
My Home Energy Report	EE	Residential
Appliance Recycling Program	EE	Residential
Energy Efficient Appliances and Devices	EE	Residential
Multi-Family Energy Efficiency	EE	Residential
EnergyWise for Business	EE/DSM	Non-residential
Business Energy Reports	EE	Non-residential
Power Manager	DSM	Residential

Audience

All retail Duke Energy Carolinas customers who have not opted out.

B & C. Impacts, Participants and Expenses

The tables below include actual results for the entire year of Vintage 2015 in comparison to as filed data for Vintage 2015.

The Company includes the number of units achieved and a percentage comparison to the as filed values. The unit of measure varies by measure as a participant, for example, may be a single CFL bulb, a kW, a kWh, a household or a square foot. Due to the multiple measures in a given program or programs, units may appear skewed and are not easily comparable.

Carolinas System Summary¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$283.0	\$351.2	124%
Program Cost	\$105.2	\$110.2	105%
MW²	970.2	1,003.9	103%
MWH	408,673.2	649,417.3	159%
Units	2,871,189	102,103,514	3556%

- 1) Numbers rounded.
- 2) As filed MW are annual maximum peak. Coincident peak is tracked for impacts.

Carolinas Energy Efficiency Summary¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$158.2	\$249.8	158%
Program Cost	\$66.2	\$78.4	118%
MW²	75.1	129.1	172%
MWH	408,673.2	649,417.3	159%
Units	2,028,451	101,279,900	4993%

- 1) Numbers rounded.
- 2) As filed MW are annual maximum peak. Coincident peak is tracked for impacts.

Carolinas Demand Response Summary¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$124.8	\$101.5	81%
Program Cost	\$39.0	\$31.8	82%
MW²	895.1	874.8	98%
MWH	N/A	41.6	-
Units³	842,738	823,614	98%

- 1) Numbers rounded.
- 2) MW capability derived by taking the average over the PowerShare and PowerManager contract periods.
- 3) Units included in filing represented MW at meter, rather than number of participants. YTD value reflects average participation for 2015.
- 4) Numbers rounded.

D. Qualitative Analysis

The Company includes the number of units achieved and a percentage comparison to the as filed values. The unit of measure varies by measure as a participant, for example, may be a single CFL bulb, a kW, a kWh, a household or a square foot. Due to the multiple measures in a given program or programs, units may appear skewed and are not easily comparable.

Energy efficiency impacts have primarily been driven by lighting measures for both residential and non-residential customers. This is a result of a higher take-rate for lighting offerings than originally projected.

Highlights

Energy Efficiency

Customer participation continues to be largely driven by lighting and assessments programs. These measures provide customers with a relatively low cost efficiency upgrade, with minimal hassle, creating a positive initial energy efficiency experience.

Demand Side Management (DSM)

The DSM portfolio is comprised of PowerShare (non-residential), Power Manager (residential), and EnergyWise for Business (non-residential) programs. The impacts and participation were very close to the 2015 As-Filed targets.

Issues

There have been a number of program specific issues that have negatively impacted the following programs: Appliance Recycling Program, Income Qualified Energy Efficiency and Weatherization Assistance and Non-Residential Smart Saver Customer Assessment. The Residential HVAC Energy Efficiency Program has also struggled to achieve participation and impact targets. Modifications to this program were proposed in late 2015, and recently approved by the NC Commission.

Potential Changes

Several programs are reviewing their current processes and are considering potential modifications designed to increase customer adoption. Potential changes are discussed in individual program reports.

E. Marketing Strategy

Located in individual reports.

F. Evaluation, Measurement and Verification

Located in individual program reports.

APPLIANCE RECYCLING PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Appliance Recycling Program ("Program") promotes the removal and responsible disposal of operating refrigerators and freezers from Duke Energy Carolinas, LLC's (the "Company's") residential customers. The refrigerator or freezer must have a capacity of at least 10 cubic feet but not more than 30 cubic feet. The Program recycles approximately 95% of the material from the harvested appliances.

Audience

Eligible Program participants include the Company's residential customers who own operating refrigerators and freezers used in individually metered residences.

B & C. Impacts, Participants and Expenses

Appliance Recycling¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$9.9	\$1.9	19%
Program Cost	\$2.3	\$1.5	66%
MW	3.9	0.7	19%
MWH	16,819.4	5,536.0	33%
Units	16,688	9,797	59%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

Marketing Efforts

The Program incorporated new channels in our 2015 marketing plan: social media, mass media – gas station, billboards and gas station pulp toppers and fill boards. We partnered with our Home Energy House Call (HEHC) Auditors by providing training and talking points on the Program to inform customers of the benefits of recycling their old second refrigerators & freezers when the HEHC auditors noted one in the customer's home. A comprehensive marketing plan was developed and launched with print, broadcast, digital, and media events during the year. The Program management team scheduled media coverage at an elementary school. The Filet A Fridge event provides an opportunity to educate students in North & South Carolina studying recycling and other environmental efforts, on how refrigerators & freezers can be safely deconstructed with up to 95% of the material being recycled...

Potential Changes

On November 19th, Jaco, the implementation vendor, abruptly discontinued operations. The impact included delayed and bounced incentive payments to customers who participated in the program and cancellations for customers with appointments scheduled through December. Internal work continues to reissue incentive payments and reschedule pickup times for appliances for impacted customers. Additionally, we will consider submitting an RFP to evaluate the future of the Program.

E. Marketing Strategy

The marketing campaign incorporated multiple approaches to reach customers and promote the Program. The marketing outreach includes mass media/advertising, direct mail using a propensity model to refine the target market, social media, bill inserts, direct mail, paid search, and the Program website including digital/on line/web promotions – On Line Services & Hero Banners.

F. Evaluation, Measurement and Verification

A process and impact evaluation report that encompassed participation between September 2013 and May 2015 was completed in December 2015. This completed report was combined for the Program in Duke Energy Carolinas and Duke Energy Progress.

The allocation of combined EM&V costs was based on the actual number of participants in the Appliance Recycling program for each company.

While evaluation work (process and impact) is planned for 2017 with a combined DEC and DEP final report in the fourth quarter of 2017, due to the fact that JACO, the Program supplier, went into bankruptcy in November 2015 and is no longer in business, future Appliance Recycling Programs evaluations are on hold for the time being.

G. Appendix

Q1 Web Banner/State Landing Page

Free removal
of your extra fridge.

Easy. Convenient. Plus get \$50.

[Learn more](#)

Recycle your spare
FRIDGE OR FREEZER.
GET \$50 with FREE pickup
and removal.

[Learn more](#)

Q1 Web – OLS promotion

Free removal
of your extra fridge.

Easy. Convenient.
Plus get \$50.

[Learn more](#)

Recycle your spare
FRIDGE.
GET \$50
with FREE pick up
and removal.

[Learn more](#)

Q1 Social Media

Duke Energy
2 min · 48

In 2013, we recycled 28,729 inefficient refrigerators and freezers through our appliance recycling program. Have a working, spare fridge? We'll haul it away for free and you earn cash! www.duke-energy.com/recycling

Recycled refrigerators can be turned into different types of new materials

Like · Comment · Share

Duke Energy
34 min · 10

Spring into savings with our appliance recycling program. We haul away your working, inefficient fridge—you save energy and earn cash!

Appliance Recycling
Older refrigerator models use a lot more energy than today's more efficient appliances.

www.duke-energy.com [Learn More](#)

Like · Comment · Share · 7 · 10

Duke Energy
February 11 at 9:30pm · 48

It's so smile like this awesome guy? We recycle inefficient working fridges, and you earn cash! www.duke-energy.com/recycling

DUKE ENERGY

Q1 Bill Inserts

DUKE ENERGY

Savings Madness!
ways we can help you

APPLIANCE RECYCLING PROGRAM

Take your shot. 4 ways to save.

- Appliance Recycling Program:**
\$50 cash plus up to \$150 a year in energy savings
- Home Energy House Call:**
\$180 value – a free home energy audit and kit to help you lower your energy bill
- Smart Saver Home Upgrade Rebates:**
Up to \$1,325 in rebates

Free removal of your extra fridge.
Easy. Convenient. Plus get \$50.

- Contact us to schedule your free home pickup
- We'll come get your fridge when it's good for you
- You'll get a \$50 check and save up to \$150 a year in energy costs

[Schedule your free pickup today](#)

Q2 Web Banner/State Landing Page

You could lift it.....But do you want to?




We'll remove your old fridge for FREE and give you \$50.

Learn more

Q2 Web - OLS Promotion

You could lift it.....But do you want to?



We'll remove your old fridge for FREE and give you \$50.

Learn more

Q2 Social Media

Duke Energy
Jun 8, 2015

Cleaning out the garage can be a pain. Recycling the old fridge? Easy! Visit duke-energy.com/recycle for your appointment today.



duke-energy.com/recycle

Q2 Bill Inserts

Celebrate Earth Day with energy-saving tips.
Energy-saving offers inside.



APPLIANCE RECYCLING PROGRAM


Free removal of your extra fridge.
Easy. Convenient.
Plus get \$50.

- ✓ Contact us to schedule your free home pickup
- ✓ We'll come get your fridge when it's good for you, and recycle up to 95 percent of it
- ✓ You'll get a \$50 check and save up to \$150 a year in energy costs


To schedule a free pickup please call 855.398.6200.
For more information or eligibility please visit duke-energy.com/save.



You could lift it.




But do you want to?




We'll remove your old fridge for FREE and give you \$50.


duke-energy.com/save or call 888.653.5353




You do the fun stuff.
We'll lift the fridge.



Call or click to schedule pickup.




We'll haul your old fridge away for free.



You'll get \$50.



Enroll online at
duke-energy.com/save
or call 888.653.5353.




For full details and eligibility visit duke-energy.com/save
© 2015 Duke Energy Corporation. 000153 04/15/15

Q2 – June Email

Subject line:
Free removal of your spare fridge. Plus get \$50.





You could lift it.
But do you want to?




You stick to the fun stuff.
We'll get rid of the old fridge.


We'll remove your old fridge for FREE and give you \$50.




Click or call to
schedule pickup



We'll haul your
fridge away for free



\$50
You'll get \$50

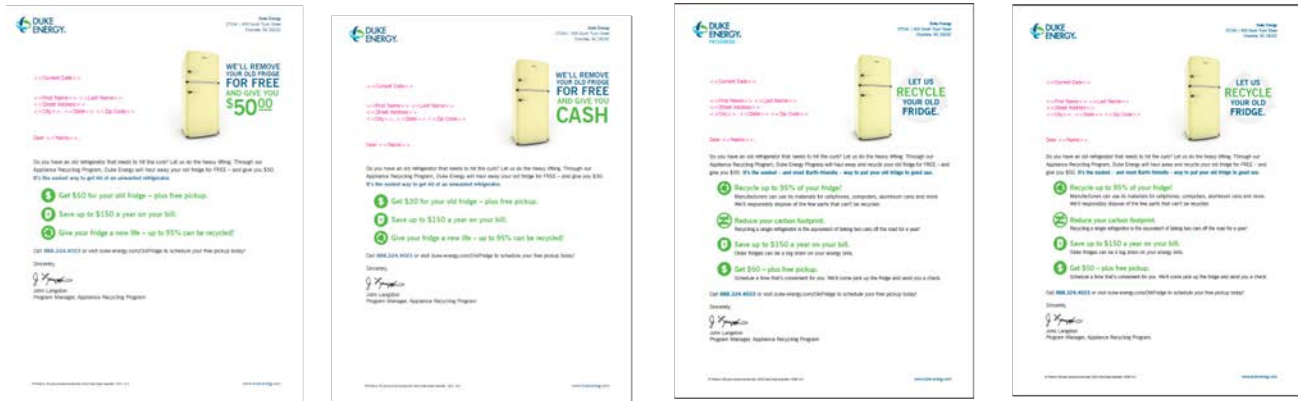
Enroll online 

or call 866.509.4910

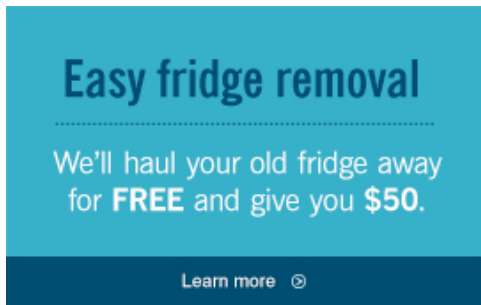
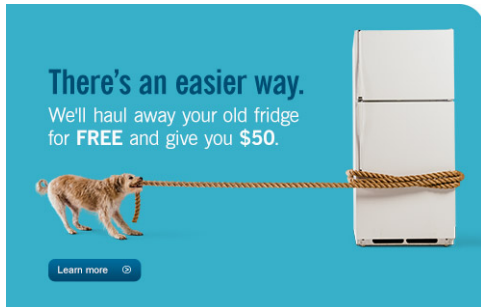
[See our website for full details and eligibility requirements.](#)

Update Your Information | Unsubscribe | Privacy Policy | www.duke-energy.com
Duke Energy | 555 South Tryon Street | Charlotte, NC 28202

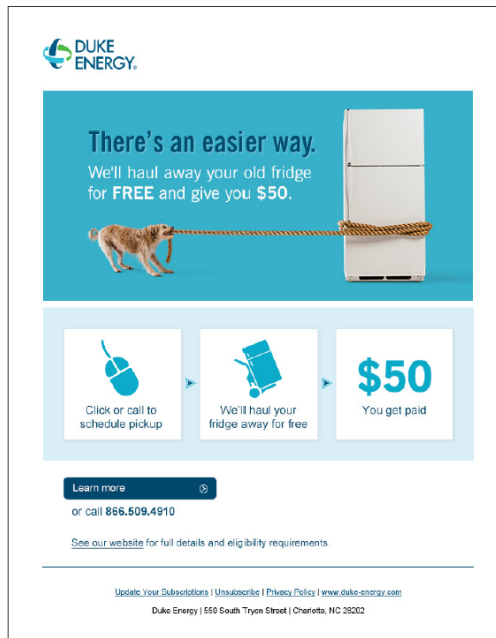
Q3: Direct Mail Piece: Different Versions Targeted Towards Different Axiom Segments.



Q4: HERO Banner, OLS Banner, and EMAIL



Subject line 1: Easy, FREE fridge removal
Subject line 2: Get \$50 for your old fridge



BUSINESS ENERGY REPORT PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Business Energy Report ("BER" or the "Program"), is a periodic comparative usage report that compares a customer's energy use to their peer groups. Comparative groups are identified based on the customer's energy use, type of business, operating hours, square footage, geographic location, weather data and heating/cooling sources. Pilot participants will receive targeted energy efficiency tips in their report informing them of actionable ideas to reduce their energy consumption. The recommendations may include information about other Company offered energy efficiency programs. Participants will receive at least six reports over the course of a year.

Audience

This Pilot will be offered to approximately 13,000 customers served on an eligible Duke Energy Carolinas, LLC (the "Company") non-residential rate schedule who are not opted out of the EE portion of the Rider and have at least 12 months of electric usage with the Company. Initial program participants will be automatically enrolled in the Program. Program participants may request their removal from the Program at any time.

B & C. Impacts, Participants and Expenses

Business Energy Report¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed ³	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	N/A	\$0.0	-
Program Cost	N/A	\$0.1	-
MW ²	N/A	0.0	-
MWH	N/A	0.0	-
Units ³	N/A	0	-

1) Values are reflected at the system level.

2) Numbers rounded.

3) As filed values not included as program was not included in filing.

D. Qualitative Analysis

As customers receive subsequent reports, their engagement increases as they learn more about their specific energy use and how they compare to their peer group. The report then provides customers tools to reduce their usage in the form of targeted energy efficiency tips that provide customers with actionable ideas to help them become more efficient. Program participants are encouraged to contact the Company with their questions, comments and report corrections.

Highlights

The Company mailed letters to pilot participants on December 30, 2015 welcoming them to the program. Customers were provided a form and a business reply envelope to update information about the business such as business type, operating hours, square footage, own/lease, heating/cooling information, and a contact name. After providing customers an opportunity to respond, the first report is scheduled to be mailed to customers on February 17, 2016.

E. Marketing Strategy

The Company will communicate information about the Pilot via the customized proactive reports distributed through, but not limited to, direct mail.

F. Evaluation, Measurement and Verification

There is currently no evaluation activity for the Program in 2016. The first process and impact evaluation report for the Program is scheduled for completion in first quarter of 2018.

OFFICIAL COPY

Mar 09 2016

ENERGY EFFICIENT APPLIANCES AND DEVICES PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Energy Efficient Appliances and Devices program ("Program") offers a variety of measures that allow eligible Duke Energy Carolinas, LLC (the "Company") customers to take action and reduce energy consumption. The Program includes offers for lighting measures, pool pumps, heat pumps water heaters and water measures.

Compact Florescent Lamps Measure

The Compact Fluorescent Lamps ("CFLs") measure is designed to increase the energy efficiency of residential customers by offering customers CFLs to install in high-use fixtures within their homes.

The CFLs are offered through multiple channels to eligible customers. The on-demand ordering platform enables eligible customers to request CFLs and have them shipped directly to their homes. Eligibility is based on past campaign participation (i.e., coupons, Business Reply Cards ("BRCs") and other Company programs offering CFLs). Bulbs are available in 3, 6, 8, 12 and 15 pack kits that have a mixture of 13 watt and 18 watt bulbs. The maximum number of bulbs available for each household is 15, but customers may choose to order less.

Customers have the flexibility to order and track their shipment through three separate channels:

- 1) Telephone: Customers may call a toll-free number to access the Interactive Voice Response ("IVR") system, which provides prompts to facilitate the ordering process. The IVR is designed to handle request for both English and Spanish-speaking customers. Customers may easily validate their account, determine their eligibility and order their CFLs over the phone.
- 2) The Company's Web Site: Customers can go online to order CFLs. Eligibility requirements and frequently asked questions are also available.
- 3) Online Services ("OLS"): Customers enrolled in the Company's Online Services may order CFLs through the Company's web site, if they are eligible.

Specialty Lighting

The Duke Energy Savings Store ("Store") is an extension of the on-demand ordering platform enabling eligible customers to purchase specialty bulbs and have them shipped directly to their homes. The Store launched on April 26, 2013 and offers a variety of CFLs and Light Emitting Diodes lamps ("LEDs") including; Reflectors, Globes, Candelabra, 3 Way, Dimmable and A-Line type bulbs. The incentive levels vary by bulb type and the customer pays the difference, including shipping. The maximum number of bulbs eligible for the Company offered incentive for each household varies by category, but customers may choose to order additional bulbs but will not receive the Company offered incentive.

Customers can check eligibility and shop for specialty bulbs through three separate channels:

- 1) The Company Web Site: Customers can go online to visit the Store and purchase specialty bulbs. Frequently asked questions and a savings calculator are available to help customers understand how much they can save and how sustainable they can be by purchasing and using CFL and LED lighting.
- 2) Online Services: Customers enrolled in the Company's Online Services may visit the Store and purchase specialty bulbs. Upon login, eligible customers are intercepted with the Store offer. Customers can select "Shop Now" or "No Thanks". Additional links and promos within OLS are also available for customers to access the Store.
- 3) Phone Ordering: In September of 2014, customers were provided with the opportunity to order by phone. A toll free phone number is now provided on all promotional pieces for the

program and customers can place their orders over the phone directly with the programs third party vendor.

- 4) In October of 2015, Duke Energy provided customers with a mail-in option for placing an order. Customers received a direct mailer that offered specially priced bulb bundles and had the option to order these bundles online, by phone or with a postage paid return mailer included in the piece.

The Store is managed by a third party vendor, Energy Federation Inc. ("EFI"). EFI is responsible for maintaining the Store website and fulfilling all customer purchases. The Store's landing page provides information about the store, lighting products, account information and order history. Support features include a toll free number, package tracking and frequently asked questions.

An educational tool is available to help customers with their purchase decisions. The interactive tool provides information on bulb types, application types, savings calculator, lighting benefits, understanding watts versus lumens (includes a video) and recycling/safety tips. Each wireframe within the educational tool provides insight on the types of bulbs customers can purchase and/or provides answers to questions they have about the products or savings.

Product pages for each bulb category include application photos, product images, product specifications, purchase limits and program pricing. Customers may place items in their shopping carts to purchase at a later time. Customers can pay for their purchase with a credit card or by check.

Benefits of the four distinct channels for the Savings Store include:

- Improved customer experience
- Advanced inventory management
- Simplified program coordination
- Enhanced reporting
- Increased program participation
- Reduced program costs
- Quick and convenient
- Discounted pricing

Water Measures

The Save Energy and Water Kit Program ("SEWK") is designed to increase the energy efficiency of residential customers by offering customers low flow water fixtures and insulated pipe tape for use within their homes.

The SEWK program is offered through a selective ordering platform, enabling eligible customers to request a kit and have it shipped directly to their homes. Customers residing in a single-family home with an electric water heater who has not received similar measures through another Company-offered energy efficiency program are eligible for the program. Kits are available in 3 sizes for homes with 1, 2 or 3 full bathrooms and contain varying quantities of shower heads, bathroom aerators, kitchen aerator and insulated pipe tape. Program participants with at least one electric water heater are eligible for one kit shipped free of charge to their home.

Customers are pre-screened based on the eligibility requirements and mailed a BRC. Upon receiving the BRC from the customer, the Company will ship the eligible kit to the customer. Due to the unique eligibility requirements of this program, the BRC is the only channel the Company is currently employing to offer the kits to customers.

High Efficiency Pool Pumps

The High Efficiency Pool Pumps measure ("Pool Energy Efficiency Program") is designed to encourage the purchase and installation of energy efficient variable speed pool pumps for residential in-ground swimming pools. Eligible customers receive an incentive of \$300 for the replacement of an eligible single-speed pool pump with a new Energy Star certified variable speed pump. New swimming pool construction is also eligible for the rebate. The program is marketed through a network of participating contractors ("Trade Allies") that interface directly with the customer, as well as through various marketing channels such as direct mail, email, company website, bill inserts and other customer communications. Eligible customers include single-family, owner-occupied residential customers with an in-ground pool in the Duke Energy Carolinas service territory. Builders of single-family residences are eligible for new residence construction that includes an in-ground swimming pool.

High Efficiency Heat Pump Water Heater

The High Efficiency Heat Pump Water Heater measure is designed to encourage the installation and adoption of heat pump water heaters. Eligible customers receive an incentive of \$350 for the replacement of an existing electric water heater with an Energy Star certified heat pump water heater having an Energy Factor ("EF") rating of 2.0 or higher. The program is marketed through a network of participating contractors ("Trade Allies") that interface directly with the customer, as well as through various marketing channels such as direct mail, email, company website, bill inserts and other customer communications. Eligible customers include single-family, owner-occupied residential customers with electric water heating in the Duke Energy Carolinas service territory. Builders of single-family residences that include an eligible heat pump water heater are also eligible for the rebate.

Audience

Customers who meet the Program eligibility requirements.

B & C. Impacts, Participants and Expenses

Energy Efficient Appliances and Devices¹

<u>\$ in millions, rounded</u>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$12.0	\$48.0	399%
Program Cost	\$6.5	\$12.1	186%
MW	3.3	14.7	453%
MWH	30,662.5	126,600.5	413%
Units	773,122	3,826,679	495%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

CFL

Highlights

Many customers have participated in the CFL Program by ordering bulbs through the IVR, OLS and the Company's website. Customers view this process as simple and enjoy the convenience of having bulbs shipped directly to their homes. In 2015 over 208,000 customers participated in the program, generating the distribution of over 2,882,000 bulbs. Participation is tracked at the account level which allows the Company to focus its attention and resources on non-program participants. Over 57 percent of the orders were placed through the toll-free phone number, while 29 percent of the orders were placed through OLS and 14 percent through the Company's website.

Issues

Analyzing customer data and finding ways to effectively market to non-participating customers.

Potential Changes

The Company continues to evaluate opportunities to respond to changes in the market as it relates to lighting technology. In 2016, Duke Energy will transition the program to a newer technology, Light Emitting Diode (LED) bulbs. LEDs perform better than CFLs with lower energy consumption, longer life and better light quality

Specialty Lighting

Highlights

Customers are responding well to the discounted specialty lamps offered via the Energy Efficiency Store. The Energy Efficiency Store provides functionality allowing customers to purchase CFLs and LEDs at any time. Over 42,800 customers placed orders in 2015 resulting in over 625,000 bulbs being delivered. Over 82 percent of customer accessed the Energy Efficiency Store via the public website, while 18 percent accessed the Energy Efficiency Store by logging into their on-line services account.

Issues

Educating and bringing awareness of the Store to eligible customers. Educating customers about LED lighting, how to choose the right bulb and why they should make sure the LED bulbs they use are Energy Star certified.

Potential Changes

Minimize and/or promote special shipping offers for customer orders and continue to build the product portfolio for more lighting options and technologies. Additional bulb technologies added to the store include 3-Way LED and Globe LED.

Save Energy and Water Kit Program

Highlights

The Save Energy and Water Kit ("Program") was launched in April 2014. In 2015, over 212,000 business reply cards "BRCs" were mailed resulting in the distribution of over 28,000 kits to customers.

Issues

The Company continues to analyze data from non-respondents of the BRC offer to identify opportunities to increase the adoption rate. Customers lack the ability to order the different products offered in the kit in the quantities and finishes they desire, this has proved to be a challenge in getting the products installed.

Potential Changes

Innovative marketing campaigns will be utilized to improve awareness for hard to reach and late adopter customers. In 2016, the program will pursue the addition of an online option that will allow customers to choose the finish for the products offered in the kits. Additionally, the program will reduce the number of kits offered through the program to address install service rates. We will continue to offer kit 1 and 2 to eligible customers based on the home's square footage.

High Efficiency Pool Pumps

Highlights

The Company partnered with several wholesale distributors across North Carolina and South Carolina to serve as distribution channels for program awareness and developing the Trade Ally Network. Trade Allies are important to the program's success and continue to be targeted through these channels

because they interface with the customer during the decision-making process. Several training classes were conducted throughout the jurisdiction to continue educating the trade allies on the advanced technology variable speed offers for reducing energy consumption as well as how to sell the technology to the end user.

Issues

Customer buy-in and participation of the Trade Ally network is vital to the success of the program. Educating contractors on new emerging technologies and the value the technologies provide customers is critical in growing the trade ally network and their willingness to adopt the program.

High Efficiency Heat Pump Water Heater

Highlights

The Company partnered with manufactures and national retailer such as General Electric and Lowes and launched a series of successful co-branded direct mail and email campaigns which increased program awareness and maximized in store purchases. The program continued recruiting plumbing contractors and currently registered HVAC companies to increase coverage across the jurisdictions and maximize participation. Several training classes were conducted throughout the jurisdiction to continue educating the trade allies on the advanced technology variable speed offers for reducing energy consumption as well as how to sell the technology to the end user.

Issues

Educating and bring awareness of the program to both customers and potential contractors.

Educating contractors was addressed through additional Trade Ally marketing, recruitment and training but remained slow do to the re-emerging technology of heat pump water heaters and willingness to adopt more services to be offered. Customer awareness is being addressed through program design and marketing tactics but will be primarily targeted as a joint effort with manufactures and national retailers. Their willingness to continue co-branding and the frequency of those campaigns will be critical in reaching our customer base.

E. Marketing Strategy

CFL

The overall strategy of the program is to reach residential customers who have not adopted CFL bulbs. The Company will continue to educate customers on the benefits of CFLs while addressing barriers for customers who have not participated in the program. Additionally, the ease of Program participation will also be highlighted to encourage use of the on-demand ordering platform. The CFL and Specialty Lighting offers utilize the same ordering platform which allows the Company to promote both lighting offers efficiently and bring awareness to non-adopters.

Direct mail marketing has generated a significant number of orders in both North Carolina and South Carolina. New customers are made aware of the offer through a quarterly letter which has an average response rate of 17 percent. Samples of the marketing collateral used for these campaigns are available in the Appendix.

Specialty Lighting

Since the launch of the Store, the marketing efforts include bill messages, bill inserts, email campaigns and direct mail. Examples of the marketing pieces can be found in the Appendix. Awareness and education will be the main focus in collateral messages to eligible customers.

Save Energy and Water Kit Program

The overall strategy of the program is to reach residential customers who have not adopted low flow water devices. The Company will continue to educate customers on the benefits of low flow water devices while addressing barriers for consumers who have not participated in the program.

Direct mail marketing in the form of BRCs is the only marketing channel being utilized by this program in the Carolinas. The Company will pursue the option to add a web-based ordering platform in 2016.

High Efficiency Pool Pumps

The Company implemented several customer marketing campaigns in 2015 which leveraged channels such as email, paid search, display ads, direct mail and social media to build awareness of the program. Other channels such as co-branded retail displays with selected distributors were utilized to create awareness for the program. The programs' messaging was built around the benefits of the product including payback, annual savings and cleaner pools.

High Energy Efficiency Heat Pump Water Heater

The Company implemented several customer marketing campaigns in 2015 which leveraged channels such as bill inserts, email, paid search, display ads and direct mail to build awareness of the program. Other channels such as co-branded retail displays with selected manufacturers and national retailers were utilized to create awareness for the program.

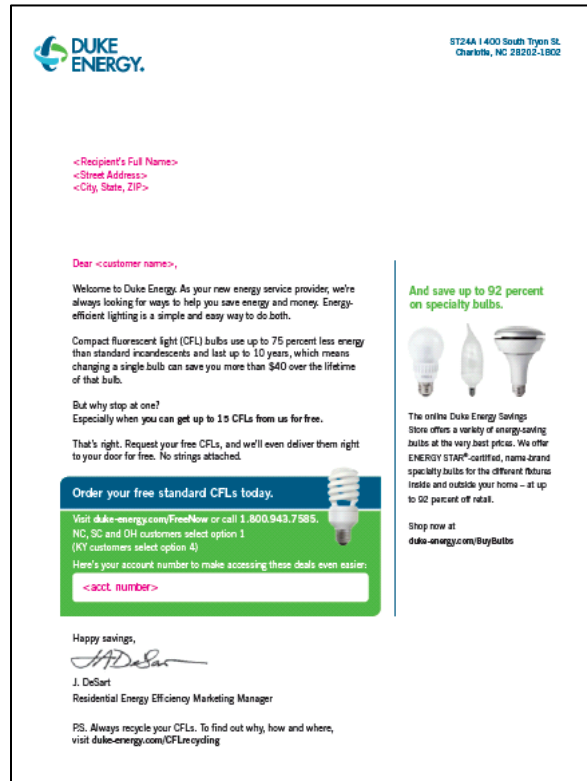
F. Evaluation, Measurement and Verification

In 2015, evaluation reports were completed for Residential CFLs, and the Save Energy and Water Kit Program.

On-site data collection for the Residential LED program is planned for 2016. Residential LED and Specialty Bulbs evaluation work is planned to be combined with a final report scheduled for third quarter of 2017. No planned evaluation work is scheduled for the Save Energy and Water Kit program in 2016. In addition, participation continues to be monitored for heat pump water heaters and pool pump measures.

G. Appendix

CFL – Direct Mail Campaign



APPLIANCE RECYCLING PROGRAM	ONLINE SAVINGS STORE
<p>Free removal of your extra fridge. Easy. Convenient. Plus get \$50.</p>  <ul style="list-style-type: none"> Contact us to schedule your free home pickup We'll come get your fridge when it's good for you You'll get a \$50 check and save up to \$150 a year in energy costs <p>Schedule your free pickup today. Call 855.398.6200 or visit duke-energy.com/save.</p> <p>For more information and eligibility please visit duke-energy.com/save.</p>	<p>Stop paying retail prices for your energy-saving light bulbs. Shop online.</p>  <ul style="list-style-type: none"> Enjoy up to 92 percent off retail prices Huge selection of energy-saving CFL and LED bulbs delivered to your door Free shipping on orders over \$25 through May 31, 2016. Use promotion code Duke315 <p>Visit duke-energy.com/BigSavings and start saving money today.</p>




It's March Savings Madness!

ways we can help you score more than \$1,000.

©2015 Duke Energy Corporation 100102 3/15/15




A wide variety of energy-saving bulbs are just a click away at the Savings Store.

To get your deeply discounted CFLs and LEDs online, visit duke-energy.com/BuyBulbs

Or if you'd rather order by phone, you can call our toll-free number: 866.849.9704

Have your account number handy to make ordering even easier.

Get FREE shipping on orders of \$25 or more.

Enter promotion code **Duke422** at checkout.

Always recycle your CFLs. To find out why, how and where, visit duke-energy.com/CFLRecycling

Duke Energy Savings Store is open to eligible residential customers in NC, SC, VA, MD, DE and WV. Customers must log in to their account and verify their identity. Some restrictions may apply. See website for details. ©2015 Duke Energy. All rights reserved. Terms, conditions and restrictions apply. See website for details.



Get better bulbs at the best prices at the Duke Energy Savings Store.



DUKE ENERGY

 LAP1001001 100-Watt Warm White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001002 100-Watt Cool White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001003 100-Watt Soft White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001004 100-Watt Daylight CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001005 100-Watt Full Spectrum CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001006 100-Watt Warm White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49
 LAP1001007 100-Watt Warm White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001008 100-Watt Cool White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001009 100-Watt Soft White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001010 100-Watt Daylight CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001011 100-Watt Full Spectrum CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001012 100-Watt Warm White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49
 LAP1001013 100-Watt Warm White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001014 100-Watt Cool White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001015 100-Watt Soft White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001016 100-Watt Daylight CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001017 100-Watt Full Spectrum CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49	 LAP1001018 100-Watt Warm White CFL Save at 85%, only costs \$2.49 Retail \$1.67, you pay \$2.49





Save time and money on CFLs and LEDs.

Deep discounts on energy-saving lights are just a click away – and just for Duke Energy customers like you.

- Up to 92% off retail prices
- 82% lower energy costs
- Easy phone or online ordering
- Delivered to your door

We'll even help you find the right bulb for your needs with our "shopping assistant" feature. Take advantage of our huge savings, selection and convenience today.

Shop now

Please have your account number handy.

Hurry! Free Shipping on orders \$25 or more. Enter promo code: **Duke359 shipping until May 15.**



[Update Your Subscriptions](#) | [Unsubscribe](#) | [Privacy Policy](#) | www.duke-energy.com

Duke Energy | 550 South Tryon Street | Charlotte, NC 28202

Brightness in Lunches

The brightness of incandescent bulbs was measured in watts, which was simply a measure of the electricity the bulb used.

The brightness of LED's CFLs and LCDs is measured in lumens, which is a more accurate measure of the light's output. The higher the number, the brighter the bulb. Here's how lumens and watts compare:

Type	Location
100-mesh (100-mesh) sample	100
75-mesh (75-mesh) sample	100
60-mesh (60-mesh) sample	100
45-mesh (45-mesh) sample	100

- Life expectancy of the build

HEAVY DUTY certified built-in last 10 to 25 times longer than inordinance. That way you can go 5, 10, even 20 years before you'll have to change that bulb again. Put away the step ladder and enjoy the night.



Energy Used in Watts

Watts are simply a measure of the energy used by the light – not the brightness. Because CFLs and LEDs are so much more energy efficient, they use significantly less electricity, or watts, to achieve the same brightness.

Don't know much about CFLs and LEDs?



Southey College hosts an annual college-wide Energy Week, commencing in March, to give its students a practical understanding of energy and its importance in our world. For more information go to www.southey.ac.uk/energy

Will help you make the switch. Our "shopping assistant" is an educational feature that provides information and advice so it's easy to choose the right bulbs for all the different rooms inside and outside your home.

Selection, convenience and huge discounts are all just a click away. Take advantage today at duke-energy.com/NowBulbs.



\$5 flat rate shipping
From now until April 15, 2015

© 2000 Blackwell Science Ltd, *Journal of Internal Medicine* 247: 399–406



(724) 400 South Tryon St.
Charlotte, NC 28202-4300

 Get energy-saving bulbs up to 80% off retail.

Please Send U.S. Funds P.O. Order/Check	Name _____ Address _____ City _____ State _____ Zip _____ Telephone _____ E-mail _____ Fax _____ Signature _____ Date _____
---	--

<John L. Raggio>
<HILL Main St.>
<Apptown, MD 21225-0722>

Images require post-CDs, reflect on any type and source, with the use of appropriate language.



**George,
Save time and money
on CFLs and LEDs:**

- 92% off retail prices
- 82% lower energy costs
- Easy phone or online ordering
- Delivered to your door

Get energy-saving CFLs and LEDs for up to 92% off retail.

Standard incandescent bulbs are no longer made in or imported into the U.S. But today's CFLs and LEDs are ready to take their place. They last up to 25 times longer and are up to 80 percent more efficient. And now you can buy them at remarkably reduced prices at the Duke Energy Savings Store, online or by phone.

Deep discounts are just a click away
at duke-energy.com/NewGuils
or by phone at 866.848.9704.

Get questions? Just click the **Frequently Asked Questions** button along the way.

Keep your account secure or simply be secure back online.

<1234567890>

- = LED indicator
- = CFL indicator



Now accepting orders by phone.



How to shop for today's energy-efficient bulbs

When choosing new CFLs and LEDs, pay attention to the retail packaging. The Lighting Facts label can help you choose the right bulb for your needs. Similar information can be found in our "Need Help?" tool and in the "product specifications" for each bulb.

Lighting Facts and Figures

- All greenhouse lighting systems are rated in foot-candles (fc) or lux
- 1 foot-candle = 10.76 lux
- 1 lux = 0.09 foot-candle
- 1 foot-candle = 1 lumen per square foot
- 1 lux = 1 lumen per square meter
- 1 foot-candle = 10.76 lux
- 1 lux = 0.09 foot-candle
- 1 foot-candle = 1 lumen per square foot
- 1 lux = 1 lumen per square meter

1. Energy Cost Per Hour

This article of the label gives you an estimate of how much this bulb will cost you per hour of use. The number of hours of use per year (CFLs use 75% less energy to operate than incandescents and LEDs use 80% less energy. That means significantly more energy used here. In fact you could spend an 18W as a dollar per hour to operate an energy-efficient LED.

2. Color Temperature and Richness

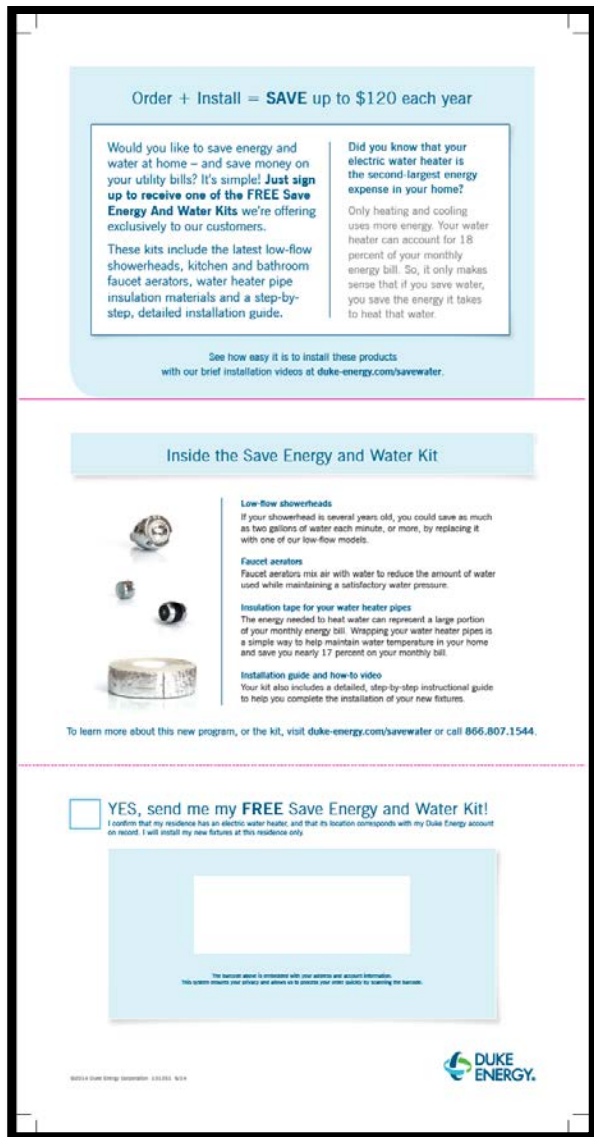
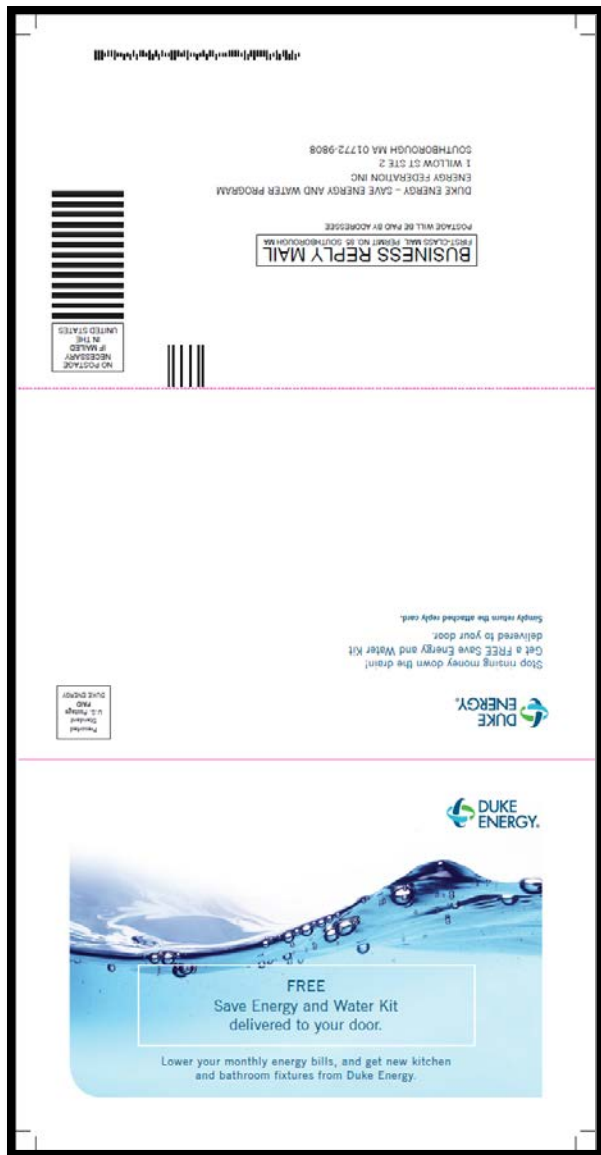
Color temperature is a measure of the "whiteness" of the light generated by the bulb. The number on the label is a "Kelvin" (K). CFLs and LEDs are available in a wide spectrum of color temperatures. If you prefer a softer, warmer looking light, look for a lower number on the label. If you prefer a cooler, bluer light, choose a bulb with a higher number on the label.

3. Choosing the Right Color

When it comes to color, there are two main categories: warm and cool. Warm colors are more like the colors of the sun, while cool colors are more like the colors of the moon. Warm colors are more like the colors of the sun, while cool colors are more like the colors of the moon.

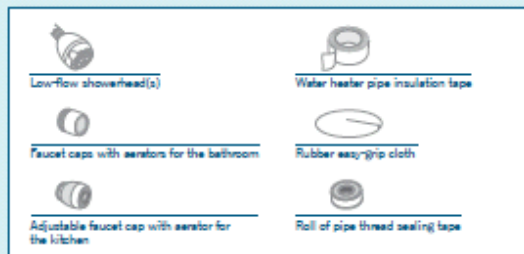
4. Energy Use and Efficiency

Energy use is measured in watts (W). Efficiency is measured in lumens per watt (lm/W). The higher the lm/W, the more efficient the bulb is. LEDs are the most efficient, followed by CFLs, and then incandescents.



The items included in this kit combine the best energy efficiency with the best performance. These devices save more energy and water than most of the low-flow devices on the market today.

In your kit, you've received:



The following instructions will help you install these items in your home. Watch our how-to installation videos online at duke-energy.com/savewater. Then, let the savings begin!

Showerhead Installation

What you'll need:

- ☐ Low-flow showerhead(s)
- ☐ Rubber easy-grip cloth
- ☐ Pipe thread sealing tape
- ☐ Wrench (optional)
- ☐ Rag



1. Remove your existing showerhead.

- Wrap the rubber easy-grip cloth around the base of your showerhead where it is attached to the shower arm.
- Turn the showerhead counterclockwise (left) to loosen.
- If the showerhead is difficult to loosen, you may need to use a vise-grip or adjustable pliers to help remove it. Before using any tools, wrap the easy-grip cloth around the fixture to protect it from the teeth of the vise-grip or pliers during removal.



2. Apply pipe thread sealing tape.

- Once your existing showerhead is removed, wipe the pipe threads with a clean, dry cloth to remove any excess moisture.
- Stretch two layers of the white pipe thread sealing tape provided across the threads to cover them. Then cut the tape off the roll. This tape is used to seal the pipe connection and lubricate the threads for easy assembly.

3. Install your new low-flow showerhead.

- Hold the base of your new showerhead with the rubber easy-grip cloth and twist it onto the threaded area of the shower arm in a clockwise direction (right).
- You may tighten the shower pipe with the rubber easy-grip cloth too, if necessary, to prevent any leaks.



4. Test your showerhead.

- Turn on the water to test your new showerhead. Look closely at the connection between the shower arm and the base showerhead collar to see if there is any water leaking.
- If the showerhead is leaking, tighten the base collar with a vise-grip or pliers.

5. Adjusting the water flow mode.

- Your new low-flow showerhead is equipped with two different modes: massage and pulsating. You can change the modes by twisting the outer ring in both directions until you create the desired water flow.
- If you turn the outer ring all the way to the right, the water will be in massage mode. If you turn it all the way to the left, it is in full spray mode.

Troubleshooting tips:

If you have followed the installation instructions and you still find water leakage, there are three common sources of water leaks:

- a. Your pipe threads are not taped properly. Please be sure to use two layers of the provided tape to ensure the seal is tight.
- b. If your tape is applied correctly and the showerhead is still leaking, then your showerhead is cross-threaded. Unscrew and reinstall it, making sure you are lining up the threads.
- c. In some cases, your showerhead may not be properly tightened. Please wrap the easy-grip cloth around your new fixture to protect it, and then use a vise-grip or pliers over the cloth to ensure a fully tight connection between your shower arm and your new showerhead.

Try these troubleshooting tips before calling Energy Federation Inc. (EFI) customer service at 866.807.1544.

Faucet Aerator Installation (for both kitchen and bathroom)

What you'll need:

- ☐ Faucet caps with aerators*
- ☐ Rubber easy-grip cloth
- ☐ Wrench (optional)



* If you experience trouble installing the kitchen aerator or it does not fit, call 866.807.1544. We will ship you a free adapter.

1. Remove your existing faucet cap.

- Using the rubber easy-grip cloth, unscrew your faucet cap in a counterclockwise (left) direction.
- Your faucet arm will have threads on the inside (female) or threads on the outside (male). If your faucet arm has female threads, use the male rubber washer to align and install your new faucet cap and aerator. If your faucet arm has male threads, use the female rubber washer provided.



2. Install your new faucet cap with aerator.

- Install the new faucet cap by aligning the threads on the inside of the faucet arm with the exterior threads of the new cap.
- Gently screw in the faucet cap in a clockwise (right) direction until it is firmly connected. Tighten it fully with the rubber easy-grip cloth provided.

High Efficiency Pool Pumps Email

DUKE ENERGY | Smart \$aver®



Save up to \$640
the first year.
Upgrade your pool
pump today.

Get a \$300 incentive plus save up to \$340 in energy costs when you invest in a quieter, more efficient pool pump.

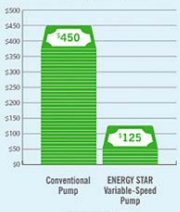
An ENERGY STAR® certified variable-speed pool pump:

- Can save you up to \$340 a year in energy costs*
- Pays for itself in less than two years
- Prolongs the life of your pool's filtering system
- Runs quieter

Use a Duke Energy participating contractor for your upgrade to earn a \$300 energy efficiency incentive. [Find one online](#) or call 866.507.3496.

[Find a participating contractor](#)

ANNUAL ENERGY COSTS FOR POOL PUMPS



Pump Type	Annual Energy Cost
Conventional Pump	\$450
ENERGY STAR Variable-Speed Pump	\$125

ENERGY STAR

*Source: energystar.gov

[Update Your Subscriptions](#) | [Unsubscribe](#) | [Privacy Policy](#) | [www.duke-energy.com](#)
Duke Energy | 550 South Tryon Street | Charlotte, NC 28202

High Efficiency Pool Pump Digital Ad

Get \$300 from
Duke Energy
when you invest
in a quieter,
more efficient
pool pump.



[Learn more](#)

DUKE ENERGY | Smart \$aver®

High Efficiency Pool Pump Direct Mail

Get \$300 from Duke Energy
when you invest in a quieter,
more efficient pool pump.

An ENERGY STAR® certified variable-speed pool pump:

- Can save you up to \$340 a year in energy costs*
- Pays for itself in less than two years
- Prolongs the life of your pool's filtering system

Find a Duke Energy participating contractor at
[duke-energy.com/Diveln](#).

ENERGY STAR

*Source: energystar.gov



DUKE ENERGY | Smart \$aver®

High Efficiency Pool Pump Facebook Posting



High Efficiency Heat Pump Water Heater National Retailer Display

A national retailer display for a high efficiency heat pump water heater. On the left is a tall, white and red water heater. To its right, the text reads: "Cut water heating costs in half." followed by "Save big when you upgrade to a heat pump water heater." Below this, two boxes highlight benefits: "LOWER BILLS" (Save up to \$250 on water heating costs*) and "REBATE" (Qualify for a \$350 mail-in rebate from Duke Energy*). A section titled "Get your \$350 cash rebate in three easy steps:" lists three steps: 1. Make your selection, 2. Installation, and 3. Get your cash. At the bottom, there is a green banner with contact information: "For more information, call 866.507.3496 or visit duke-energy.com/SaveBig." The footer includes a disclaimer, the Duke Energy logo, and the "Smart Saver" program logo.

Cut water heating costs in half.

Save big when you upgrade to a heat pump water heater.

LOWER BILLS
Save up to \$250 on water heating costs*

REBATE
Qualify for a \$350 mail-in rebate from Duke Energy*

Get your \$350 cash rebate in three easy steps:

- STEP ONE: Make your selection.**
Select and purchase the ENERGY STAR® model that fits your needs.
- STEP TWO: Installation.**
Schedule an installation date with one of our participating contractors.
- STEP THREE: Get your cash.**
Submit your rebate application.

*Cost savings is comparing a heat pump hot water heater to a standard 50-gallon electric water heater.
**Heat pump water heater must be ENERGY STAR qualified.

For more information, call 866.507.3496 or visit duke-energy.com/SaveBig.

Lowie's is not responsible for the fulfillment of the rebate.

DUKE ENERGY | Smart Saver®

©2014 Duke Energy Corporation 1412903 9/14

OFFICIAL COPY

Mar 09 2016





Cut expenses in half
with a new GE® GeoSpring™
water heater.**



**Plus save up to \$550
through May 1!**

- ✓ **\$200 in instant savings** when you purchase from Lowe's by May 1, 2015
- ✓ **\$350 cash rebate** from Duke Energy when installed by Lowe's
- ✓** **Plus save hundreds of dollars** every year on water heating costs


The GeoSpring averaged
4.5 out of 5 stars
from 750+ reviews!



Learn more
about the GE GeoSpring Water Heater

* Some restrictions and exclusions apply. Must be a Duke Energy electric customer with electric water heating. For full details and eligibility on this mail-in rebate, visit duke-energy.com/saver2015.

** Cost savings are estimated by comparing a heat pump water heater to a 60-gallon standard electric water heater.






ENERGY EFFICIENCY EDUCATION PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Energy Efficiency Education Program ("Program") is an energy efficiency program offered in the Duke Energy Carolinas (the "Company" or "DEC") service territory. The Program is available to students in grades K-12 enrolled in public and private schools who reside in households served by the Company. The current curriculum administered by The National Theatre for Children ("NTC") targets K-8 grade students.

The Program provides principals and teachers with an innovative curriculum that educates students about energy, resources, how energy and resources are related, ways energy is wasted and how to be more energy efficient. The centerpiece of the curriculum is a live theatrical production focused on concepts such as energy, renewable fuels and energy efficiency performed by two professional actors. Teachers receive supportive educational material for classroom and student take home assignments. The workbooks, assignments and activities meet state curriculum requirements.

School principals are the main point of contact responsible for scheduling their school's performance at their convenience. Once the principal confirms the performance date and time, two weeks prior to the performance, all materials are delivered to the principal's attention for classroom and student distribution. Materials include school posters, teacher guides, and classroom and family activity books.

Students are encouraged to complete a home energy survey with their family (included in their classroom and family activity book) to receive an Energy Efficiency Starter Kit. The kit contains specific energy efficiency measures to reduce home energy consumption. The kit is available at no cost to all student households at participating schools, including customers and non-customers.

Audience

Eligible participants include the Company's residential customers who reside in households served by Duke Energy Carolinas with school-age children enrolled in public and private schools.

B & C. Impacts, Participants and Expenses

Energy Efficiency Education¹

<u>\$ in millions, rounded</u>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$2.9	\$2.5	86%
Program Cost	\$2.1	\$2.1	100%
MW	0.5	0.8	160%
MWH	5,226.0	4,417.9	85%
Units	24,000	19,582	82%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

For the fifth straight year, the Company is supporting arts and theatre in schools while providing an important message about energy efficiency through an innovative delivery channel for students. Enhancing the message with a live theatrical production truly captivates the students' attention and reinforces the classroom curriculum materials provided.

The 2014-2015 school year, offered two different productions. The *Treasure Trove of Conservation Cove*, was delivered to elementary school aged students and taught them how to use resources wisely through a fun pirate treasure hunt. *The Resource Raiders*, an improvisational sketch comedy was offered to middle school aged students.

The 2015-2016 school year introduced two new productions in partnership with the Program vendor, The National Theatre for Children (NTC). The elementary school production, *Space Station Conservation*, is a 25 minute performance for elementary students and teaches them how to use resources wisely through a fun space adventure featuring a cast of colorful characters. *The Conservation Crew*, a 40-minute performance, is designed for middle school students. This production combines sketch comedy with improvisation and audience participation to teach students about natural resources and energy efficiency while complimenting student studies in science and energy.

During the 2015 calendar year, combining spring semester and fall semester themes, a total of 772 schools were visited in the Company's service territory and NTC conducted 1,149 performances reaching approximately 251,611 students.

Once the completed energy efficiency survey is processed for an eligible customer, the energy efficiency starter kit is shipped and received within two to four weeks. To ensure customer satisfaction with the energy efficiency starter kit and the installation of items, an email reminder is sent monthly after successful kit delivery to encourage families to return their Business Reply Card (BRC). Qualified households that have submitted their energy efficiency survey and returned the BRC are automatically entered into the household contest drawing, sponsored by NTC.

Additionally, school and classroom contests encourage sign ups and NTC awards checks to schools whose students, along with their families completed home energy surveys and received energy efficiency kits as part of the Program. In the fall and spring of each year, a drawing is held selecting one school and one household contest winner. Chester Park School of the Arts in Chester, SC won \$10,000 in the spring 2015 contest. W. R. Odell Elementary in Concord, NC won the \$10,000 prize for the fall 2015 school contest drawing. Principals, teachers and students may view their school's progress and compare the number of sign ups to other schools via the website, www.trackmysignups.org.



Photo: \$10,000 presentation for June 2015 school contest winner, Chester Park School of the Arts

Updates

The Company has worked closely with NTC to enhance the Program by:

- Introducing two new productions each school year to refresh and refocus the materials and scripts to keep participating schools engaged.

- Promoting the program through social media to encourage awareness, recognition and participation.
- Partnering with Duke Energy Account and District Managers to leverage existing relationships in the community to develop positive media stories while encouraging kit sign ups.

E. Marketing Strategy

The National Theatre for Children is responsible for all marketing campaigns and outreach. NTC utilizes direct mail and email sent directly to principals to market the Program.

F. Evaluation, Measurement and Verification

There is currently no planned difference in the EM&V plans for the Programs in DEC and DEP. However, due to the pre-established schedule of DEC evaluation and the launch schedule for the Program in DEP, the evaluations will initially be performed separately at different times. Subsequent evaluations are expected to be combined for the Programs in DEC and DEP. At that time, the allocation of combined EM&V costs is proposed to be based on the projected number of participants of the Programs for each company.

The next evaluation work is planned as a combined Duke Energy Carolinas and Duke Energy Progress process and impact evaluation. Evaluation activities will begin third quarter of 2017, with a final report to be delivered in second quarter of 2018.

The goal of the impact evaluation is to assess the net energy savings attributable to the Program, as well as the persistence of the energy savings over time. The independent, third-party EM&V consultant will determine the detailed analysis methodologies, sample design and data collection activities. The impact evaluation for this Program is expected to consist of engineering estimates and a billing analysis.

Where applicable, a statistically representative sample of participants will be selected for the analysis. The Company intends to follow industry-accepted methodologies for all measurement and verification activities, consistent with International Performance Measurement Verification Protocol (IPMVP) Options A, C or D depending on the measure.

ENERGYWISE BUSINESS PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Duke Energy Carolinas, LLC's (the "Company's" or "DEC") EnergyWise Business (the "Program") is an energy efficiency and demand response program for non-residential customers that will allow the Company to reduce the operation of participants AC units to mitigate system capacity constraints and improve reliability of the power grid. The Program provides customers with options on how they would like to participate in the Program. For participation in the program, the Company provides participants with an annual incentive applied directly to their bill.

Program participants can choose between a Wi-Fi thermostat or load control switch that will be professionally installed for free by the program for each air conditioning or heat pump unit that they have. In addition to equipment choice, the participants also can choose at what cycling level they would like to participate. There are three levels of cycling, 30%, 50% or 75%. The levels are the percentage reduction of the normal on/off cycle of the unit. During a conservation period, the Company will send a signal to the thermostat or switch to reduce the on time of the unit by the percentage selected by the participant. For participating at the 30% level the customer will receive a \$50 annual bill credit for each unit, \$85 for 50% cycling, or \$135 for 75% cycling. Finally, participants that have a heat pump unit with electric resistance emergency/back up heat and choose the thermostat can also participate in a winter option that will allow the Company to control the emergency/back up heat. For the 100% control of the emergency/back up heat, the Company will provide an additional \$25 annual bill credit.

Participants choosing the thermostat will be given access to a portal that will allow them to control their units from anywhere they have internet access. They can set schedules, adjust the temperature set points, and receive energy conservation tips & communications from the Company. In addition to the portal access, participants will also receive conservation period notifications. This will allow participants to make adjustments to their schedules or notify their employees of the upcoming conservation period. Finally, the participants will be allowed to override two conservation periods per year. They can do this before the conservation period starts or during the conservation period.

Audience

The Program is available to existing non-residential customers that are not opted-out of the DSM Rider, have at least one air conditioner or heat pump that operates to maintain a conditioned space on weekdays during the calendar months of May through September, and are not served under Schedules BC and HP, Riders NM, SCG, IS, PS or PSC. Also, customers must have an average minimum usage of 1,000 kWh during those same calendar months.

B & C. Impacts, Participants and Expenses

EnergyWise for Business¹

<u>\$ in millions, rounded</u>	Vintage 2015 As Filed ³	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	N/A	\$0.0	-
Program Cost	N/A	\$1.5	-
MW	N/A	0.0	-
MWH	N/A	41.6	-
Units ³	N/A	27	-

1) Values are reflected at the system level.

2) Numbers rounded.

3) As filed values not included as program was not included in filing.

D. Qualitative Analysis

Highlights

The Program received approval from the SC Public Service Commission on September 30, 2015 and from the NC Utilities Commission on October 27, 2015. The planned launch of the program was scheduled for January 4th, 2016. Thirteen customers in the Greenville/Spartanburg area of SC were chosen in December of 2015 to test all system functionality as part of the Program development process.

Issues

The major issue will be building customer awareness for a new program. In addition, the program equipment is limited to the control of standard air conditioners and heat pumps. Those customers that have direct digital controls and other new control systems may not be compatible with program equipment.

Potential Changes

E. Marketing Strategy

The Program is going to use a multi-layered approach to build customer awareness. The first item was building a Program website on Duke-Energy.com with cross promotion from other areas of the website. In addition to the website content, material was created to market the program through email, newsletters and face to face conversation. Activities planned for 2016 include the following,

- Face to face cross-promotion with customers through the Small Business Energy Saver program
- Face to face with customers through Duke Energy Business Energy Advisors and Large Account Managers
- Duke Energy Business Newsletter
- Quarterly Email

F. Evaluation, Measurement and Verification

The next process and impact evaluation report is scheduled for completion in second quarter of 2017 with activities beginning in early 2016. The evaluation report is planned to be combined for DEC and DEP. The allocation of combined EM&V costs is proposed to be based on the projected number of participants in the EnergyWise for Business Program for each company.

HOME ENERGY HOUSE CALL PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Home Energy House Call Program ("Program") is offered under the Energy Assessment Program. Duke Energy Carolinas, LLC (the "Company") partners with several key vendors to administer the Program.

The Program provides a free in-home assessment performed by a Building Performance Institute ("BPI") certified energy specialist designed to help customers reduce energy usage and save money. The BPI certified energy specialist completes a 60 to 90 minute walk through assessment of a customer's home and analyzes energy usage to identify energy savings opportunities. The energy specialist discusses behavioral and equipment modifications that can save energy and money with the customer. The customer also receives a customized report that identifies actions the customer can take to increase their home's efficiency. Examples of recommendations might include the following:

- Turning off vampire load equipment when not in use.
- Turning off lights when not in the room.
- Using energy efficient lighting.
- Using a programmable thermostat to better manage heating and cooling usage.
- Replacing older equipment.
- Adding insulation and sealing the home.

In addition to a customized report, customers receive an energy efficiency starter kit with a variety of measures that can be directly installed by the energy specialist. The kit includes measures such as energy efficiency lighting, low flow shower head, low flow faucet aerators, outlet/switch gaskets, weather stripping and an energy saving tips booklet.

Audience

Eligible Program participants are Company's residential customers that own a single-family residence with at least four months of billing history and have central air, electric heat or an electric water heater.

B & C. Impacts, Participants and Expenses

Energy Assessments¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$2.2	\$10.1	462%
Program Cost	\$1.9	\$3.1	166%
MW	0.4	1.3	322%
MWH	3,396.3	10,293.8	303%
Units	5,000	10,443	209%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

The Program's marketing campaign positions the company as an expert source of information and education offering to analyze the customers personal home energy usage and provide recommendations on ways to reduce energy usage, improve comfort in the home and potentially reduce their bill.

Applying historical learnings from 2014, the Company continues with a multichannel marketing approach leveraging peak seasons for larger scale outreach initiatives. Channels include the Program's website pages and banners, online services banner, email, bill inserts, and direct mail. Examples of online and direct mail promotion are included in the Appendix. The Program management team continues to evaluate other channels to reach our target audience and maximize both program performance as well as customer experience.

Potential Changes

Some program enhancements to increase the effectiveness of the Program being considered include:

- The Program is proposing measure modifications to the current kit to include energy efficient lighting offers such as LEDs.
- Collaborating with vendor to launch an enhanced online enrollment experience that enables the customer to schedule, cancel, and/or modify their appointment time online scheduled to launch 2016.
- Continue to leverage and modify propensity modeling to allow for more direct targeting.
- Product training program to encourage cross sell or cross promotion of other relevant offers.
- Refreshing marketing materials.

E. Marketing Strategy

Program participation continues to be driven through a multichannel approach including targeted mailings to pre-qualified residential customers, bill inserts, online promotions and online video. For those who elect to receive offers electronically, email marketing continues to be used to supplement direct mail. Information about the Program was included in the My Home Energy Report distributed in January 2015 as well as December 2015. The Program has experienced an increase in response rates when taking a multichannel approach within close proximity to seasonal months when energy usage is top of mind to the customer. The Program management team continues to explore additional channels to drive awareness including but not limited to community outreach and event marketing. The marketing material continues to drive engagement and interest in the Program based on online survey results from a previous ad effectiveness study. Aligning with expert guide, messaging has continued to be simple and focused on key benefits (free energy expert advice, free in-home assessment and free starter kit) and three easy steps: you call, we come over, and you save.

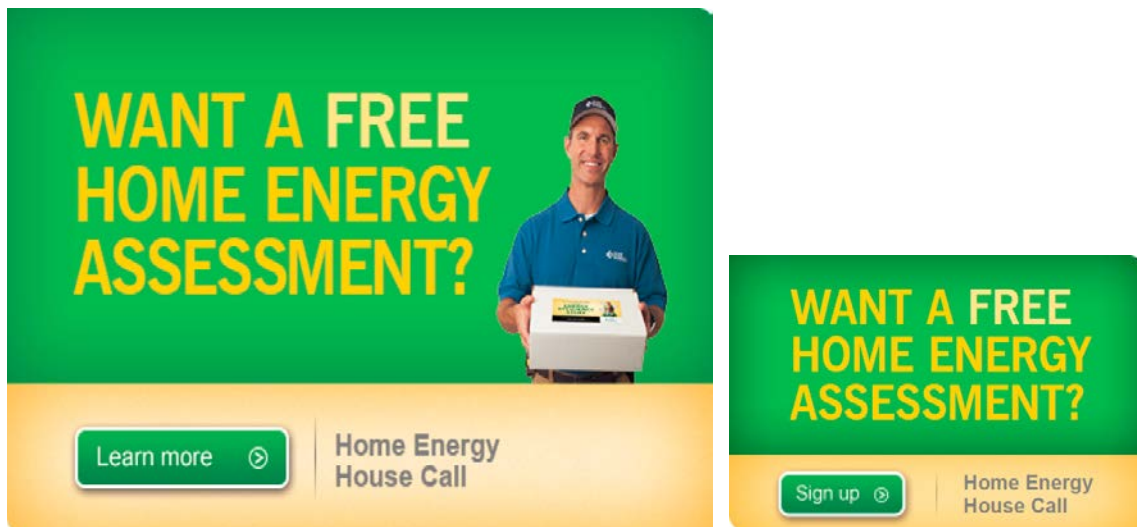
Home Energy House Call program information and an online assessment request form are available at www.duke-energy.com.

F. Evaluation, Measurement and Verification

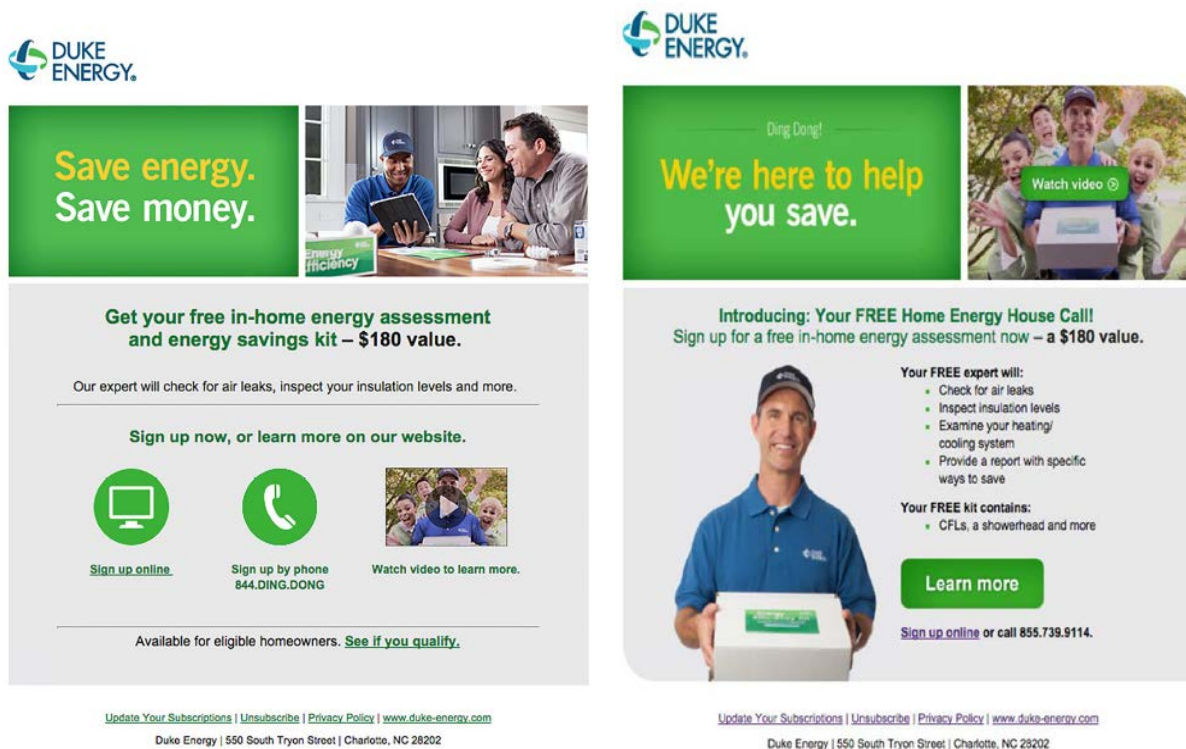
There is currently no evaluation activity for this Program. The next process and impact evaluation report is scheduled for completion in third quarter of 2017 with activities beginning late 2016.

G. Appendix: 2015 Marketing Samples

Online Banners:



Email:



Direct Mail:

Take control of your energy use with a free ...

HOME ENERGY HOUSE CALL

Ding Dong!

**NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES**

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 1000
DUKE ENERGY
ATTN: HOME ENERGY HOUSE CALL
11 E. SUPERIOR ST. STE. 400
DULUTH GA 30030-9990

POSTAGE WILL BE PAID BY ADDRESSEE

DUKE ENERGY
17200A - 1000 South Tryon Street
Charlotte, NC 28202

**FREE OFFER FOR
HOMEOWNERS**

Sign up today.

HOME ENERGY HOUSE CALL
Ding Dong!

YOU SIGN UP. WE COME OVER. YOU SAVE.
Sign up today.

DUKE ENERGY

OUR HOME ENERGY HOUSE CALL ROCKS
YOU GET A LOT OF FREE STUFF IN A BOX
PLUS AN EXPERT FROM DUKE ENERGY
WILL EXAMINE YOUR HOUSE FOR FREE

Take control of your energy use.

**STEP 1:
YOU SIGN UP**

**STEP 2:
WE COME OVER**

**STEP 3:
YOU SAVE**

**PLUS:
YOU GET A FREE
STARTER KIT**

The free energy efficiency starter kit helps you start saving right away:
• 25 bulbs • Energy efficient showerhead • EnergySaver vent fan
• Bathroom faucet aerator • Power windowstripping • Color and color energy audit

START SAVING.
Sign up today.

Schedule your FREE Home Energy House Call today. Fill out the form below, attach this card and place it in the mail. You can also sign up at dukeenergy.com/FreeAudit, or by calling 888-234-2222.

Name or account
Address
City State ZIP
Daytime phone
Evening phone

To qualify you must:
• Be a Duke Energy residential customer
• Own a single-family home and have been there for at least two months
• Have an existing water meter service line, or service an existing one

©2015 Duke Energy Corporation. All rights reserved.

Bill Inserts:

**WE MAKE
HOUSE CALLS.**

You sign up. We come over. You save.

Visit duke-energy.com/FreeAudit to see if you qualify.

DUKE ENERGY

HOME ENERGY HOUSE CALL
Ding Dong!

Free in-home energy assessment and energy-savings kit for eligible homeowners – \$180 value!

Your FREE expert will:

- Check for air leaks
- Inspect insulation levels
- Examine your heating/cooling system

**We're here to
help you save.**

**FIND
OUT
HOW >**

Home Energy House Call®
You sign up. We come over. You save.

Your free energy expert will:

- Check for air leaks
- Inspect insulation levels
- Examine your heating/cooling system
- Give you free CFLs and an energy efficiency starter kit
- Provide a detailed report on how to improve your home's efficiency



A \$180 Value

*Available for eligible homeowners. Contact us to see if you qualify.

Sign up now and save:

855.739.9114 or
duke-energy.com/FreeAudit



2 HOME ENERGY HOUSE CALL

Take your shot. 4 ways to save.




1
Appliance Recycling Program:
\$30 cash plus up to \$150 a year in energy savings

2
Home Energy House Call:
\$180 value – a free home energy audit and kit to help you lower your energy bill

3
Smart Saver Home Upgrade Rebates:
Up to \$1,325 in rebates

4
Online Savings Store:
92 percent off retail prices for bulbs

A free, in-home energy audit and free starter kit valued at \$180.



Your FREE energy expert will:

- Check for air leaks and inspect insulation levels
- Examine your heating/cooling system
- Provide a report with specific ways to help lower your bill
- Plus, give you a FREE energy-savings starter kit with CFLs, a showerhead and more!

Available for eligible homeowners.
Call **855.739.9114** or visit duke-energy.com/FreeAudit to see if you qualify.

It's March Savings Madness!

4 ways we can help you score more than \$1,000.



We're here to help you save.

FIND OUT HOW >



Home Energy House Call

Home Energy House Call®

You sign up. We come over. You save.

Your free energy expert will:

Check for air leaks
Inspect insulation levels

Examine your heating/cooling system
Give you free CFLs and an energy efficiency starter kit

Provide a detailed report on how to improve your home's efficiency

A \$180 Value

*Available for eligible homeowners. Contact us to see if you qualify.

Sign up now and save:

855.739.9114 or duke-energy.com/FreeAudit

©2015 Duke Energy Corporation 151500 07/15G

HVAC ENERGY EFFICIENCY PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Residential HVAC Energy Efficiency Program ("Program") offers measures that allow eligible Duke Energy Carolinas, LLC (the "Company") customers to take action and reduce energy consumption in the their home, including direct action against the home's single-largest user. The Program offering provides incentives for the purchase and installation of eligible central air conditioner or heat pump replacement. In addition, Program participants may receive an incentive for central air conditioner tune up, heat pump tune up, attic insulation, air sealing, duct sealing and duct insulation.

Program staff is responsible for establishing relationships with HVAC and home performance contractors as well as home builders ("Trade Allies") who interface directly with residential customers. These Trade Allies market and leverage the Program to assist with selling these products and services to customers. Once the Trade Ally has sold the service/product, they adhere to Program requirements for completion and submit incentive applications on behalf of the customer. An incentive is disbursed to the customer and/or Trade Ally after the application has been approved and processed.

Duke Energy contracts with a third party vendor who is responsible for application processing, incentive payment disbursement, and Trade Ally and customer call processing.

Audience

The Company's residential customers that meet the eligibility requirements of the Program.

B & C. Impacts, Participants and Expenses

HVAC Energy Efficiency¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$12.9	\$6.8	53%
Program Cost	\$6.8	\$5.4	80%
MW	3.7	2.7	71%
MWH	8,268.0	4,763.6	58%
Units	16,741	13,489	81%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

The Company partnered with select participating Trade Allies across North Carolina and South Carolina during 2015 to offer discounts on heat pump and central air conditioner replacements, tune ups and duct sealing services to eligible customers. The campaigns received a positive reaction from customers as well as Trade Allies. The Company has filed a program modification that hedges against additional efficiency standard changes and increased building code requirements and allows for the program to operate in a more cost effective manner.

Issues

The buy-in and participation of the Trade Ally network is vital to the success of the Program. The Program aims to transform the market; shifting market practices away from some of the more commonly utilized practices which rely heavily on decentralized training and varying knowledge levels, as well as imprecise

and manual field calculations, towards industry trained and certified trade allies using higher quality diagnostic instruments and processes. The Company has continued to struggle to gain contractor acceptance with the tune and seal measures due to the required diagnostic equipment purchases, obtaining additional industry certifications and altering current business practices.

- **Marketing Strategy**

Promotion of the HVAC segment of the Program is primarily targeted to HVAC and home performance contractors as well as new home builders. Trade Allies are important to the Program's success because they interface with the customer during the decision-making event, which does not occur often for most customers.

Program information and Trade Ally enrollment links are available on the Program's website to educate customer about the Program and encourage participation. By increasing the overall awareness of the Program and the participation of Trade Allies, it ensures more customers are discussing the benefits of the Program at time of purchase.

The Company implemented several customer marketing campaigns during 2015 which leveraged channels such as bill inserts and email messaging to build awareness of the program. Other channels such as a paid search and co-branded direct mail campaigns with selected Trade Allies were also utilized to create awareness for the program.

The Program tested a new channel in Q4 of 2015 which explores the effectiveness of using residential thermal imaging scans as a targeted and cost effective channel for increasing participation in the HVAC equipment and Tune and Seal measures. This campaign distributed free personalized reports identifying areas within the customers home where the most substantial energy leaks are occurring, prioritizing the items that need to be addressed and offering incentives based solutions for qualifying repairs through the Trade Ally network. The campaign has been extended through February of 2016 to capture additional participation that may have been effected by unseasonably high temperatures through December 2015 and the holiday season.

The campaign is continuing to evaluate 2,400 pre-scanned customers in the Charlotte, NC market that was divided up into two test groups.

- Direct mail / Email Report – These customers received the free personalized report displaying the captured thermal image of the home along with an itemized description of the inefficiencies identified. The call to action is to call Duke Energy to discuss the report and to learn about opportunities to address those issues through incentive based solution provided by the program.
- Direct mail / Email Notification – These customers received a letter stating that the free report is available and to call Duke Energy and opt-in to the campaign. If the customers pursue, the report will be sent to the residence.

The Program is continuing to work with internal and external teams to define the customer experience. Learning requirements from this campaign may include but are not limited to:

- Customer Perception / Satisfaction – Insight into whether customers find this type of channel informative and finds value in the utility providing this type of solution based opportunity. Are there privacy concerns around this type of engagement and how does the company mitigate against those types of concerns.

- Customer Acquisition – How many customers contacted us after receiving the reports and how many resulted in a transfer to a Trade Ally.
- Operational Feasibility – Assessment of internal and external partnerships pertaining to customer support related processes and availability.
- Financial Impact – Is the overall cost to acquire, support and maintain the customer experience offset by the total number of participation under the current energy efficiency offerings.


All 2,400 customers will receive a survey at the end of the campaign to capture information on a variety of metrics defining the customer experience.

- **Evaluation, Measurement and Verification**

There is currently no evaluation activity for this Program. The next process and impact evaluation report is scheduled for completion in fourth quarter of 2017 with activities beginning early 2017.


- Appendix

Residential HVAC – Bill Insert



SMART \$AVER PROGRAM

Upgrade your home's energy efficiency and get up to \$1,325.



These cash rebates could be yours.:

HVAC install.....	\$200
Health check.....	\$50
Insulate and seal	\$425
Variable-speed pool pump install	\$300
Heat pump water heater install	\$350

For HVAC Install, Insulate and Seal and Health Check rebate info call **866.785.6209**.

For Heat Pump Water Heater Install and Variable-speed Pool Pump Install rebate info call **866.507.3496**.

For program eligibility requirements and more details, visit **duke-energy.com/cash**.

Residential HVAC – Co-Branded Campaigns



Carolina
HEATING SERVICE INC.
HEAT • AIR • ELECTRICAL • GENERATORS

Sizzling Summer Savings

- Improve your home's cooling system
- Enjoy better comfort and indoor air quality
- Lower your summer energy bills
- Take advantage of our great offers plus qualify for rebates from Duke Energy

Call us today!
864.232.5684
www.CarolinaHeating.com/SmartSaver

Duke Energy Health Check

Free Health Check with purchase of Carolina Comfort Club.
Regularly \$99

FREE

Plus qualify for a \$50 rebate from Duke Energy.

Double Rebate

On the purchase of qualifying high-efficiency equipment.
Offer expires 08/31/15

Save
\$400

Savings includes a \$200 rebate per qualified system from Duke Energy.

\$100 Off Duct Sealing

On the purchase of qualified duct sealing.
Offer expires 08/31/15

Save
\$200

Savings includes a \$100 rebate from Duke Energy on qualified duct sealing.



Is your home ready
for summer?



www.greenhorizon.com

\$100 OR **\$200**

OFF DUCT SEALING OFF AIR DUCT REPLACEMENT

Plus qualify for a \$100 rebate from Duke Energy.

SAVE 20% on
all air seal and
insulate packages

20% OFF

Plus qualify for a rebate up to \$325 from Duke Energy.

FREE one-year
maintenance
agreement with
all new HVAC
installations

FREE

Plus qualify for a \$200 rebate per system from Duke Energy.

Residential HVAC – Email Message



This winter, make your
whole house cozier.
And get paid for it.



Insulate and Seal. Get up to \$425.

Winter is when you're most likely to notice uneven temperatures or drafts in your home. You may feel uncomfortable in the rooms where you spend the most time, but the biggest sources of air leaks may be in spaces you don't even think about.

Upgraded insulation and sealing can make your home more comfortable and lower your energy use. And when you insulate and seal with a participating contractor, we'll give you up to \$425.

Call **866.785.6209** or visit
duke-energy.com/staywarm.

Improvements must be completed by a Duke Energy participating contractor.

Stay cozy all winter long with our Insulate and Seal program. Saving energy and money is as easy as 1, 2, 3!



Step One:
Choose a contractor.



Step Two:
Make improvements.



Step Three:
Get cash.



[Update Your Subscriptions](#) | [Unsubscribe](#) | [Privacy Policy](#) | www.duke-energy.com

Duke Energy | 550 South Tryon Street | Charlotte, NC 28202

Residential HVAC – Thermal Image (SAMPLE FRONT) Report



GENERIC HOME THERMAL ANALYSIS PROGRAM Helping to make your home stronger.

SAMPLE A. SAMPLE
123 ANY STREET
ANYTOWN, USA 12345-6789



0001

Congratulations, you have been selected to participate in Duke Energy's Thermal Analysis Program to help make your home stronger.







Get Started Here


Thermal imaging is a new technology that helps you identify energy leaks in your home that result in wasted air conditioning in the summer and heating in the winter. Review the sample home to the left and the information below to learn how to spot and fix common energy leaks.


Next month you will receive a thermal image of your home in the mail. Please save this report to use as a reference guide when reviewing your home. This will help you identify and fix leaks that will keep your electric and gas bills low while keeping your home more comfortable.

Don't Waste Your Air Conditioning this Summer! Fix Your Home's Envelope to Keep Your Bills Down

-  **IMPROVE YOUR ATTIC INSULATION.** Heat rises, and a lot of it escapes through poorly insulated attics. Adding attic insulation is easy to do and can save you big on your heating bills.
-  **MAKE SURE YOUR WINDOW FRAMES DON'T LEAK.** Bright areas around the edges of windows means that they are leaking air out of the house. A bit of caulk can easily seal them up.
-  **INSULATE YOUR BASEMENT WALLS.** The area of the basement that is above ground is often poorly insulated, and is a major source of escaped heat from your home. Sealing leaks and adding a bit of insulation can help cut down your energy bill.
-  **SEAL EDGES AROUND YOUR CHIMNEY.** The area where the chimney meets the house can be a major source of leaks. Using caulk or insulated plates can be a relatively low cost way to seal it up.

Take These Simple Actions Inside Your Home to Save Even More!

- 
- INSTALL CFLS OR LEDs.**
- Replace traditional light bulbs with compact fluorescents (CFLs) or LEDs. CFLs and LEDs use 75% less energy and last more than 4 times as long.

- 
- LOWER YOUR THERMOSTAT.**
- Lower your thermostat setting just three degrees this winter. This can save you over 15 percent on your winter heating costs.

Please see the reverse side of this report if you would like to receive these reports via email in the future, learn more about the security and privacy of your home's image, or opt out of participating in the program. ➡

Residential HVAC - Thermal Image (SAMPLE BACK) Report

We take your privacy very seriously. The thermal images we collect only measure temperature and heat flow on the surface of your home to identify areas where energy is leaking unnecessarily. The thermal images cannot capture any personal or private information related to your home or family. Here are a few important things you should know about the thermal images we collect:



Thermal images can't see through glass

Thermal images cannot see inside your home, garage or vehicles. Thermal images are unable to see through glass since they are simply measuring temperature and heat flow. The thermal images cannot capture any personal or private information related to your home or family.



Thermal images can't see faces

Thermal images cannot identify individual people, faces or other identifying characteristics, like tattoos.



Thermal images can't see license plates

Thermal images cannot read your license plate number or mailbox number. Thermal images cannot see any numbers at all.

Duke Energy's Thermal Analysis Program is a free service offered to our customers to help you identify ways to make your home stronger and more comfortable while lowering your energy bills. If you have any questions about the program, please email us at dukeenergy@essess.com.

If you would like to opt out of participating in the program, including opting out of receiving a thermal image of your home, please go to essess.com/dukeenergy/optout or call 1-800-XXX-XXXX and input this unique code: 76543

LOW INCOME ENERGY EFFICIENCY AND WEATHERIZATION ASSISTANCE PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The purpose of the Low Income Energy Efficiency and Weatherization Assistance Program ("Program") is to assist low income customers with energy efficiency measures in their homes to reduce energy usage. There are three offerings currently in the Program:

- Residential Neighborhood Program ("RNP")
- Weatherization and Equipment Replacement Program ("WERP")
- Refrigerator Replacement Program ("RRP").

WERP and RRP are available for income-qualified customers in Duke Energy Carolinas, LLC's (the "Company's") service territory for existing, individually metered, single-family, condominiums, and mobile homes. Funds are available for (i.) weatherization measures and/or (ii.) heating system replacement with a 14 or greater SEER heat pump, and/or (iii.) refrigerator replacement with an Energy Star appliance. The measures eligible for funding will be determined by a full energy audit of the residence. Based on the results of the audit, customers are placed into a tier based on energy usage (Tier 1, which provides up to \$600 for energy efficiency services; and Tier 2, which provides up to \$4,000 for energy efficiency services, including insulation), allowing high energy users to receive more extensive weatherization measures. WERP and RRP are delivered in coordination with State agencies that administer the state's weatherization programs.

Customers participating in the RNP receive a walk-through energy assessment to identify energy efficiency opportunities in the customer's home and a one-on-one education on energy efficiency techniques and measures. Additionally, the customer receives a comprehensive package of energy efficient measures. RNP participants may have the measures listed below installed in their home based on the opportunity identified from the energy assessment.

1. Compact Fluorescent Bulbs (CFL's) - Up to 15 CFL's to replace incandescent bulbs.
2. Electric Water Heater Wrap and Insulation for Water Pipes.
3. Electric Water Heater Temperature Check and Adjustment.
4. Water Saving Faucet Aerators - Up to three faucet aerators.
5. Water Saving Showerheads - Up to two showerheads.
6. Wall Plate Thermometer.
7. HVAC Winterization Kits – Up to three kits for wall/window air conditioning units will be provided along with education on the proper use, installation and value of the winterization kit as a method of stopping air infiltration.
8. HVAC Filters - A one-year supply of HVAC filters will be provided along with instructions on the proper method for installing a replacement filter.
9. Air Infiltration Reduction Measures - Weather stripping, door sweeps, caulk, foam sealant and clear patch tape will be installed to reduce or stop air infiltration around doors, windows, attic hatches and plumbing penetrations.

Audience

WERP is available to qualified customers in existing individually-metered, owner-occupied single-family residences, condominiums or manufactured homes.

RRP is available to qualified customers in individually-metered residences irrespective of whether the property owner or the tenant owns the refrigerator.

RNP is available to individually-metered residential customers in selected neighborhoods where ~50% of the homeowners have income equal to or less than 200% of the Federal Poverty Guidelines, based on third party and census data.

B & C. Impacts, Participants and Expenses

Income Qualified Energy Efficiency and Weatherization Assistance¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$5.7	\$1.5	27%
Program Cost	\$11.2	\$2.2	20%
MW	2.2	0.6	27%
MWH	10,208.6	2,751.0	27%
Units	10,421	6,518	63%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

Through December of 2015, RNP offered free walk-through energy assessments to qualifying neighborhoods in Bessemer City, NC; Mooresville, NC; Lenoir, NC, Durham, NC; Winston-Salem, NC; Elkin, NC; Reidsville, NC, Charlotte, NC, Greenville, SC; Ware Shoals, SC; Hendersonville, NC; Lancaster, SC, Liberty, SC and Pickens, SC. Neighborhood events have included support from community groups and speakers such as elected officials, community leaders and community action agency representatives. The vendor's contract to deliver this program from 2013-2015 has expired. Starting 2016, there will be one vendor for all jurisdictions, and the transition between the vendors started 4th quarter of 2015, resulting in lower participation. Starting January 2016, the program will be called "Neighborhood Energy Saver" (NES) which provides a consistent name across all jurisdictions.

In addition to formal kick-off events, the Company has utilized "tent events" in select neighborhoods to allow customers to visit an information tent at their convenience for additional information about the RNP.

The Company launched WERP and RRP at the end of February 2015 in North Carolina and South Carolina. The Company selected the program administrator, North Carolina Community Action Agency (NCCAA), in December 2014 via a request for proposal. The company is working with the NC and SC Weatherization Agencies to deliver this program. In 2015, 403 families received weatherization assistance in conjunction with the DOE weatherization program, with 41 refrigerators replaced, 81 Tier 1 services provided and 320 Tier 2 services provided.

E. Marketing Strategy

WERP and RRP plan to piggy-back the marketing efforts of the current state Weatherization Assistance Programs administered by the state weatherization service providers. Additionally, agencies may utilize referrals generated from other Company energy efficiency programs as well as from their existing pool of weatherization applicants.

RNP continues to target neighborhoods with a significant low-income customer base using a grassroots marketing approach to interact on an individual customer basis to gain trust. Participation is driven through a neighborhood kick-off event that includes trusted community leaders and local and state officials explaining the benefits of the Program. The purpose of the kick-off event is to rally the neighborhood around energy efficiency and to educate customers on methods to lower their energy bills. Customers have the option to make an appointment for an energy assessment at the time of the event.

In addition to the kick-off event, the Company plans to use the following avenues to inform eligible customers about the Program:

- Direct mail (letters and reminder post cards)
- Door hangers
- Press releases and/or neighborhood flyers

- Community presentations and partnerships
- Inclusion in community publications such as newsletters, etc.

In addition, through the end of 2015, the vendor is running a sweepstakes and offering a \$500 gift card per neighborhood. All customers that participate in the program, as well as those that see the promotion and register are eligible to win.

F. Evaluation, Measurement and Verification

The process and impact evaluation report for the Residential New Program is scheduled for completion in fourth quarter of 2016 with activities beginning in early 2016.

The process evaluation will include interviews with program management, implementation contractors, and customer participants. Customer interviews will include data collection to better understand sources of program awareness, measure verification, use and satisfaction, effectiveness of one-on-one education and leave-behind materials, behavioral changes, and participant spillover.

The impact evaluation will determine the net program savings by conducting a billing analysis. The evaluation will also verify the key inputs to the engineering algorithms for the kit items provided to Residential Neighborhood Program participants.

Low Income Weatherization Program participation began in August 2015. Impact evaluation plans include a billing analysis, however there is not sufficient billing data available at this time to conduct the evaluation in 2016. The evaluation report is now tentatively planned for the fourth quarter of 2017.

G. Appendix

Event Postcard Front:

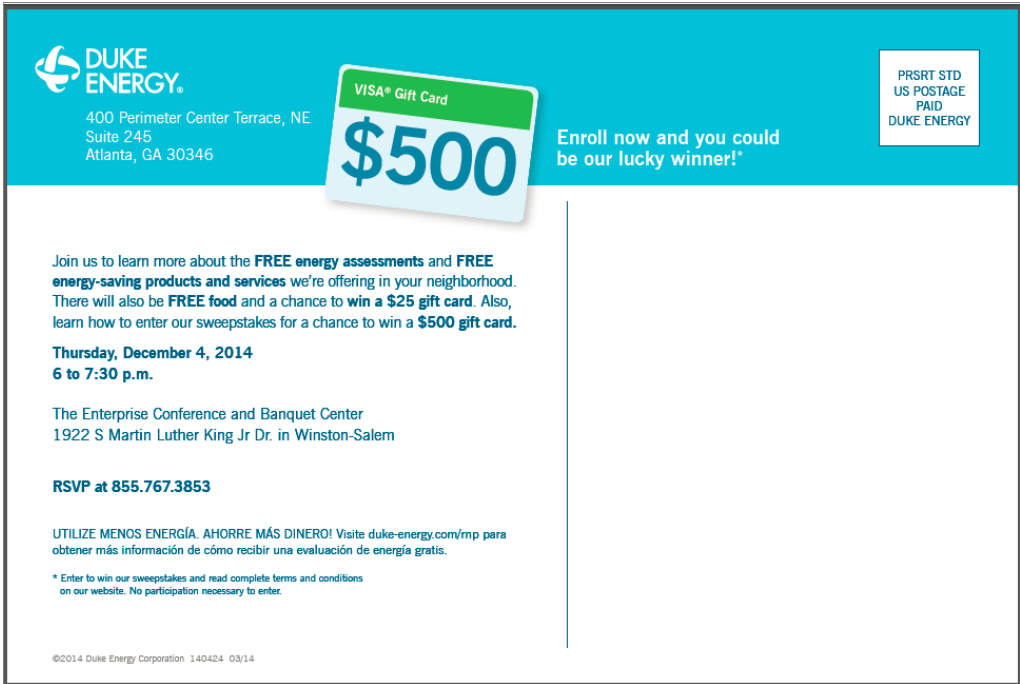


The front of the event postcard features a photograph of a smiling man in a blue shirt holding a compact fluorescent light bulb and a cylindrical energy-saving device. To the right of the photo, on a blue background, is the text: "Your neighborhood has been selected for FREE products and services. Join us at a special family-friendly event to learn about the free energy-saving items, worth up to \$210, that we will be installing in homes in your neighborhood for FREE." Below this is a bulleted list: "· Info on FREE home energy assessments", "· FREE food", "· Chance to win a \$25 gift card", and "· Learn how to enter our \$500 gift card sweepstakes". At the bottom of the blue section is the link "Learn more at duke-energy.com/rnp". The bottom of the postcard has a dark blue footer with the Duke Energy logo on the left and the text "Residential Neighborhood Program | Use less. Save more!" on the right.

DUKE ENERGY

Residential Neighborhood Program | Use less. Save more!

Event Postcard Back:



The back of the event postcard has a blue header section. On the left is the Duke Energy logo and address: "400 Perimeter Center Terrace, NE Suite 245 Atlanta, GA 30346". In the center is a graphic of a Visa Gift Card with "\$500" on it. On the right is a small white box with the text "PRSRT STD US POSTAGE PAID DUKE ENERGY". Below the header, the text reads: "Join us to learn more about the FREE energy assessments and FREE energy-saving products and services we're offering in your neighborhood. There will also be FREE food and a chance to win a \$25 gift card. Also, learn how to enter our sweepstakes for a chance to win a \$500 gift card." This is followed by the date and time: "Thursday, December 4, 2014 6 to 7:30 p.m." and the location: "The Enterprise Conference and Banquet Center 1922 S Martin Luther King Jr Dr. in Winston-Salem". Below that is the RSVP number: "RSVP at 855.767.3853". A Spanish version of the text is provided below: "UTILIZE MENOS ENERGÍA. AHORRE MÁS DINERO! Visite duke-energy.com/rnp para obtener más información de cómo recibir una evaluación de energía gratis." At the bottom left is a small disclaimer: "* Enter to win our sweepstakes and read complete terms and conditions on our website. No participation necessary to enter." At the bottom center is the copyright notice: "©2014 Duke Energy Corporation 140424 03/14".

DUKE ENERGY

400 Perimeter Center Terrace, NE
Suite 245
Atlanta, GA 30346

VISA® Gift Card

\$500

PRSRT STD
US POSTAGE
PAID
DUKE ENERGY

Enroll now and you could
be our lucky winner!*

Join us to learn more about the **FREE energy assessments** and **FREE energy-saving products and services** we're offering in your neighborhood. There will also be **FREE food** and a chance to **win a \$25 gift card**. Also, learn how to enter our sweepstakes for a chance to win a **\$500 gift card**.

Thursday, December 4, 2014
6 to 7:30 p.m.

The Enterprise Conference and Banquet Center
1922 S Martin Luther King Jr Dr. in Winston-Salem

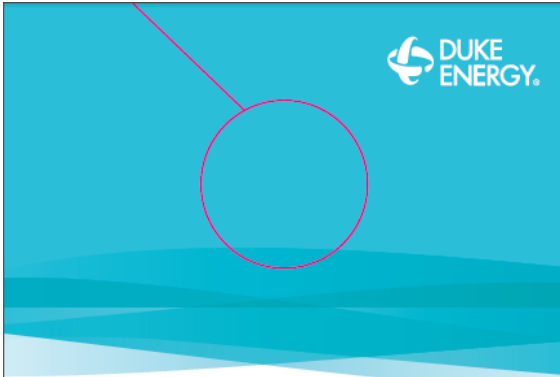
RSVP at 855.767.3853

UTILIZE MENOS ENERGÍA. AHORRE MÁS DINERO! Visite duke-energy.com/rnp para obtener más información de cómo recibir una evaluación de energía gratis.

* Enter to win our sweepstakes and read complete terms and conditions on our website. No participation necessary to enter.

©2014 Duke Energy Corporation 140424 03/14

Don't Miss Out Doorhanger



Don't miss out!

A Duke Energy representative will be on your street tomorrow performing FREE walk-through energy assessments, which can help you use less energy at home and save money on your energy bills. Your neighborhood was specially selected to receive these FREE assessments – don't miss out! You'll get:

- A walk-through assessment to show you where your home is wasting energy.
- Up to 16 energy-saving products and services that could help you save money on your electric bill. (These energy-saving measures can cost up to \$210, but we'll give them to you for free – and we'll install them, too.)
- Free energy tips to help you save even more.

We will be on your street _____
between _____ a.m. / p.m.

Energy Specialist's name: _____

Phone number: _____

To take advantage of this free program, an adult occupant must be home at the time of our visit.

Learn more at duke-energy.com/rnp

*Landlord consent is required before an assessment can be performed. Renters can download an Owner Authorization Form at duke-energy.com/rnp.

Residential Neighborhood Program
Use less. Save more!

Sorry We Missed You Doorhanger



We're sorry we missed you!

An Energy Specialist from Duke Energy was here to help you find ways to save energy, and save money on your energy bills. Your neighborhood was selected for this FREE service through our Residential Neighborhood Program. We're offering FREE walk-through energy assessments and energy-saving products to homes in your neighborhood. But don't worry – we can come back at another time.

Please contact me to set up a time that is convenient for you.

Energy Specialist's name: _____

Phone number: _____

As a part of this program, you'll get:

- A walk-through assessment to show you where your home is wasting energy.
- Up to 16 energy-saving products and services that could help you save money on your electric bills. (These energy-saving measures can cost up to \$210, but we'll give them to you for free – and we'll install them, too.)
- Free energy tips to help you save even more.

To take advantage of this free program, an adult occupant must be home at the time of our visit.

Learn more at duke-energy.com/rnp

*Landlord consent is required before an assessment can be performed. Renters can download an Owner Authorization Form at duke-energy.com/rnp.

Residential Neighborhood Program
Use less. Save more!

Event Flyer

Front of Flyer

Back of Flyer



We want to help you and your neighbors save money and energy at home.



Please join us to learn more about the FREE walkthrough energy assessments we'll be performing in your neighborhood through our Residential Neighborhood Program. There will be demonstrations of our FREE energy-saving products, a FREE meal and a chance to WIN a \$25 gift card. Also, learn how to enter our sweepstakes for a chance to win a \$500 gift card.

The Enterprise Conference and Banquet Center
1922 S Martin Luther King Jr Dr.
Winston-Salem, NC 27107

Thursday, December 4, 2014
6 to 7:30 p.m.

RSVP by calling 855.767.3853

The Residential Neighborhood Program is a FREE walkthrough energy assessment and improvement program for qualified customers.

In the days following this neighborhood event, an Energy Specialist will visit your house to perform a walkthrough assessment that will show you where your home is wasting energy.

During the FREE walkthrough assessment, we'll also give you up to 16 energy-saving products and services that could help you save money on your electric bill. These energy-saving measures can cost up to \$210, but we'll give them to you for free – and install them, too. Services provided are based on your home's specific energy usage and needs.

[Learn more at duke-energy.com/mp](http://duke-energy.com/mp)


Enroll now and you could be our lucky winner!*


* Enter to win our sweepstakes and read complete terms and conditions on our website. No purchase necessary to enter.

©2014 Duke Energy Corporation. 140405 014

Residential Neighborhood Program

All homes within the map included are eligible to participate.





MULTI-FAMILY ENERGY EFFICIENCY PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Multi-Family Energy Efficiency program ("Program") provides energy efficient lighting and water measures to reduce energy usage in eligible multi-family properties. The Program allows Duke Energy Carolinas, LLC (the "Company") to utilize an alternative delivery channel which targets multi-family apartment complexes. The measures are installed in permanent fixtures by Franklin Energy the program administrator or the property management staff. Franklin Energy is in charge of all aspects of the Program which include outreach, direct installations and customer care.

The Program helps property managers upgrade lighting with energy efficient 13 watt CFLs and also saves energy by offering water measures such as bath and kitchen faucet aerators, water saving showerheads and pipe wrap. The quantity of lighting measures installed is based on apartment size. Franklin Energy may install up to 12 bulbs in a one bedroom apartment, up to 15 bulbs in a two bedroom apartment and up to 18 bulbs in a three bedroom apartment. Water measures are available to eligible customers with electric water heating. These measures assist with reducing maintenance costs while improving tenant satisfaction by lowering energy bills.

The Program offers a direct install ("DI") option service by Franklin Energy. However, property managers still have the option for their property maintenance crews to complete the installations. The lighting measures and water measures are installed during scheduled direct install visits by Franklin Energy crews or routine maintenance visits by property personnel. In the case of direct installs, crews carry tablets to keep track of what is installed in each apartment. In the case of DIY installations, the property maintenance crew tracks the number of measures installed and reports them back to Franklin Energy. Franklin Energy then validates this information and submits the results to the Company.

After installations are completed, Quality Assurance ("QA") inspections are conducted on 20 percent of properties that completed installations in a given month. The QA inspections are conducted by an independent third party.

Audience

The target audience is property managers who have properties that consist of four or more units and are served on an individually metered residential rate schedule. In order to receive water measures, apartments must have electric water heating.

Properties that have already been served by the Property Manager CFL program are only eligible for water measures.

B & C. Impacts, Participants and Expenses

Multi-Family Energy Efficiency¹

<u>\$ in millions, rounded</u>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$6.0	\$7.4	123%
Program Cost	\$3.0	\$2.1	69%
MW	0.9	1.3	153%
MWH	10,426.6	13,988.1	134%
Units	132,454	232,495	176%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

The Program completed installations at 151 properties in 2015 accounting for close to 24,000 units. The Program installed 176 percent of the overall participation in comparison to the as filed participation. Lighting measures reflect 40 percent of the participation and water measures reflect 60 percent of the participation.

Potential Change

The Company is considering upgrading the Program's lighting technology from CFLs to LEDs. Internal work to evaluate cost effectiveness for LED A-line, Globes and Candelabra bulbs for specialty applications is on-going.

E. Marketing Strategy

As program implementer, Franklin Energy is responsible for marketing and outreach to property managers. This is primarily done through outbound calls and on-site visits to understand initial interest in the program from property managers in the Company's service territory. The Program also utilizes local apartment association memberships to obtain access to contact information for local properties and attend any association trade shows or events to promote the program.

In addition to proactively marketing the Program using these tactics, a Multi-Family Energy Efficiency promo and public website landing were developed for property managers to learn more about the Program. Once enrolled, Franklin Energy provides property managers with a variety of marketing tools to create awareness of the Program to their tenants. The tools include Program posters to display in common areas and letters for tenants focused on educating them about measures being installed and when the installation will occur. In addition, tenants are provided an educational leave-behind brochure when the installation is complete. This provides additional details on the installed measures as well as tear-off customer satisfaction survey to fill out and mail back to the Company to provide valuable Program feedback.

Another way a property manager may learn more about this Program is through the MyDuke Portal, an online tool, when they login to pay the bills of vacant units at their property. The MyDuke Portal presents a promo link that directs the user to the Program website for more information.

F. Evaluation, Measurement and Verification

For 2016, the impact and process evaluation will be a combined evaluation between Duke Energy Progress and Duke Energy Carolinas, with a final report in the fourth quarter of 2016. Duke Energy Carolinas will evaluate lighting measures only.

The impact evaluation will consist of estimating annual energy and demand impacts associated with program participation. The primary activity will involve an engineering-based analysis to estimate the impacts of the various program measures. The analysis will be supplemented by on-site field verification of sampled participants.

Samples of tenants and property managers will be selected for the process evaluation, which will collect information needed to estimate net impacts, assess program satisfaction, and identify program improvement opportunities.

G. Appendix

State Landing Page Promotion



Program Web Page



North Carolina
change location

[View Mobile](#) [Contact Us](#) [Investors](#)

RESIDENTIAL

BUSINESS

LARGE BUSINESS

OUR COMPANY

Save Energy & Money

> Easy Ways to Lower Your Bill

> Your Business Savings Toolkit

> Online Business Energy Analysis

> Multifamily Energy Efficiency Program

> Small Business Energy Saver

> The Business Energy Advisor Approach

> Smart Saver Incentive Program - Midstream Channel

[North Carolina Business > Save Energy & Money > Multifamily Energy Efficiency Program](#)

Multifamily Energy Efficiency Program



Multifamily Energy Efficiency Program helps you deliver

Longer product life. Happy tenants.



In today's competitive rental market, you need ways to set your community a step above your competition, in order to attract new tenants and retain existing ones.

Duke Energy will help by providing and installing energy-efficient lighting and water measures in each unit at your property to assist with scaling energy consumption and slicing utility costs for your tenants.

Swap and Save

We will replace your existing light bulbs with energy efficient products as well as insulate your hot water pipes (if water is heated by electricity), for longer life and lower utility bills. Your tenants will save instantly and your maintenance to-do list will dwindle.

Save Watts

Compact fluorescent light bulbs (CFLs) use up to 75 percent less energy and last up to 10 times longer than incandescent light bulbs. They also run cooler.

Get started!

Schedule a free assessment today. Email or call 1-888-297-1671.

Program forms

Get the safety and cost-saving details on these energy-efficiency products ... and get started!

[Program brochure](#)

[Program FAQs](#)

Tenant Leave-Behind

Duke Energy Multifamily Energy Efficiency Program



Today we installed the following energy-saving products in your home:



Compact fluorescent lightbulbs
CFLs last longer than incandescent bulbs and use up to 75 percent less energy.



Faucet aerators*
Faucet aerators installed in the kitchen and bathroom use up to 35 percent less water than standard faucet aerators.



Showerhead*
An energy-efficient 1.5 gpm showerhead will use less water than a regular showerhead, which means you can also use less energy to heat the water.



Pipe wrap*
Hot water pipe wrap reduces water and energy use by preventing heat loss while hot water travels through the pipes.

*Provided only to properties that use electricity to heat the water.



For more information, contact Duke Energy Multifamily Energy Efficiency Program at 888.297.1671 or dukeenergymultifamilyees@nankinenergy.com. Or, visit duke-energy.com/multifamily.

Note that this program is administered by Nankin Energy, a contractor of Duke Energy, with experience in the installation of home energy saving products.

Customer Survey

Thank you for participating in this program. We'd like to know how we did installing your new energy-saving products. Please complete this short survey and mail it to us. OR take our online survey at duke-energy.com/multifamilysurvey.

Property Name: _____ Unit #: _____ City: _____ State: _____ ZIP: _____
I was notified in advance of this work. ☐ Yes ☐ No
I was at home while the technicians installed the products. ☐ Yes ☐ No
The technicians' ID badges were visible. ☐ Yes ☐ No ☐ N/A

Using a scale of 1 to 10, please rate your level of agreement with the following statements. (Check your response)

Statement	1	2	3	4	5	6	7	8	9	10
Overall, I was satisfied with the Duke Energy Multifamily Energy Efficiency Program.										
The technicians respected my property and left it in good condition.										
The technicians treated me with courtesy.										
The technicians installed the product(s) correctly.										
The technicians were knowledgeable about the products and answered my questions.										
Overall, I am satisfied with the installed items.										
The leave-behind materials are informative.										

Comments: _____



Program Brochure



Multifamily Energy Efficiency Program



We'll install free energy-saving products to help your tenants save and help you attract and retain them.



To learn more or to schedule an appointment, contact the Duke Energy Multifamily Energy Efficiency Program today!

Phone: 888.297.1671 Website: duke-energy.com/multifamily
Email: dukeenergymultifamilyees@nankinenergy.com



Note that this program is administered by Nankin Energy, a contractor of Duke Energy, with experience in the installation of home energy saving products.

Duke Energy at night, March 2016. Nankin Energy, a contractor of Duke Energy, with experience in the installation of home energy saving products.

Start saving now with the latest COMPLIMENTARY energy-saving products.

If you are a Duke Energy electric customer, your tenants can receive the following energy-saving products - installed in each multifamily unit at no cost.

Compact fluorescent light (CFL) bulbs

Use up to 75 percent less energy and last up to 10 times longer than incandescent light bulbs. They also run cooler than incandescent bulbs, reducing energy loss. Each unit is eligible for up to 12 installed CFLs based on prequalification.

Bathroom and kitchen faucet aerators

Use up to 35 percent less water than traditional 2.2 gallons per minute (gpm) faucets, which can reduce water and sewer costs, as well as the amount of energy used to heat the water.

Water-saving showerheads

Use up to 40 percent less water than traditional 2.5 gpm showerheads, which can reduce water and sewer costs, as well as the amount of energy used to heat the water.

Hot water pipe wrap

Reduce water and energy use by preventing heat loss while hot water travels through your building's hot water pipes.*

Duke Energy at night, March 2016.

*If water is heated by electricity, savings are not guaranteed.

Benefits to you

- Upgrade the efficiency of your buildings for less.
- Reduce maintenance costs and efforts.
- Improve tenants' satisfaction by helping them save energy and money.
- Attract and retain tenants by providing your energy-efficient products.

Get started today!

- Step 1: Call 888.297.1671 or email dukeenergymultifamilyees@nankinenergy.com to schedule an appointment for a complimentary energy assessment and installation of energy-saving products at no additional cost.
- Step 2: Receive your complimentary in-unit product installation and your property's energy assessment report.
- Step 3: Enjoy your energy savings!

MY HOME ENERGY REPORT PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The My Home Energy Report ("MyHER" or the "Program"), is a periodic comparative usage report that compares a customer's energy use to similar residences in the same geographical area based upon the age, size and heating source of the home. Energy saving recommendations are included in the report to encourage energy saving behavior.

The reports are distributed up to 12 times per year (delivery may be interrupted during the off-peak energy usage months in the fall and spring). The report delivers energy savings by encouraging customers to alter their energy use. Customer's usage is compared to the average home (top 50 percent) in their area as well as the efficient home (top 25 percent). Suggested energy efficiency improvements, given the usage profile for that home, are also provided. In addition, measure-specific offers, rebates or audit follow-ups from other Company offered programs are offered to customers, based on the customer's energy profile.

Audience

Target customers reside in individually-metered, single-family residences with an active account and concurrent service from Duke Energy Carolinas, LLC (the "Company").

B & C. Impacts, Participants and Expenses

My Home Energy Report¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$12.4	\$17.3	140%
Program Cost	\$8.6	\$9.9	115%
MW	35.5	61.8	174%
MWH²	151,281.3	228,776.4	151%
Units	674,997	1,045,780	155%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

As customers receive subsequent reports, their engagement increases as they learn more about their specific energy use and how they compare to their peer group. The report then provides customers tools to reduce their usage in the form of targeted energy efficiency tips that provide customers with actionable ideas to help them become more efficient. Program participants are encouraged to contact the Company with their questions, comments and report corrections. Report corrections continue to generate the largest number of inquiries. Customers wishing to be removed from the Program represent less than one tenth of one percent of Program participants.

Highlights

The Company filed notification¹ under the Flexibility Guidelines with the North Carolina Utilities Commission to add an interactive/electronic report and expanded the MyHER to approximately 325,000 additional customers that are eligible to participate in the Program. This expansion started in January 2015.

The Company developed an interactive online portal which allows customers to further engage and learn more about their energy use and opportunities to reduce their usage. Customers will be able to set goals,

¹ The notification was filed on November 7, 2014 in Docket No. E-7, Sub 1032.

track their progress to goal, interact with calculators to assess the value of changing their behavior (i.e. turn thermostat up two degrees) and receive more targeted tips. This portal was rolled out in March 2015. Creative marketing strategies produced significant portal participation growth in 2015.

In the cooling season of 2016, within a subgroup of participants DEC-NC, the company will test a behavioral notification mechanism to drive an increase in the coincidental peak demand savings of MyHER. Electronic communications will be issued to this subgroup in advance of a peak event, to request a voluntary curtailment of demand, and this same group will receive a comparative report of their response to the request within 1-2 days after the peak event. The intention of the test is to ascertain the incremental peak demand savings driven by this notification, and to identify any related impact on customer satisfaction.

E. Marketing Strategy

Marketing for the Program consists of proactive communication through distribution of reports supported by a program website featuring additional information on the reports, Frequently Asked Questions ("FAQs") and contact resources. The MyHER Interactive portal is marketed by email campaigns as well as in the printed report.

F. Evaluation, Measurement and Verification

The next process and impact evaluation report is scheduled for completion in fourth quarter 2016. The evaluation report is planned to present results for both DEC and DEP, with costs allocated based on projected participation. While the evaluation will be conducted concurrently between Duke Energy Carolinas and Duke Energy Progress, impacts will be reported separately for each respective company.

For the process evaluation, samples of participants will be surveyed to inform the Program about attitudes, awareness, and MyHER effects on customer engagement and interest in reducing household energy use. The impact analysis will estimate the total net energy change in treated homes during the evaluation period. In addition, the evaluation will assess incremental net impacts from the Program encouraging MyHER customers to visit the Interactive Portal.

NON-RESIDENTIAL SMART \$AVER® PRESCRIPTIVE PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The Non-Residential Smart Saver[®] Prescriptive Program ("Program") provides incentives to Duke Energy Carolinas, LLC's (the "Company's") commercial and industrial customers to install high efficiency equipment in applications involving new construction and retrofits and to replace failed equipment. The program also uses incentives to encourage maintenance of existing equipment in order to reduce energy usage. Incentives are provided based on the Company's cost effectiveness modeling to assure cost effectiveness over the life of the measure.

Commercial and industrial customers can have significant energy consumption but may lack knowledge and understanding of the benefits of high efficiency alternatives. The Program provides financial incentives to help reduce the cost differential between standard and high efficiency equipment, offer a quicker return on investment, save money on customers' utility bills that can be reinvested in their business, and foster a cleaner environment. In addition, the Program encourages dealers and distributors (or market providers) to stock and provide these high efficiency alternatives to meet increased demand for the products.

The Program promotes prescriptive incentives for the following technologies – lighting, HVAC, pumps, variable frequency drives, food services, process and information technology equipment.

Audience

All of the Company's non-residential opt-in customers billed on an eligible Duke Energy Carolinas rate schedule

B & C. Impacts, Participants and Expenses¹

Non Residential Smart Saver Prescriptive

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$45.9	\$57.9	126%
Program Cost	\$10.6	\$13.9	131%
MW	13.7	15.5	114%
MWH	76,418.5	89,725.7	117%
Units	297,275	3,330,594	1120%

1) Values are reflected at the system level.

2) Numbers rounded.

Non Residential Smart Saver Energy Efficient Food Service Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$0.6	\$5.4	897%
Program Cost	\$0.2	\$0.2	90%
MW	0.1	1.2	1215%
MWH	1,369.3	7,483.9	547%
Units	1,058	3,785	358%

1) Values are reflected at the system level.

2) Numbers rounded.

¹ The information reflects results for the Non-Residential Smart Saver Prescriptive program in aggregate. Reference the Appendix for results by technology.
Docket No. E-7, Sub 1105

Non Residential Smart Saver Energy Efficient HVAC Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$8.9	\$6.2	70%
Program Cost	\$1.5	\$1.1	76%
MW	2.4	1.6	66%
MWH	6,286.6	5,405.2	86%
Units	55,988	3,014,985	5385%

1) Values are reflected at the system level.

2) Numbers rounded.

Non Residential Smart Saver Energy Efficient Lighting Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$32.6	\$42.0	129%
Program Cost	\$7.6	\$11.3	150%
MW	10.3	11.4	111%
MWH	58,100.8	66,480.8	114%
Units	225,261	305,298	136%

1) Values are reflected at the system level.

2) Numbers rounded.

Non Residential Energy Efficient Pumps and Drives Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$2.4	\$2.5	105%
Program Cost	\$0.8	\$0.5	60%
MW	0.7	0.6	78%
MWH	5,982.9	4,345.7	73%
Units	5,597	3,805	68%

1) Values are reflected at the system level.

2) Numbers rounded.

Non Residential Energy Efficient ITEE¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$1.3	\$1.1	84%
Program Cost	\$0.5	\$0.7	132%
MW	0.1	0.5	476%
MWH	4,598.7	5,196.7	113%
Units	8,976	957	11%

1) Values are reflected at the system level.

2) Numbers rounded.

Non Residential Energy Efficient Process Equipment Products¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$0.1	\$0.7	1189%
Program Cost	\$0.0	\$0.1	426%
MW	0.0	0.2	1058%
MWH	80.2	813.3	1014%
Units	395	1,764	447%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

Getting the Trade Allies (TA) to support the program has proven to be the most effective way to promote the program to our business customers. The Smart Saver outreach team builds and maintains relationships with trade allies associated with the technologies in and around the Company's service territory. Existing relationships continue to be cultivated while recruitment of new Trade Allies also remains a focus. Trade ally company names and contact information appears on the TA search tool located on the Smart Saver website. This tool was designed to help customers who do not already work with a TA, to find someone in their location who can serve their needs. The Company continues to look for ways to engage the trade allies in promotion of the Program as well as more effective targeting of trade allies based on market opportunities.

The Company offers a co-marketing campaign for trade allies. Trade Allies that included information about the Smart Saver program in their marketing efforts could apply for reimbursement of up to 50% of their marketing costs not to exceed \$2,000. Several trade allies took advantage of the matching funds. This campaign continues.

The Company is currently launching a mid-stream marketing channel. Many trade allies participating in the traditional application process reduce their invoice to the customer by the amount of the incentive and then receive reimbursement from Duke Energy when the incentive is paid. Many customers prefer this rather than paying the full cost upfront and receiving an incentive check from the Company. Many TAs, such as distributors, are not staffed to handle the paperwork involved in this process. The midstream marketing channel removes this barrier. TAs reduce the customer's invoice by the amount of the Smart Saver Prescriptive incentive. TAs then provide the sales information to the Company electronically for reimbursement. Duke Energy currently has one TA signed up for the midstream channel and many more have expressed interest. The Company continues to work with TAs to launch the channel. Based on other the experience of other utilities, Duke Energy expects this channel to increase participation in the Smart Saver Prescriptive program.

The Company added two business energy advisors to focus on the unassigned small and medium business customers. These team members will focus on marketing and program support.

The Company continues to offer the Energy Efficiency Store on the Company's website. The site provides customers the opportunity to take advantage of a limited number of incentive measures by purchasing qualified products from an on-line store and receiving an instant incentive that reduces the purchase price of the product. The incentives offered in the store are consistent with current program incentive levels.

Issues

As the program has matured, much of the low-hanging fruit is already gathered. In response to this, the Company continues to add measures to the Prescriptive portfolio in order to offer customers additional options for energy savings. The Company also continues to reach those customers who have not yet participated in the Smart Saver program. In 2015, CLEAResult completed a portfolio review of current prescriptive measure offerings. The measure level revisions include removals and additions to the current prescriptive offering. Lighting, Foodservice, HVAC and Information Technology programs are affected by these changes. The new

measures will allow Duke Energy to offer customers the most updated options in energy savings.

The Company continues to work with outside consultants and internal resources to develop strategies to understand equipment supply/value chains and increase awareness of these measures going forward.

Potential Changes

Standards continue to change and new more efficient technologies continue to emerge in the market. The Company will continue evaluating the opportunity to add measures to the approved Program that provide incentives for a broader suite of energy efficient products.

E. Marketing Strategy

Nonresidential customers are informed of programs via targeted marketing material and communications. Information about incentives is also distributed to trade allies, who in turn sell equipment and services to all sizes of nonresidential customers. Large business or assigned accounts are targeted primarily through assigned account managers. Accounts that do not have an assigned account manager receive information about the program through direct mail, email and other direct marketing efforts including outbound call campaigns.

The internal marketing channel is comprised of assigned Large Business Account Managers and Local Government and Community Relations, who all identify potential opportunities as well as distribute program collateral and informational material to customers and Trade Allies. In addition, the Economic and Business Development groups also provide a channel to customers who are new to the service territory.

The Company added two business energy advisors to the team to perform outreach to unassigned small and medium business customers. The business energy advisors follow up on customer leads to assist with program questions and steer customers to the trade ally search tool who are not already working with a trade ally. In addition, the business energy advisors are contacting customers with revenue between \$60,000 and \$250,000 to promote the Smart \$aver programs.

F. Evaluation, Measurement and Verification

Currently, evaluation work is underway on measures in all the Smart \$aver prescriptive technologies, with reports scheduled for lighting to be completed in the second quarter of 2016 and other technologies to be completed in the first quarter of 2016.

Samples of participants are selected for the process and impact studies. For the impact evaluation, some blend of selective monitoring and site visits are being performed at a sample of facilities, with engineering-based estimation and participant billing analysis to be determined by the evaluator. Participant surveys are being conducted to collect information needed to estimate net impacts and for the process evaluation.

G. Appendix

Non Residential Smart Saver Energy Efficient Food Service Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD June 30, 2015	% of Target
NPV of Avoided Cost	\$0.6	\$0.5	91%
Program Cost	\$0.2	\$0.1	47%
MW	0.1	0.1	94%
MWH	1,369.3	1,168.1	85%
Units	1,058	1,196	113%

- 1) Values are reflected at the system level.
2) Numbers rounded.

Non Residential Smart Saver Energy Efficient HVAC Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD June 30, 2015	% of Target
NPV of Avoided Cost	\$9.0	\$2.9	32%
Program Cost	\$1.5	\$0.6	40%
MW	2.4	1.0	39%
MWH	6,286.6	4,088.6	65%
Units	55,988	1,559,679	2786%

- 1) Values are reflected at the system level.
2) Numbers rounded.

Non Residential Smart Saver Energy Efficient Lighting Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD June 30, 2015	% of Target
NPV of Avoided Cost	\$39.2	\$24.6	63%
Program Cost	\$7.6	\$6.3	83%
MW	11.5	8.8	76%
MWH	69,216.0	51,465.5	74%
Units	225,261	177,260	79%

- 1) Values are reflected at the system level.
2) Numbers rounded.

Non Residential Energy Efficient Pumps and Drives Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD June 30, 2015	% of Target
NPV of Avoided Cost	\$2.4	\$1.2	50%
Program Cost	\$0.8	\$0.3	35%
MW	0.7	0.4	52%
MWH	5,982.9	3,146.5	53%
Units	5,597	2,141	38%

- 1) Values are reflected at the system level.
2) Numbers rounded.

Non Residential Energy Efficient ITEE¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD June 30, 2015	% of Target
NPV of Avoided Cost	\$1.3	\$0.6	42%
Program Cost	\$0.5	\$0.3	60%
MW	0.1	0.3	291%
MWH	4,598.7	3,556.0	77%
Units	8,976	730	8%

1) Values are reflected at the system level.

2) Numbers rounded.

Non Residential Energy Efficient Process Equipment Products¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD June 30, 2015	% of Target
NPV of Avoided Cost	\$0.1	\$0.3	535%
Program Cost	\$0.0	\$0.0	193%
MW	0.0	0.1	721%
MWH	80.2	479.9	598%
Units	395	825	209%

1) Values are reflected at the system level.

2) Numbers rounded.

NON-RESIDENTIAL SMART \$AVER® CUSTOM ASSESSMENT PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

Duke Energy Carolinas, LLC's (the "Company's") Non-Residential Smart Saver[®] Custom Assessment (the "Program") offers financial assistance to qualifying commercial, industrial, and institutional customers to help fund an energy assessment designed to identify the overall energy efficiency of a building(s) or system and to provide a list of suggested capital measures that will reduce energy costs with the intent of also helping customers to utilize the Non-Residential Smart Saver[®] Custom Program. The deliverable of the Program is a detailed energy report that includes the above as well as the technical data needed for the Non-Residential Smart Saver[®] Custom Program and to provide assistance with the Non-Residential Smart Saver[®] Custom Application. All kWh and kW savings identified from measures implemented as a result of the pre-qualified assessments are solely counted to the Program.

The program was expanded in 2015 to include a focus on new construction called Energy Design Assistance (EDA). EDA assists customers with new construction, major renovations, and additions by providing design assistance to enable construction beyond the applicable state energy code. EDA includes a number of benefits: 1) professional engineering and design resources, 2) computer simulated energy modeling to develop multiple energy efficiency design options providing each customer design choices 3) final computer simulated energy model with selected design, 4) support for application of Non-Residential Smart Saver Custom Incentives.

The intent of the Program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the Company's technical and financial assistance. The Program's application requires pre-qualification for eligibility. All assessments and design assistance are performed by professional engineering firms that have been pre-selected and contracted by the Company. The current engineering firms include: Building Intelligence Group, LLC, CB&I, Inc., ThermalTech Engineering, Inc., and CLEARResult.. Each offers a diversified set of skills that allow all qualifying commercial, industrial, and institutional customers to be supported.

Audience

Pre-qualified non-residential electric customers, except those that choose to opt-out of the Program, are eligible.

B & C. Impacts, Participants and Expenses

Non Residential Smart Saver Custom Technical Assessments¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$8.4	\$0.3	4%
Program Cost	\$3.9	\$0.7	18%
MW	2.0	0.1	4%
MWH	17,528.7	765.3	4%
Units	14,202	2,501	18%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

Customers continue to show interest in the Program. In 2016, 58 new customers expressed interest in the Program of which 18 customers have received assessments or are in progress.. Approximately, 22 customers are evaluating the information and considering whether to proceed with a project. Over 50 percent of the customers that receive assessments implement the energy efficiency projects. Lack of capital is the primary reason for not moving forward with projects. In addition, if the energy efficiency measures identified do not meet the internal financial criteria needed for a capital project.

The Company projects over 20,000 MWh in 2016.

E. Marketing Strategy

The marketing strategy for the Program is to work with those customers that need technical and financial assistance as a companion to their internal resources. Given the facility-wide approach, many of the energy savings opportunities are complex and interactive in nature which fits well with the end-to-end involvement utilized in the Program. Typical customer marketing activity involves direct marketing from assigned Account Managers, electronic postcards, e-mails, and information attained through the Company's website, and direct customer inquiries.

F. Evaluation Measurement and Verification

A process and impact evaluation report for Smart \$aver custom assessment measures is scheduled to be completed in second quarter of 2017.

Samples of participants are selected for the process and impact studies. For the impact evaluation, some blend of selective monitoring and site visits are being performed at a sample of facilities, with engineering-based estimation and participant billing analysis to be determined by the evaluator. Evaluation analysis may include identification of spillover impacts from the process of engaging customers in the energy assessment. Participant surveys are planned to collect information needed to estimate net impacts and for the process evaluation.

NON-RESIDENTIAL SMART \$AVER® CUSTOM INCENTIVES PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

Duke Energy Carolinas, LLC's (the "Company's") Non-Residential Smart Saver[®] Custom Incentives (the "Program") offers financial assistance to qualifying commercial, industrial and institutional customers (that have not opted-out) to enhance their ability to adopt and install cost-effective electrical energy efficiency projects.

The Program is designed to meet the needs of the Company's customers with electrical energy saving projects involving more complicated or alternative technologies, or those measures not covered by the Non-Residential Smart Saver Prescriptive Program. The intent of the Program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the Company's technical or financial assistance.

The Program's application is for projects that are not addressed by the applications for the Non-Residential Smart Saver Prescriptive Program. Unlike the Non-Residential Smart Saver Prescriptive Program, the Program requires pre-approval prior to the project implementation. Proposed energy efficiency measures may be eligible for customer incentives if they clearly reduce electrical consumption and/or demand.

The two approaches for applying for incentives for this Program are Classic Custom and Custom-to-Go. The difference between the two approaches focuses on the method by which energy savings are calculated. The documents required as part of the application process vary slightly.

Currently the applications forms listed below are located on the Company's website under the Smart Saver[®] Incentives (Business and Large Business tabs).

- Custom Application, offered in word and pdf format with the designated worksheet in excel format for projects saving more than 700,000 kWh annually. Customers can utilize provided calculation tools (Custom-to-Go) for EMS projects savings less than 700,000 kWh annually or request worksheets in another format if preferred. Customers or their vendors submit the forms with supporting documentation. Forms are designed for multiple projects and multiple locations. Custom Incentive Application (doc or pdf), submit with one or more of the following worksheets:
 - Classic Custom approach (> 700,000 kWh or no applicable Custom-to-Go calculator)
 - Lighting worksheet (excel)
 - Variable Speed Drive (VFD) worksheet (excel)
 - Compressed Air worksheet (excel)
 - Energy Management System (EMS) worksheet (excel)
 - General worksheet (excel), to be used for projects not addressed by or not easily submitted using one of the other worksheets
 - Custom-to-Go Calculators (< 700,000 kWh and applicable Custom-to-Go calculator)
 - Energy Management Systems
 - Lighting
 - Process VFDs
 - Compressed Air

The Company contracts with AESC to perform technical review of applications. and Ecova to provide the personnel to process applications as well as train and provide technical support to our Trade Ally (TA) network. Starting in 2016 all program implementation is performed by Duke Energy employees or direct contractors. All other analysis is performed internally at Duke Energy.

Audience

All of the Company's non-residential electric accounts billed on eligible rate schedules, except those that choose to opt-out of the Program, are eligible.

B & C. Impacts, Participants and Expenses

Non Residential Smart Saver Custom¹

<u>\$ in millions, rounded</u>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$39.9	\$53.9	135%
Program Cost	\$9.4	\$9.9	106%
MW	9.0	11.1	124%
MWH	78,437.2	76,142.6	97%
Units	63,551	21,318	34%

1) Values are reflected at the system level.

2) Numbers rounded.

D. Qualitative Analysis

Highlights

Customers continue to identify energy efficiency offers eligible under this Program. An average of 25 new pre-approval applications per month was received in 2015, down from 29 in 2014.. An average of 15 applications are being paid per month consistent with 15 in 2014. The custom program continues to see a large number of small projects and a very small number of large projects from our customers.

Custom To Go has excelled greatly since the launch in April 2015. On average, out of the 29 applications submitted per month since April, 40% are Custom To Go applications.

Smart \$aver Custom Incentives program launched the use of a flat rate incentive in 2015. The flat rate incentive allows for greater transparency to customers and the Trade Ally network. The current flat rate incentives allows the customer to receive an incentive for both energy and demand savings.

Efforts to educate trade allies and vendors who sell energy efficient equipment have been very successful. In many cases, vendors will submit the paperwork for the customer which eliminates a barrier for customers that do not have the resources to devote to completing the application.

Issues

The Program application process is considered burdensome by some customers due to the technical review required for all projects applying for a custom incentive. The technical review often requires customers (or their vendor) to quantify the projected energy savings from the proposed project. This can be a lengthy process that may require some level of engineering expertise. Where required, this requirement will continue, thus ensuring that incentives are being paid for cost-effective verifiable efficiency gains. Those technologies that seem to be a good fit for the Non-Residential Smart \$aver Prescriptive Program will be recommended for addition to the prescriptive application. The more measures offered through the Non-Residential Smart \$aver Prescriptive Program, the fewer burdens there are on the customer that prevents participation in the Smart \$aver program.

The custom program is subject to large fluctuations in performance due to a small number of projects. There are a significant amount of small projects compared to the small number of large projects which can drive the majority of annual impacts.

Potential Changes

The Program continues to consider several functional enhancements. The Company is investigating the feasibility of enhancements that will improve program transparency as well as enable participation of customer projects that are on fast track schedules or for which energy savings are difficult to quantify. More work and investigation is needed before these changes can be effectively presented.

Furthermore, the Custom program continues to evaluate additional improvements to enhance participation and program efficiency.

E. Marketing Strategy

The 2015 marketing strategy for the Program is the same as the Non-Residential Smart \$aver Prescriptive Program. The strategy is to promote prescriptive incentives, which show pre-approved incentive amounts that get customers interested in a project and are designed for a high volume of applications. Then, if a customer's project does not fall under prescriptive incentives, the custom application is there to offer an alternative. The program is promoted through but not limited to the following:

- Trade ally outreach
- Account Executives
- Business Energy Advisors
- Company website
- Outward customer campaigns

Looking forward, the 2016 marketing strategy for the Smart \$aver Custom Program is closely aligned with the Non-Residential Smart \$aver Prescriptive Program. The goal is to educate our non-residential customers about the technologies incentivized through both programs, as well as the benefits of installing energy-efficient equipment. These efforts will encompass a multi-channel approach, which will include:

- Email
- Direct Mail
- Print Media
- Online Media
- Industry Associations
- Large Account Managers
- Business Energy Advisors
- Trade Ally Outreach

F. Evaluation, Measurement and Verification

Currently, evaluation work is underway on Smart \$aver custom measures, with a report scheduled to be completed in second quarter of 2017. Samples of participants are selected for the process and impact studies. For the impact evaluation, some blend of selective monitoring and site visits are being performed at a sample of facilities, with engineering-based estimation and participant billing analysis to be determined by the evaluator. Participant surveys are being conducted to collect information needed to estimate net impacts and for the process evaluation.

POWER MANAGER® PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

Power Manager® (“Program”) is a demand response program that cycles residential central air conditioning during high summer peak demand periods. Duke Energy Carolinas, LLC (the “Company”) installs a load cycling device near the outdoor unit of a qualifying air conditioner. This enables the customer’s air conditioner to be cycled off and on when the Company initiates a control event. During these events, the Company can perform cycling or full shed interruptions of participating customers’ air conditioning systems at any time to mitigate capacity constraints in the generation, transmission or distribution systems.

Program participants receive a financial incentive as a bill credit in the amount of \$8 per month from July through October (\$32 annually).

There is no adverse impact on the customer’s air-conditioning system. The load control device has built-in safeguards to prevent the “short cycling” of the air-conditioning system. Cycling simply reduces the amount of time the air-conditioning system runs in a given period. Additionally, the indoor fan will continue to run and circulate air during the cycling event.

Audience

The Program is available to the Company’s residential customers residing in owner-occupied, single-family residences with a qualifying central air-conditioning unit.

B & C. Impacts, Participants and Expenses

PowerManager¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$56.9	\$53.1	93%
Program Cost	\$14.1	\$14.6	104%
MW²	407.7	457.5	112%
MWH	N/A	N/A	-
Units³	383,821	430,741	112%

Notes on Tables:

- 1) Values are reflected at the system level.
- 2) MW capability at the generator derived from the average reduction during the June - September control season achieved by a full shed of participating air conditioners.
- 3) Units included in filing represented average MW at the meter during the June - September control season. Current value is based on an average of 213,030 Power Manager devices during that period.
- 4) Numbers rounded.

D. Qualitative Analysis

Power Manager Events

The Company initiated four Power Manager cycling events in North Carolina and three in South Carolina during the summer of 2015. South Carolina was not included in the July 20th event due to ongoing multi-day outage restoration following storms that had swept through the upstate. In addition to these events, two short duration tests were held in the latter half of May as part of pre and post production testing of an upgrade to the Power Manager control system. The tests included both cycling and full shed control capabilities.

Power Manager Device Replacement

As 2015 began, there were over 11,500 older Power Manager devices remaining of the nearly 170,000 in place when the Company began a multi-year replacement project in 2011. To maximize efficiencies in the Company's replacement, initial efforts were focused on areas with higher concentrations of participating customers. Over time, the remaining locations became more spread out and difficult to access.

With an emphasis on obtaining more demand response impacts in 2015, the Company focused its primary efforts on increasing overall Power Manager participation. As a result, replacements continued in 2015, but at a slower pace. By year-end, 5,001 older switches remained. Replacements will continue until all older devices have been removed, with a target completion of May 31, 2016.

E. Marketing Strategy

The Company dramatically increased enrollments in the Power Manager program in 2015. Thanks to the proven success of the outbound telephone marketing channel and a very successful fall email, Power Manager ended the year with 177,672 customers and 213,030 air conditioners on the program; 12% and 13.6% net growth, respectively.

Using findings from the 2014 Power Manager participant surveys, the Company incorporated key messages in the annual postcard sent to all Power Manager customers. This included information on: how the program works, bill credits, tips to stay cool and advice not to lower the thermostat setting during events.


Program information and an enrollment form are available to customers on the Power Manager website located at <http://www.duke-energy.com/north-carolina/savings/power-manager.asp>.


F. Evaluation, Measurement and Verification

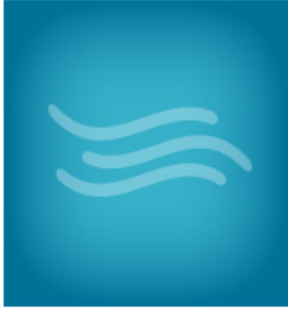
Evaluation activities include process and impact evaluations. The process evaluation is scheduled to be completed in the second quarter of 2016, while the impact evaluation is scheduled to be completed in third quarter of 2016.

G. Appendix

Fall Email







Earn money for taking a load off.

Get \$32 off your summer bills – just by helping our region use less energy at peak demand times.

If this summer's energy bills were a bit heavy on the wallet, our Power Manager program can help make next year's bills a little lighter. Enroll now to save \$32 next summer.




How does the program work?

On a handful of weekday afternoons during the summer, when energy demand is at its highest, Power Manager helps reduce the amount of time your AC runs for a few hours. That helps us keep costs lower and helps keep everyone's rates down. Most people tell us they don't even notice.

[Learn more and watch our short video](#)

Enroll now

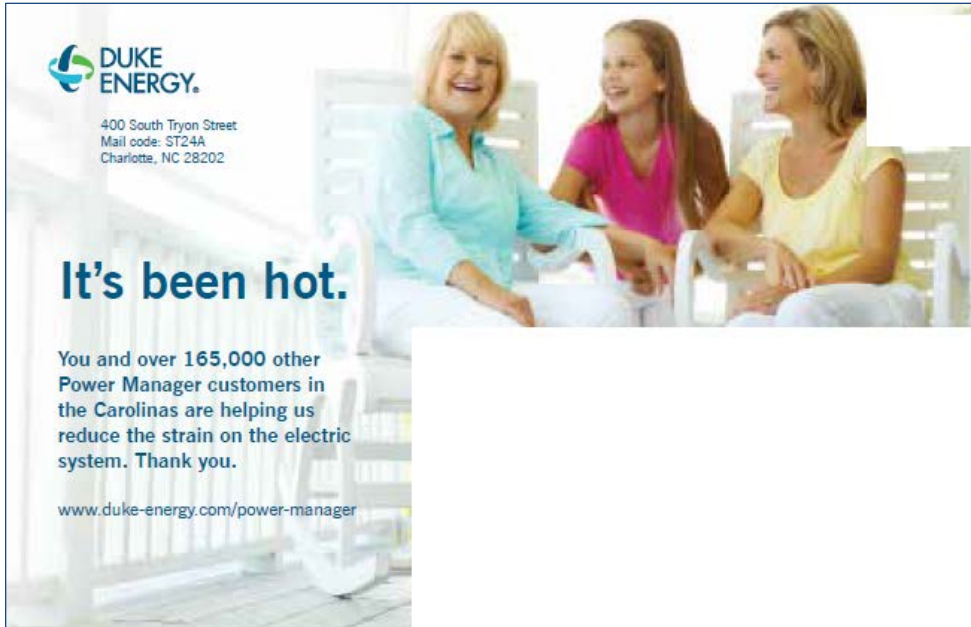
You'll enjoy:

-  \$32 in bill credits (\$8 each from July-October)
-  Knowing you're helping the community by taking a load off the power grid
-  Helping the environment and making a positive impact

[Update Your Subscriptions](#) | [Unsubscribe](#) | [Privacy Policy](#) | www.duke-energy.com

Duke Energy | 550 South Tryon Street | Charlotte, NC 28202

Thank You/Reminder Postcard



DUKE ENERGY.
400 South Tryon Street
Mail code: ST24A
Charlotte, NC 28202

It's been hot.

You and over **165,000** other Power Manager customers in the Carolinas are helping us reduce the strain on the electric system. Thank you.

www.duke-energy.com/power-manager

Thanks to you:

Our planet wins.
We can rely less on older sources of generation. And that means less use of natural resources.

Our community wins.
We can delay the need for new power plants – and reduce chances of blackouts.

You win.
You get \$32 in credits on your summer electric bills. An \$8 credit is applied to your July through October bills.



A few things to remember:

There is a small device attached to your AC unit that helps us cycle its run-time during times of peak demand.

We'll only cycle your AC on certain weekday afternoons – never holidays or weekends – to reduce the use of older, less efficient power plants. In the event of an extremely rare system emergency, your air conditioner may be turned off to avoid other actions such as blackouts.

Whether we're having a Power Manager event or not, during hot summer afternoons keep your blinds or curtains closed and save heat-producing activities – like cooking, laundry and vacuuming – for later.

Don't lower your thermostat in an attempt to cool your house quicker. It won't cool your home any faster. Instead, it can lead to extra energy use and a higher bill.

Don't call someone to check your AC until you've called 800.832.3169 to find out if an event is underway.

Who to call:

To find out if an event is underway: 800.832.3169
For a free reconnection or repair of the Power Manager device: 888.463.5022

For more information, including tips to keep cool: www.duke-energy.com/power-manager

POWERSHARE® PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

PowerShare® (“Program”) is a demand response program offered to commercial and industrial customers. The Program is comprised of Mandatory (“PS-M”), Generator (“PS-G”), Voluntary (“PS-V”) and CallOption options, and customers can choose from a variety of offers. Under PS-M, PS-G and CallOption, customers receive capacity credits for their willingness to shed load during times of peak system usage. Energy credits are also available for participation (shedding load) during curtailment events. The notice to curtail under these offers can be rather short (15-30 minutes), although every effort is made to provide as much advance notification as possible. Failure to comply during an event will result in penalties.

Audience

The Program is offered to Duke Energy Carolinas, LLC’s (the “Company’s”) non-residential customers who have not opted-out and are able to meet the load shedding requirements.

B & C. Impacts, Participants and Expenses

PowerShare¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$63.3	\$48.4	76%
Program Cost	\$22.7	\$15.6	69%
MW²	453.5	417.3	92%
MWH	N/A	N/A	-
Units³	426,917	359,926	84%

Notes on Tables:

- 1) Values are reflected at the system level.
- 2) MW capability derived by taking average over specific PowerShare contract periods.
- 3) Units included in filing represented KW at meter, rather than number of participants. The average participation for 2015 was 187.
- 4) Numbers rounded.

PowerShare CallOption¹

<i><u>\$ in millions, rounded</u></i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$4.5	\$0.0	0%
Program Cost	\$2.2	\$0.0	0%
MW²	34.0	0	0%
MWH	N/A	N/A	-
Units³	32,000	0	0%

Notes on Tables:

- 1) Values are reflected at the system level.
- 2) MW capability derived by taking average over specific PowerShare contract periods.
- 3) Units included in filing represented KW at meter, rather than number of participants. There was no participation in 2015.
- 4) Numbers rounded.

D. Qualitative Analysis

Highlights

PS-Mandatory and PS-Generator have been well received by customers in both North Carolina and South Carolina. Most customers previously enrolled in Interruptible Power Service ("IS") and Standby Generator ("SG") programs in South Carolina transitioned to PS-M and PS-G, respectively. Program modifications made in response to 2013 EPA regulations also led to the transition of many North Carolina SG participants to PS-G.

In the past year, the Company implemented NCUC and SCPSC approved revisions to Rider PS that we feel will improve accuracy of reported seasonal capabilities and will provide greater flexibility for participants. The modifications included the ability for PS-Mandatory participants to establish separate summer and winter Firm Demands and the allowance of terminations and amendments at the end of each contract term with 60 day notice instead of requiring a 12-month notification period.

Issues

The Company entered into an agreement with interested parties in 2011 to create a new measure offer for PowerShare® CallOption. This offer would allow for up to 200 hours of "economic curtailments" and pay the customer a \$50/kW per year capacity credit. Due to changes in operations, the original interested parties decided not to participate. Duke Energy Carolinas has been unable to generate interest in any of the CallOption offerings since the sole participant transitioned to PS-M in June 2013. It is the Company's intention to close Rider PSC when the term of our agreement with the previously interested parties expires.

On May 1, 2015, the DC Circuit Court of Appeals delivered a decision against the EPA stating that they had not sufficiently evaluated the environmental and capacity market impacts when they modified the RICE NESHAP rule to increase allowances for emergency generators on DR programs from 15 hours to 100 hours per year. The EPA filed a motion for and was granted a one-year stay through May 1, 2016 of the mandate to vacate the RICE NESHAP rule's 100-hour demand response provision so they can further review the rule. Duke Energy will continue to provide the EPA with feedback on the importance of the resources and the need for an annual DR allowance in any amended rule. However, if the rule is revised such that generators that do not meet the new emissions standards cannot participate in demand response, it would have a significant impact on our DR portfolio resources.

Potential Changes

If the 100 hour DR allowance in the RICE NESHAP rule is vacated, it is likely that the PS-Generator program would lose the majority of its current participants and the Company would discontinue operating PS-Generator to align with the EPA's definition of an emergency DR program. Otherwise, the Company does not anticipate any changes to the PowerShare program.

E. Marketing Strategy

To date, marketing efforts for the Program have focused on the relationship between the Company's account executives and their assigned customers. As part of their normal contact with customers, the account executives introduce the Program, including any new options/offers, while explaining the value proposition to the customer. Account executives share in-house analytical spreadsheets that show the specific incentives for each offer as applied to the customer's specific load profile as well as collateral to explain the details of all the Program offers.

In consideration of the number of qualifying customers that do not meet the criteria for being assigned to account executives, the Company continues to explore both internal and external marketing opportunities to enhance our outreach and increase program participation.

F. Evaluation, Measurement and Verification

The Impact and Process evaluation for the program year 2015 is scheduled to be completed in the third quarter of 2016.

The impact evaluation will summarize the actual kW and expected peak normal kW impacts for each event for the Program Year 2015. The process evaluation will encompass interviews with Duke Energy program staff and telephone surveys with participants to identify program strengths and satisfaction, event awareness, and potential barriers to participation.

OFFICIAL COPY

Mar 09 2016

SMALL BUSINESS ENERGY SAVER PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The purpose of Duke Energy Carolinas, LLC's (the "Company's" or "DEC") Small Business Energy Saver program (the "Program") is to reduce energy usage through the direct installation of energy efficiency measures within qualifying small non-residential customer facilities. All aspects of the Program are administered by a single Company-authorized vendor. Program measures address major end-uses in lighting, refrigeration, and HVAC applications.

Program participants receive a free, no-obligation energy assessment of their facility followed by a recommendation of energy efficiency measures to be installed in their facility along with the projected energy savings, costs of all materials and installation, and up-front incentive amount from the Company. Upon receiving the results of the energy assessment, if the customer decides to move forward with the proposed energy efficiency project, the customer makes the final determination of which measures will be installed. The energy efficiency measure installation is then scheduled at a convenient time for the customer and the measures are installed by electrical subcontractors of the Company-authorized vendor.

The Program is designed as a pay-for-performance offering, meaning that the Company-authorized vendor administering the Program is only compensated for energy savings produced through the installation of energy efficiency measures.

Audience

The Program is available to existing non-residential customers that are not opted-out of the EE portion of the Company's EE/DSM rider, Rider EE. Program participants must have an average annual demand of 100 kW or less per active account.

B & C. Impacts, Participants and Expenses

Small Business Energy Saver¹

<i>\$ in millions, rounded</i>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$38.1	\$39.1	103%
Program Cost	\$17.0	\$14.0	82%
MW	13.7	13.1	96%
MWH	56,916.9	60,206.3	106%
Units ³	60,143,852	63,541,107	106%

1) Values are reflected at the system level.

2) Numbers rounded.

3) Units reflect gross kWh.

D. Qualitative Analysis

Highlights

2015 marked the first full year of the Program being in operation, after launching in September of 2014.. Lime Energy is the Program administrator for DEC and Duke Energy Progress, LLC ("DEP").

The Company's small business customers continue to show significant interest in the Program, with over 2,500 Small Business Energy Saver projects completed in 2015.

The Company has administered a customer satisfaction survey to Program participants since the Program's launch in DEC. Customers have responded very positively to the Program, with 88% of all survey participants thus far (through November) rating their overall satisfaction with the Program experience at an 8 or above (out of a 10 scale). Also, Program participants have overwhelmingly responded that the Program has served to improve their perception of Duke Energy, with 87% of

responders indicating that the Program has had a positive effect on their overall satisfaction with the Company.

Issues

The majority of issues encountered early on in 2015 were driven by the customer's lack of awareness of the Program and acceptance that the offer is a legitimate offer from the Company. With the Program still being a relatively new offer in DEC, Program representatives from Lime Energy interact with customers regularly who are initially skeptical and question the legitimacy of the Program and Lime Energy's status as the Company-authorized vendor. To curb customer skepticism and concerns of fraud, the Company has outfitted all Program field representatives with Duke Energy badges and Company-branded attire. As the Company expected, issues with customer skepticism decreased as Program marketing and outreach efforts increased in the second-half of 2015.

Potential Changes

Standards continue to change and new more efficient technologies continue to emerge in the market. This continuing market progress led to the addition at mid-year of Design Lights Consortium Qualified T8 LED tubes as an incentivized Program measure.

As the Program matures, the Company will continue to evaluate opportunities to add incentivized measures suitable for the small business market to the approved Program which fit the direct install program model. The Company would ultimately like to ensure that small business customers are given the opportunity to maximize their energy savings by being offered a comprehensive energy efficiency project through the Program wherever possible.

E. Marketing Strategy

In 2015, the Program was marketed primarily using the following channels:

- Direct mail (letters and postcards to qualifying customers)
- Duke Energy Carolinas website
- Direct marketing & outreach via Program administrator
- Community outreach events

The Company executed a paid outdoor advertising campaign in Q4 2015 with the aim of increasing customer awareness about the Program. The Company selected billboards in high-traffic areas in the Charlotte market and used a "We ♥ Small Biz" design (seen below in Appendix), which was consistent with the graphics used to advertise the Program on the Company's website.

All marketing efforts are designed to create customer awareness of the Program, to educate customers on energy saving opportunities and to emphasize the convenience of Program participation for the target market.

F. Evaluation, Measurement and Verification

The process and impact evaluation report is scheduled for completion in fourth quarter of 2016 with activities beginning in early 2016. The evaluation report is planned to be combined for DEC and DEP. The allocation of combined EM&V costs is proposed to be based on the projected number of participants in the Small Business Energy Saver Program for each company.

The process evaluation will include interviews with program management, implementation contractors, and customer participants. Customer interviews will include data collection for use in the spillover and free ridership analysis.

The impact evaluation will focus on verifying the key inputs to the engineering algorithms for lighting measures. If participation increases in non-lighting measures, the evaluator may elect to adjust this approach for those measures.

G. Appendix

We  small biz.

Small Business Energy Saver Program
Up to 80% off energy-efficient upgrades



OFFICIAL COPY

Mar 09 2016

SMART ENERGY IN OFFICES PROGRAM

OFFICIAL COPY

Mar 09 2016

A. Description

The purpose of Duke Energy Carolinas, LLC's (the "Company's") Smart Energy in Offices Program ("Program") is to increase the energy efficiency of program participants. The Program leverages communities to educate and engage building owners, property managers, building operators, tenants and occupants of a building on ways to reduce energy usage in the workplace through simple behavioral changes. This is accomplished by providing participants with detailed information of the account/building's energy usage, support to launch tenant and building operator energy saving campaigns, forums that allow networking and exchange of building operation best management practices, and information showing comparisons between their building's energy performance and others within their community and actionable recommendations to improve their energy performance.

Audience

Non-residential customers with 12 months of usage history with business operations in building with a minimum of 10,000 square feet and 50% of the space is dedicated to office space who meet the Program's eligibility requirements.

B & C. Impacts, Participants and Expenses

Smart Energy in Offices¹

<u>\$ in millions, rounded</u>	Vintage 2015 As Filed	Vintage 2015 YTD December 31, 2015	% of Target
NPV of Avoided Cost	\$1.7	\$2.8	170%
Program Cost	\$1.4	\$1.5	108%
MW	3.0	5.3	179%
MWH	14,177.5	25,450.1	180%
Units ³	16,277,377	29,219,597	180%

1) Values are reflected at the system level.

2) Numbers rounded.

3) Units reflect gross kWh.

D. Qualitative Analysis

A key component of the Program is community engagement from the time of enrollment in the Program and on-going throughout the Program. Program participants identify a single point of contact that is responsible for working with the Program management team or the Company selected vendor. This person is responsible for interfacing with Company representatives on all aspects of the Program, including providing assistance to the Company as it relates to coordinating live events, meetings and seminars and assisting with the distribution of written materials. The customer representative, also referred to as the Coach, is also responsible for dedicating time/resources and implementing the recommendations and guidance provided by the Company. The Coach coordinates with the building operator to carry out building operator campaigns and complete a building profile and benchmark. The Coach also provides the names and contact information for additional customer champions (referred to as energy captains). The energy captains provide a "grassroots" deployment of energy campaigns to ensure employees are aware and participate in the energy campaigns. In addition, Program participants maintain a high level of engagement with the Company during regular check-ins. The check-in provides the Company and customer an opportunity to discuss campaigns that have been conducted or planned in the near future.

Highlights

The Company received regulatory approval from the Commission to implement the Program in third quarter of 2014.¹ Since the Smart Energy in Offices launch on September 3, 2014, about 188 buildings have signed on to participate, representing about 36 customer organizations and 32 Million Square Feet. SEiO now has active participants in Charlotte Center City, the greater Charlotte area, Greenville, SC, Greensboro, Winston-Salem, and Durham.

# Distinct Coordinating Organizations	# Distinct Duke Energy Customer Names	# Distinct Buildings	# Distinct Duke Energy Accounts	Sum SqFt
36	65	188	195	32,125,107

There has been a significant level of engagement in the building operator campaigns. An Energy Star Portfolio Manager benchmarking score in conjunction with the Smart Energy HQ portal has been generated for 49% of buildings. To date, operator campaigns offered include: Damper Derby, All about that Building Automation System, Set-Point Summit, Performance Pit Stop and Wiser Economizer. There has been participation for 36% in building operator campaigns. The first Semi-Annual Operator forum was held on September 15, 2015 and was attended by about 30 participants and 100% responded positively to the event. It is anticipated that customer access to 60 minute interval data (in addition to existing monthly data) will be available in the Smart Energy HQ Portal Q1 2016, which will allow for additional actionable insights to be provided to customers.

Tenant campaigns launched include Add It Up, Caught Green Handed, Cool Choices, and Crab You're It. Tenant action campaigns have been completed or initiated in about 12% of buildings. Over 3,000 distinct actions have been recorded in the Smart Energy HQ from campaign participants. A community wide "Add It Up" campaign is planned for the April 2016 time frame, which will engage people across multiple buildings. There are plans to enhance the current engagement enabling technologies (i.e. Smart Energy HQ Portal) with a mobile device application to provide an additional interface for delivering campaign content and energy usage tips.

Potential Changes

There are no potential changes at this time.

E. Marketing Strategy

A number of marketing channels have been used including email, print media, social media, videos and presentations at public events. Examples include print ads, popup displays at building sustainability events per property management requests, and booth displays at IREM and IFMA events. Marketing materials have been developed for increased participant engagement in tenant and operator campaigns. Additionally, we continue to provide tips on how to reduce wasted energy in the office by utilizing our social media channel Twitter. The first two quarterly [newsletters](#) were distributed to participants in August and November 2015. A Smart Energy in Offices overview video to drive new enrollment and additional engagement is planned for Q1 2016.

F. Evaluation, Measurement and Verification

¹ The North Carolina Utilities Commission issued an Order in Docket No. E-7, Sub 961 on August 13, 2014 and Public Service Commission of South Carolina issued an Order in Docket No. 2014-253-E- on July 9, 2014 approving the Smart Energy in Offices program.


There is currently no evaluation activity for this Program in 2016. The next process and impact evaluation report is scheduled for completion in third quarter of 2017 with activities beginning in 2016.

OFFICIAL COPY


Mar 09 2016

G. Appendix


[Link to Smart Energy Newsletter Articles](#)



Smart Energy in Offices







We're on a mission to save energy in the workplace.
Everyone benefits when we work smarter and use less.



It's easier than you'd think.

Through the SEIO Engagement Manager and the online Smart Energy HQ portal, we'll help buildings and office teams take action to make a community impact.

-  Access information about your building's energy usage and understand what those numbers actually mean.
-  Receive ongoing support from the SEIO engagement team to help you establish goals and prioritize opportunities.
-  Initiate action campaigns and friendly competitions that motivate individuals to become Smart Energy champions.
-  Create opportunities for building operators to focus on operational best practices and build their professional network.

Smart Energy in Offices (SEIO) is a program from Duke Energy dedicated to helping reduce energy consumption in office buildings. SEIO makes it simple and fun for property managers, building operators and tenants to minimize workplace energy use.

Together, through simple changes to our daily routines and fun employee engagement efforts, we can demonstrate our commitment to sustainability. We can lead the charge in making our office environments more comfortable while strengthening our community and our reputations as socially responsible organizations.

Saving energy requires coordinating the efforts of a lot of stakeholders
SEiO makes it easy

Business Owners

- Lower energy and operator costs.
- Engage and coordinate a wide array of building stakeholders.
- Work toward LEED certification.
- Attract and retain environmentally conscious tenants.

Building Operators

- Expert guidance and insights to optimize building efficiency.
- Access to an active network of building operators in the community for best practices and professional development.
- View and track energy usage and automatically integrate with ENERGY STAR™ Portfolio with the online Smart Energy HQ portal.





Team Businesses and Workers

- Increase employee productivity.
- Meet your company's sustainability goals.
- Contribute to community improvement through engaging energy-reducing challenges.

Recognition and Reward

- Office workers complete energy challenges and compete both as individuals and members of teams.
- Lower operating costs and advance through program levels of achievement.
- Outstanding buildings and occupants are recognized at an annual event.

What's the game plan?

-  **Sign up**
It's easy, your SEIO Engagement Manager will help you register your building and teams for participation.
-  **Designate the coach**
Identify the property manager or building operator who will coordinate SEIO office worker engagement campaigns and encourage tenant participation.
-  **Nominate the captains**
Identify leaders who can form teams and start generating savings in the office.
-  **Engage**
Complete energy challenges, share energy-saving tips with fellow building operators on our Smart Energy HQ and work with the broader community to save energy in offices.

Get Started Today
Contact a Smart Energy in Offices Engagement Manager
info@smartenergyinoffices.com
800.428.4337
[@DE_SMARTENERGY](#)
smartenergyinoffices.com

SMART ENERGY IN OFFICES

Building Operator Campaign Calendar

- Participate in the Smart Energy in Offices operator campaigns and get connected to the broader operator community in the Carolinas.
- Help raise the visibility of what it takes to manage your building, and make heroes of behind-the-scene facility management teams.
- Strengthen your tenant relationships – they'll learn what it takes to keep them safe, comfortable, and focused on improving energy efficiency each day.
- Whether taking new actions or verifying system operations, each campaign offers beneficial elements for everyone – high-performing buildings included!
- Take advantage of building operation checklists and engaging activities that will have you enjoying the results of a more energy-efficient building in no time.
- Receive the recognition you deserve for your efforts as you earn points through the Smart Energy HQ.



June

DAMPER DERBY

Operators, start your engines! Get ready to verify proper damper functionality and rev up on energy savings.

Kickoff: June 1
End date: July 10

July

ALL ABOUT THAT BAS*

*Building Automation System - that is. Check and adjust HVAC settings to optimize comfort and energy efficiency.

Kickoff: July 20

August

End date: September 4

September

SET-POINT SUMMIT

Build relationships and clarify building stakeholder expectations relative to efficiency and conservation goals.

Kickoff: September 14

First Semi-annual Operator Forum
September 15

October

End date: October 16

November

FIRST PERFORMANCE PIT STOP

Inspect and clean your interior condenser coils, change filters ahead of heating season.

Kickoff: November 2
End date: November 30



WISER ECONOMIZER

Verify that mechanical systems are utilizing outdoor air for building cooling needs when possible.

Kickoff: November 16

December

End date: December 31

January

SHAKE UP YOUR WAKE-UP

Verify that occupancy schedule and start-up times are aligned and consider adjustments if applicable.

Kickoff: January 11
End date: February 12



February

IT'S 5 O'CLOCK SOMEWHERE

Review your occupancy schedules to make the best decisions about optimizing building shut-down schedules.

Kickoff: February 15
End date: March 18

March

SECOND PERFORMANCE PIT STOP

Inspect and clean your interior condenser coils, change filters for cooling season.

Kickoff: March 21
End date: April 1



April

WHERE YOU AT THERMOSTAT?

Calibrate space temperature sensors and thermostats and verify that room sensor readings are accurate.

Kickoff: April 18
End date: May 27



Second Semi-annual Operator Forum
April 2016



May

ANNUAL RECOGNITION AWARDS



Keep up the good work and stay tuned ... more rewarding energy-saving campaigns coming your way!

Building Operator Forum Agenda

Smart Energy in Offices
Semi-Annual Operator Forum, September 15, 2015
Sheraton Charlotte Airport Hotel – 3315 Scott Futrell Drive, Charlotte, NC 28208

Agenda

8:15am – 8:55am	Coffee and Pastries; Mix and Mingle Introductory Welcome Remarks (including safety minute) <i>Danielle Anderson, Duke Energy Program Manager</i>
9:00am – 9:25am	SEiO Update and Operator Program Refresh <i>Kelly Zonderwyk, SEiO Engagement Manager</i> Upcoming Operator Campaigns Overview <i>Anthony Sandonato, SEiO Engagement Associate</i>
9:30am – 10:00am	Speaker: Best Practices in Facilities Management - Presentation 1 <i>Chris Brady, Director of Facilities, BGEA</i>
10:05am – 10:40am	Roundtable Guided Discussion 1
10:45am – 11:15am	Speaker: Best Practices in Facilities Management - Presentation 2 <i>Lee Dunfee, Senior Vice President, East Engineer Leader, Cushman & Wakefield</i>
11:20am – 11:50am	Roundtable Guided Discussions 2
11:55am – 12:00pm	Concluding Remarks
12:00pm – 1:00pm	Optional Lunch Buffet and Speaker Energy Conservation at Duke Energy Facilities <i>Eugenia Taylor, Administrative Services Strategy Manager, Duke Energy</i>



Crab, You're It!

Don't get pinched for wasting energy



Did you know that crabs are attracted to light? When not in use, power down energy-using equipment in your workspace or these crabs will get all powered-up! You may just find your desk covered in them; and then **Crab, You're It!** Now it's your turn to use these light-loving crabs to remind your coworkers that it's shellfish to waste energy.



Want to know more and get involved? Call your Smart Energy in Offices Engagement Manager or email info@smartenergyinoffices.com.



Wasting energy makes everyone crabby.

Have fun saving it instead. Use these light-loving crabs to get your coworkers out of their energy-wasting shell. When you notice unoccupied spaces where lights, computer monitors and other devices have been left on, grab your colleague by placing one of these crabs near their energy-wasting equipment. It's a fun, easy way to make your office more energy friendly.

Make an impact

-  **As an individual**
Simple changes in your daily work life can make a big difference in reducing energy usage.
-  **As a company**
Starting a group program in your office is easy. We'll provide you with the tools and resources to get your office engaged in energy saving challenges.
-  **As a building**
A building-wide effort makes an enormous difference in energy savings. We make it easy.

When coworkers and office teams compete to save energy, everybody wins.

Crab You're It is part of Smart Energy in Offices, a program from Duke Energy dedicated to helping reduce energy consumption in office buildings. Together, through simple changes to our daily routines, and fun employee engagement efforts, we can demonstrate our commitment to sustainability. We can lead the charge in making our office environments more comfortable while strengthening our community and our reputations as socially responsible organizations.

Get Started Today
Contact a Smart Energy in Offices Engagement Manager
info@smartenergyinoffices.com
800.428.4337
[@DE_SMARTENERGY](https://twitter.com/DE_SMARTENERGY)
smartenergyinoffices.com

How did Building Name Add it Up?

Street Address
Address #2
City, State, Zip

December 2015

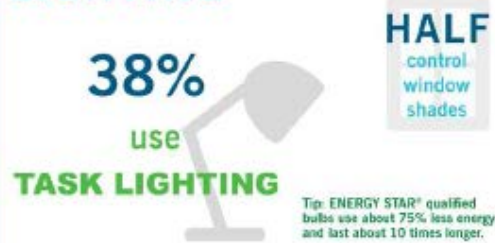
SPACE



Feelings about
TEMPERATURES
in your workspace:



LIGHTING



Access to **daylight** that you and your building colleagues have:



Tip: Bring in more daylight to save energy by reducing the need for electric lighting. Office productivity increases in daylight environments, so let the light in to get the job done!

DEVICES

50%
of your building
colleagues



Tip: Bring a sweater. A typical space heater used for 5 hours/day consumes about 1,500 watts and costs more than \$273 per year. Not to mention the serious safety hazards!

0 space heaters

CHARGE CELLPHONES AT WORK

Tip: Cellphone chargers really don't use THAT much energy, but only 5% of the power they draw is actually used to charge the phone. The other 95% is wasted when you leave it plugged into the wall, but not into your phone.



Tip: Plugged-in electronics continue to use electricity even when turned off, creating standby power loss. Switch from a regular power strip to an advanced version to cut standby power loss and save up to \$150 in energy costs over five years.

88%
have a personal
PRINTER

Tip: Turn off shared printers and photocopiers when they are not being used. Set printers to double-sided print and to "sleep mode" for non-workday hours and inactive periods.



COMPUTERS



Tip: Laptops are 85% more energy efficient than desktops. Remember to unplug laptops once fully charged!



Hours per day
your
computers
are used **7**

75%
of people
**POWER DOWN
COMPUTERS
DAILY**

Tip: Set computers and monitors into "sleep mode" after 30-60 minutes of inactivity. To save even more energy, set it to 5-20 minutes of inactivity. The lower the setting, the more energy you will save.

Minutes to
HIBERNATION
74% 5-20 min
26% 30-60 min
0% 60+ min

12%
of you power your
monitors down **every**
time you step away—but
HALF
of you do it **only once**
every few days.

43%
have 2 or more
external monitors
costing about \$37/year
for each one, if left on all
day, every day.

SEiO has **SAVED**
enough energy to power

57 schools
for **1** year!

CONTACT US: info@smartenergyinoffices.com 800.428.4337 [@DE_SMARTENERGY](https://twitter.com/DE_SMARTENERGY) SmartEnergyInOffices.com

Duke Energy Carolinas, LLC
Estimate - January 1, 2017 - December 31, 2017
Docket Number E-7, Sub 1105
Projected Program/Portfolio Cost Effectiveness - Vintage 2017

Program	UCT	TRC	RIM	PCT
Residential Programs				
• Appliance Recycling Program ¹				
• Energy Education Program for Schools	1.50	2.00	0.82	
• Energy Efficient Appliances & Devices	2.79	5.55	0.90	12.02
• HVAC EE Products & Services ¹				
• Income-Qualified EE Products & Services	0.35	1.34	0.29	
• Multi-Family EE Products & Services	3.80	5.25	1.10	
• My Home Energy Report	1.47	1.47	0.76	
• Power Manager	4.29	7.92	4.29	
• Residential Energy Assessments	3.40	3.63	1.43	
Residential Total	2.48	4.09	1.25	21.79
Non-Residential Programs				
• Business Energy Report	1.78	1.78	0.78	
• Custom Assessment	2.17	1.26	0.91	1.44
• Custom Incentive	3.75	1.52	1.11	1.42
• EnergyWise for Business	1.65	2.36	1.13	
• Food Service Products	3.27	2.25	1.08	2.96
• HVAC	2.26	1.73	1.17	1.45
• Lighting	3.73	1.70	1.18	1.72
• Motors, Pumps & VFDs	3.57	2.49	1.10	2.81
• Non Res Information Technology	3.47	2.53	0.93	3.82
• Process Equipment	7.17	5.93	1.35	5.83
• Small Business Energy Saver	2.51	2.56	1.12	2.28
• Smart Energy in Offices	2.52	3.47	0.83	
• PowerShare CallOption ¹				
• PowerShare	2.80	23.42	1.88	
Non-Residential Total	3.00	2.27	1.22	1.99
Overall Portfolio Total	2.76	2.78	1.23	2.90

¹ The Vintage 2017 projection does not reflect projected participation or program cost.

Evans Exhibit 8

Duke Energy Carolinas
Changes to DSM/EE Cost Recovery Vintage 2015 True Up January 1, 2015 - December 31, 2015
Changes from Prior Filing Due to Application of M&V and Participation
System kWh and kW Impacts Net Free Riders at the Plant

Residential Programs

Program Name	Filed in Docket E-7, Sub 1050		Filed in Docket E-7, Sub 1105		Overall Variance		E-7 Sub 1050		E-7 Sub 1105		Delta		Variance due to Change in Impacts and Measure Mix		Variance due to Change in Participation		Sum of Variances	
	kWh	kW	kWh	kW	kWh	kW	System Participation		System Participation		Participation		kWh	kW	kWh	kW	kWh	kW
Appliance Recycling Program	16,819,425	3,949	5,536,007	748	(11,283,418)	(3,201)	16,688		9,797		(6,891)		(4,338,149)	(1,570)	(6,945,269)	(1,631)	(11,283,418)	(3,201)
Energy Efficiency Education	6,016,227	632	4,417,898	827	(1,598,329)	195	24,000		19,582		(4,418)		(490,842)	311	(1,107,487)	(116)	(1,598,329)	195
Energy Efficient Appliances and Devices	30,662,529	3,256	126,600,461	14,746	95,937,932	11,490	773,122		3,826,679		3,053,557		(25,168,156)	(1,370)	121,106,087	12,860	95,937,932	11,490
HVAC Energy Efficiency	5,425,996	3,066	4,763,631	2,663	(662,364)	(403)	16,741		13,489		(3,252)		391,655	192	(1,054,019)	(596)	(662,364)	(403)
Income Qualified Energy Efficiency and Weatherization Assistance	10,208,640	2,225	2,750,969	595	(7,457,671)	(1,630)	10,421		6,518		(3,903)		(3,634,291)	(797)	(3,823,379)	(833)	(7,457,671)	(1,630)
Multi-Family Energy Efficiency	10,489,961	872	13,988,109	1,339	3,498,148	466	132,454		232,495		100,041		(4,424,801)	(193)	7,922,949	659	3,498,148	466
Energy Assessments	4,928,548	610	10,293,765	1,275	5,365,217	664	5,000		10,443		5,443		-	-	5,365,217	664	5,365,217	664
My Home Energy Report	151,281,311	35,517	228,776,428	61,770	77,495,117	26,253	674,997		1,168,110		493,113		(33,022,087)	306	110,517,204	25,947	77,495,117	26,253
PowerManager	-	407,690	-	457,528	-	49,838	383,821		485,980		102,159		-	(58,674)	-	108,512	-	49,838
Residential Programs Total	235,832,637	457,818	397,127,268	541,490	161,294,631	83,673	2,037,244		5,773,093		3,735,849		(70,686,671)	(61,793)	231,981,302	145,466	161,294,631	83,673

Non-Residential Programs

Program Name	Filed in Docket E-7, Sub 1050		Filed in Docket E-7, Sub 1105		Overall Variance		E-7 Sub 1050		E-7 Sub 1105		Delta		Variance due to Change in Impacts and Measure Mix		Variance due to Change in Participation		Sum of Variances	
	kWh	kW	kWh	kW	kWh	kW	System Participation		System Participation		Participation		kWh	kW	kWh	kW	kWh	kW
Non Residential Smart Saver Custom Technical Assessments	16,476,952	1,881	765,303	87	(15,711,649)	(1,794)	14,202		2,501		(11,701)		(2,136,321)	(244)	(13,575,329)	(1,550)	(15,711,649)	(1,794)
Non Residential Smart Saver Custom Energy Management Information Systems	73,730,939	8,417	76,142,627	11,108	2,411,688	2,691	63,551		21,318		(42,233)		51,409,796	8,284	(48,998,108)	(5,593)	2,411,688	2,691
Non Residential Smart Saver Energy Efficient Food Service Products	1,369,327	99	7,483,897	1,205	6,114,570	1,106	1,058		3,785		2,727		2,584,261	850	3,530,309	256	6,114,570	1,106
Non Residential Smart Saver Energy Efficient HVAC Products	6,286,567	2,435	5,405,220	1,611	(881,347)	(823)	55,988		3,014,985		2,958,997		(333,128,065)	(129,492)	332,246,718	128,668	(881,347)	(823)
Non Residential Smart Saver Energy Efficient Lighting Products	69,215,950	11,509	66,480,792	11,421	(2,735,158)	(88)	225,261		305,298		80,037		(27,328,310)	(4,177)	24,593,152	4,089	(2,735,158)	(88)
Non Residential Energy Efficient Pumps and Drives Products	5,982,928	724	4,345,750	562	(1,637,179)	(162)	5,597		3,805		(1,792)		278,670	70	(1,915,848)	(232)	(1,637,179)	(162)
Non Residential Energy Efficient ITEE	4,598,650	113	5,196,710	540	598,059	427	8,976		957		(8,019)		4,706,412	528	(4,108,353)	(101)	598,059	427
Non Residential Energy Efficient Process Equipment Products	80,184	16	813,335	170	733,151	154	395		1,764		1,369		455,284	98	277,867	56	733,151	154
Smart Energy in Offices	-	-	25,450,074	5,297	25,450,074	5,297	-		29,219,597		29,219,597		-	-	25,450,074	5,297	25,450,074	5,297
Small Business Energy Saver	-	-	60,206,337	13,123	60,206,337	13,123	-		63,541,107		63,541,107		-	-	60,206,337	13,123	60,206,337	13,123
EnergyWise for Business	-	-	41,585	14	41,585	14	-		27		27		-	-	41,585	14	41,585	14
PowerShare CallOption	-	33,990	-	-	-	(33,990)	32,000		-		(32,000)		-	-	-	(33,990)	-	(33,990)
PowerShare	-	453,466	-	417,276	-	(36,190)	426,917		443,225		16,308		-	(53,512)	-	17,322	-	(36,190)
Non-Residential Programs Total	177,741,498	512,650	252,331,630	462,413	74,590,132	(50,236)	833,945		96,558,369		95,724,424		(303,158,272)	(177,594)	377,748,404	127,358	74,590,132	(50,236)
Total Residential and Non-Residential Programs	413,574,134	970,467	649,458,898	1,003,904	235,884,763	33,437	2,871,189		102,331,462		99,460,273		(373,844,943)	(239,387)	609,729,706	272,824	235,884,763	33,437

NOTE - The actual per unit impacts are reflective of the following EM&V reports:

Program Name As Filed	Docket	Report Reference	Effective Date
Smart Saver® for Residential Customers	E-7, Sub 1050	Exhibit A - Process and Impact Evaluation of Duke Energy's Residential Smart Saver: Property Manager CFLs in the Carolinas (February 18, 2013)	10/1/2012
Residential Energy Assessments	E-7, Sub 1050	Exhibit B - Process and Impact Evaluation of the Residential Energy Assessments Program (Home Energy House Call) in the Carolina System (February 19, 2013)	12/1/2012
Smart Saver® for Residential Customers	E-7, Sub 1050	Exhibit C - Impact Evaluation of the Residential Smart Saver® HVAC Program in the Carolina System (February 28, 2013)	10/1/2012
Residential Energy Assessments	E-7, Sub 1050	Exhibit E - Process and Impact Evaluation of the Residential Energy Assessments Program (Personalized Energy Report®) in the Carolina System (March 29, 2013)	9/1/2012
Smart Saver® for Non-Residential Customers Lighting	E-7, Sub 1050	Exhibit F - Process and Impact Evaluation of the Non-Residential Smart Saver® Prescriptive Program in the Carolina System: Lighting and Occupancy Sensors (April 5, 2013)	10/1/2012
PowerShare	E-7, Sub 1050	Exhibit H - Impact Evaluation and Review of the 2012 PowerShare® Program in the Carolina System (June 11, 2013)	1/1/2012
Energy Efficiency Education Program for Schools	E-7, Sub 1050	Exhibit J - Impact Evaluation of the Energy Efficiency for Schools Program (The National Theatre for Children (NTC)) in the Carolinas System (August 21, 2013)	9/1/2012
Non-Residential Custom Program	E-7, Sub 1050	Exhibit K - Smart Saver Custom - Final Process and Impact Evaluation Report - Nov 20 2013	1/1/2013
My Home Energy Report	E-7, Sub 1073	Exhibit A - Process and Impact Evaluation of the My Home Energy Report (MyHER) Program in the Carolina System (February 20, 2014)	11/1/2013
Appliance Recycling	E-7, Sub 1073	Exhibit C - Process and Impact Evaluation of Duke Energy's Residential Appliance Recycling Program (ARP) in the Carolina System (April 25, 2014)	1/1/2012
Income Qualified Energy Efficiency: Neighborhoods	E-7, Sub 1073	Exhibit D - Process and Impact Evaluation of the 2013-2014 Residential Neighborhood Program in the Carolina System (November 14, 2014)	1/1/2012
Energy Efficient Appliances and Devices: Specialty Bulbs	E-7, Sub 1073	Exhibit E - Process and Impact Evaluation of the Residential Energy Efficient Appliance and Devices: Lighting - Specialty Bulbs Program in the Carolina System (November 19, 2014)	4/1/2013
HVAC Energy Efficiency: Tune & Seal	E-7, Sub 1073	Exhibit F - Evaluation of the Residential Smart Saver® Additional Measures Program in the Carolina System (December 10, 2014)	8/1/2012
Multi-Family Energy Efficiency	E-7, Sub 1105	Exhibit 13 - Multifamily Energy Efficiency Program; Evaluation, Measurement, and Verification for Duke Energy Carolinas (November 3, 2015)	5/1/2014
Energy Efficient Appliances and Devices	E-7, Sub 1105	Exhibit 13 - Save Energy and Water Kit Program; Evaluation, Measurement, & Verification for Duke Energy Carolinas (November 18, 2015)	5/1/2014
PowerManager	E-7, Sub 1105	Exhibit 13 - Impact Evaluation and Review of the 2012 Power Manager® Program in the Carolina System (September 16, 2015)	1/1/2014
Appliance Recycling Program	E-7, Sub 1105	Exhibit 13 - Duke Energy Carolinas and Duke Energy Progress Appliance Recycling Program Draft Evaluation Report (November 25, 2015)	8/1/2015
Energy Efficiency Education	E-7, Sub 1105	Exhibit 13 - Energy Efficiency in Schools Program (November 2, 2015)	6/1/2015

Duke Energy Carolinas, LLC
List of Industrial and Commercial Customers that have opted-out Vintage 2014
Docket Number E-7, Sub 1105

Customer Bill Name	Number of Accounts		Grand Total
	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	
DSM YR 2014 RIDER OPT-OUT	3,432		
EE YR 2014 RIDER OPT-OUT	2,799		
1520 SOUTH BOULEVARD LLC	1	1	2
200 NORTH COLLEGE CHARLOTTE LLC	1		1
301 S MCDOWELL STREET HOLDING LLC	1		1
A & T STATE UNIV	14	11	25
A G INDUSTRIES INC	1	1	2
A W NORTH CAROLINA INC	6	6	12
ABCO AUTOMATION INC	1	1	2
ABERCROMBIE TEXTILES LLC		2	2
ABSS FACILITIES DEPT	7	7	14
ADVANCED MACHINE & FABRICATION, INC.	2	2	4
ADVANCED TECHNOLOGY	2	1	3
AFFILIATED COMPUTER SERVICE	3	3	6
AIR PRODUCTS & CHEMICALS, INC	3	3	6
ALADDIN MANUFACTURING CORPORATION	2	2	4
ALCAN PACKAGING FOOD AND TOBACCO,INC	2	2	4
ALDERSGATE	3	3	6
ALEXANDER COUNTY SCHOOLS	2	2	4
ALEXANDER FABRICS, INC	2	1	3
ALLIED DIE CASTING CO OF NC	2	2	4
ALLSTATE INSURANCE	1	1	2
ALLVAC, A DIVISION OF TDY INDUSTRIES, INC	1	1	2
AMERICAN & EFIRD LLC	7	9	16
AMERICAN CAMPUS LLC	1		1
AMERICAN CONVERTING, CO. LTD	2	2	4
AMERICAN EXPRESS TRAVEL RELATED SERVICES COMPANY, INC		1	1
AMERICAN FIBER & FINISHING	1	1	2
AMERICAN TOBACCO POWER HOUSE LLC	2		2
AMERICAN YARNS LLC	3	3	6
ANDALE INC	3	2	5
APPLE INC	1	1	2
AQUA PLASTICS INC	2	2	4
ARARAT ROCK PRODUCTS	1	1	2
ARMACELL LLC	8	6	14
ASHLEY FURNITURE	6	6	12
AT&T BELLSOUTH	3	3	6
AT&T MOBILITY LLC	1		1
AT&T WIRELESS SERVICE		1	1
BAKER FURNITURE COMPANY	9	8	17
BAKERY FEEDS INC	2	2	4
BALDOR ELECTRIC COMPANY	5	5	10
BALLANTYNE RESORT, LLC	1		1
BANK NOTE CORP	3	3	6
BANK OF AMERICA	6	3	9
BARNHARDT MANUFACTURING COMPANY INC	4	1	5
BASF CORPORATION	4	4	8
BAY STATE MILLING	4	4	8
BB&T	7	6	13
BELL SOUTH MOBILITY	1	1	2
BELLSOUTH	7	5	12
BELLSOUTH BSC	8	7	15
BELLSOUTH COMMUNICATIONS, LLC	1		1
BEMIS MANUFACTURING CO	4	4	8
BENJAMIN COOPER		1	1
BERNHARDT FURNITURE COMPANY	4		4
BERRY TRI PLASTICS		1	1
BESTCO	4	4	8
BESTREADS INC	2	2	4
BEVERLY KNITS INC	5	5	10
BIC CORPORATION	1	1	2
BI-LO, LLC	21	24	45
BIOMERIEUX, INC	3	1	4
BISSELL BETSILL, LLC	1		1
BISSELL CO	4		4
BISSELL COMPANIES	68		68
BISSELL DEVELOPMENT	1		1
BISSELL GOLF	1		1
BISSELL HOTEL 6 LLC	1		1
BISSELL HOTELS #7, LLC	1		1
BISSELL HOTELS 5 LLC	1		1

Customer Bill Name	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	Grand Total
BISSELL HOTELS 8, LLC	1		1
BJ'S WHOLESALE CLUB	2	2	4
BLACKWELL STREET MANAGMENT COMPANY, LLC	3		3
BLUE RIDGE COMMUNITY COLLEGE	17	17	34
BLUE RIDGE HEALTH CARE	1		1
BONSET AMERICA CORP	1	1	2
BOXBOARD PROD INC	1	1	2
BOYLE BUILDING, LLC	1		1
BOYLE BUILDING,LLC	1		1
BRASS CRAFT MFG CO		1	1
BRAXTONS SAWMILL	1	1	2
BRAXTONS SAWMILL, INC	2	2	4
BREVARD COLLEGE	19	19	38
BRIGHT ENTERPRISES INC	2	2	4
BSN MEDICAL INC	2	2	4
BURLINGTON TECHNOLOGIES INC		1	1
CABARRUS COUNTY SCHOOLS	58	53	111
CALICO TECHNOLOGIES INC	3	3	6
CAMBRIDGE CC HOLDING COMPANY LLC	1		1
CAMFIL USA INC	2	2	4
CAPITAL BROADCASTING COMPANY	8		8
CARAUSTAR INC	4	4	8
CARAUSTAR INDUSTRIES	3	2	5
CARDINAL FLOAT GLASS	1	1	2
CARGILL, INCORPORATED	4	4	8
CARLISLE FOOD SERVIC	1	1	2
CAROLINA BEVERAGE GROUP, LLC	3	3	6
CAROLINA CONTAINER	4	4	8
CAROLINA PERLITE CO	1	1	2
CAROLINA TRACTOR & EQUIPMENT COMPANY	5	5	10
CAROLINA VILLAGE	4	4	8
CAROLINA YARN	2	2	4
CAROLINAS HEALTHCARE SYSTEM	16	3	19
CASE FARMS	3	3	6
CASTLE & COOKE NORTH CAROLINA LLC	4	4	8
CATAWBA COLLEGE	1		1
CATAWBA VALLEY MEDICAL CENTER	1	1	2
CATERPILLAR	2	2	4
CBL ASSOCIATES MANAGEMENT, INC	1	1	2
CEDAR FAIR SOUTHWEST, INC	3	3	6
CELGARD, LLC	8	8	16
CENTURION MOREHEAD LLC	1		1
CENTURY FURNITURE, LLC	7	13	20
CERTAINTED CORP	3	3	6
CHAPEL HILL/ CARRBORO SCHO	59		59
CHARLOTTE COUNTRY DAY SCHOOL	12	11	23
CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT	1		1
CHARLOTTE LATIN SCHOOLS, INC	1	1	2
CHARLOTTE OBSERVER PUBLISHING COMPANY	2	2	4
CHARLOTTE PIPE & FOUNDRY	16	16	32
CHEMTURA CORPORATION	1	1	2
CHEROKEE BOYS CLUB	3	3	6
CHEROKEE INDIAN HOSPITAL	1	1	2
CHESAPEAKE TREATMENT COMPANY, LLC		1	1
CHILDRENS HOME INC	2	2	4
CIM URBAN REIT PROPERTIES VIII LP	1		1
CINEBARRE, LLC	2	2	4
CISCO SYSTEMS INC	1		1
CITY OF ASHEVILLE	1	2	3
CITY OF BURLINGTON	5	3	8
CITY OF CHARLOTTE	71	30	101
CITY OF DURHAM	4	4	8
CITY OF GREENSBORO	24	23	47
CITY OF HENDERSONVILLE	4	4	8
CITY OF HICKORY		3	3
CITY OF KANNAPOLIS		1	1
CITY OF WINSTON SALEM	19	23	42
CK THREE TOWER CENTER,LLC	1		1
CLAPPS NURSING HOME CENTER	1	1	2
CLARIANT CORPORATION	11	11	22
CLEARWATER PAPER CORPORATION	4	4	8
CLEMENT PAPPAS NC, INC	5	4	9
CLEVELAND COUNTY SCHOOLS	7		7
CLONDALKIN PHARMA & HEALTHCARE, INC	5	5	10
CMBE	157		157
CMC-NORTHEAST INC	7		7
CMHA	1		1
COATS AMERICAN	2	2	4

Customer Bill Name	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	Grand Total
COCA COLA BOTTLING CO CON		5	5
COLE CREDIT INCOME OPERATING PARTNERSHIP LP	3	3	6
COLONIAL PIPELINE		5	5
COLUMBIA PLYWOOD CORPORATION	8	7	15
COMMONWEALTH BRANDS	2	2	4
COMMSCOPE, INC.	8	8	16
CONOVER LUMBER CO	1	1	2
CONSOLIDATED METCO INC		1	1
CONTINENTAL AUTOMOTIVE SYSTEMS, INC	2	2	4
COPLAND FABRICS INC		2	2
CORMETECH INC	1	1	2
CORNING CABLE SYSTEMS	5	3	8
CORNING INC	4	4	8
COSTCO WHOLESALE INC	5	5	10
CPC	44	19	63
CREE INC	13	14	27
CSHV SOUTHPARK 6100 FAIRVIEW, LLC	1	1	2
CULP INC	2	2	4
CV COLISEUM HOLDING LLC	1	1	2
DAIMLER TRUCKS NORTH AMERICA, LLC	6	5	11
DAIRY FRESH	3	3	6
DALCO NONWOVENS, LLC	2	2	4
DAVIDSON COLLEGE	15	15	30
DAVIDSON COUNTY COMMUNITY COLLEGE	3	3	6
DELTA APPAREL, INCORPORATED	2	2	4
DIAMOND VIEW I LLC	1		1
DIAMOND VIEW II	1	1	2
DISCOVERY PLACE INC	1	1	2
DISNEY WORLDWIDE SERVICES INC	1	1	2
DIVERSE LABEL PRINTING LLC	2	2	4
DOOSAN INFRACORE PORTABLE POWER - A DIVISION OF CLARKE EQUIPMENT	2	2	4
DRAKA COMTEQ, INC		1	1
DUKE UNIVERSITY	12	13	25
DURHAM COUNTY GOVERNMENT	2	2	4
DURHAM COUNTY HOSPITAL CORPORATION	1	1	2
DYNAYARN USA, L.L.C.	1	1	2
E I DUPONT CO	1	1	2
E J VICTOR INC	1	1	2
EAST COAST LUMBER CO	1	1	2
EAST DECK INC	1		1
EASTERN BAND OF CHEROKEE INDIANS	6	6	12
ECMD INC	4	4	8
EISAI INC	1	1	2
ELASTIC FABRICS OF AMERICA	2	2	4
ELASTRIX LLC	2	2	4
ELON UNIVERSITY	69	69	138
EMC CORPORATION	2	2	4
ENGINEERED CONTROLS INTERNATIONAL INC	4	4	8
ESSENTRA PACKAGING US, INC		4	4
ETHAN ALLEN	2	2	4
EVONIK STOCKHAUSEN,INC	3	3	6
FAIRSTONE FABRICS	4	4	8
FERGUSON SUPPLY & BOX	1	1	2
FIBER & YARN PRODUCTS, INC	1	2	3
FILTRONA GREENSBORO, INC	4	4	8
FIRESTONE FIBERS & TEXTILES COMPANY, LLC	2		2
FIRST STATES INVESTORS 104,LLC	5		5
FLEXTRONICS AMERICA, LLC	3	3	6
FLINT TRADING CO	2	2	4
FMC-LITHIUM CORP	5	4	9
FOCKE & CO, INC	1	1	2
FOOD LION	226	223	449
FORESTVIEW HIGH SCHOOL PTA	1		1
FREIGHTLINER OF CLEVELAND, LLC	1		1
FREUDENBERG IT LP	4	4	8
FREUDENBERG NONWOVEN	1	1	2
FRITO-LAY, INC	1	1	2
FRONTIER SPINNING MILLS, INC		2	2
FURNITURELAND SOUTH	8		8
G & I V RESOURCE SQUARE 5 LP		1	1
GALENOR DESIGNS, LLC	1	1	2
GARDNER WEBB UNIV		1	1
GASTON CO SCHOOLS	38		38
GASTON COLLEGE	7	5	12
GBORO NEWS & RECORD	2	2	4
GE LIGHTING SOLUTIONS LLC	6	6	12
GENERAL ELECTRIC	2	2	4
GENPAK LLC	3	3	6

Customer Bill Name	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	Grand Total
GENUINE PARTS COMPANY	2	2	4
GERDAU AMERISTEEL US INC	2	2	4
GILDAN ACTIVE WEAR INC	3		3
GILDAN YARNS, LLC		2	2
GLAXOSMITHKLINE LLC	7	7	14
GLEN HIGH SCHOOL	1	1	2
GLEN RAVEN INC	2	2	4
GOLF CLUB AT BALLANTYNE RESORT	2		2
GRAY MANUFACTURING TECHNOLOGIES LLC	2	2	4
GRIFFIN INDUSTRIES	2	2	4
GUILFORD COLLEGE	44	43	87
GUILFORD COUNTY SCHOOLS	225	172	397
GUILFORD TECH COMM COLL	18	18	36
HALYARD NORTH CAROLINA, INC		1	1
HAN FENG INC		1	1
HANES COMPANIES INC	1	1	2
HANSON BRICK EAST LLC	3	3	6
HARRIS TEETER INC	69	69	138
HB BISSELL	1		1
HENDERSON COUNTY GOVERNMENT	3	3	6
HENDERSON COUNTY SCHOOLS	15	14	29
HENDERSONVILLE HEALTH & REHAB	1	1	2
HENKEL CORPORATION	6	6	12
HERBALIFE INTERNATIONAL OF AMERICA INC	1	1	2
HERITAGE HOME GROUP LLC	3	5	8
HICKORY CITY SCHOOLS	13	13	26
HICKORY READY MIXED	2	2	4
HICKORY SPRINGS MANUFACTURING COMPANY	24	28	52
HIGHWOODS PROPERTIES	55	55	110
HIGHWOODS REALTY LIMITED PARTNERSHIP	1	1	2
HIGHWOODS REALTY LTP	1	1	2
HINES GLOBAL REIT HOCK PLAZA I LLC	1	1	2
HINES INTEREST LIMITED PARTNERSHIP	2		2
HITACHI METALS NC LTD	1	1	2
HONDA POWER EQUIPMENT	1	1	2
HORSEHEAD CORPORATION	1	1	2
HUNTSMAN INTERNATIONAL LLC	2	2	4
IBM CORPORATION	1		1
IGM RESINS USA INC		1	1
INCHEM CORPORATION	2	2	4
INDUSTRIAL TIMBER &	2		2
INDUSTRIAL WOOD PROD	3	3	6
INDUSTRIAL WOOD PRODUCTS	3	3	6
INFO-GEL, LLC	3	3	6
ING CLARION REALTY SERVICES LLC	3		3
INGLES MARKETS, INC.	45	45	90
INGREDION INCORPORATED	1	1	2
INTERNATIONAL PAPER	7	6	13
INTERNATIONAL TEXTILE GROUP INC	1	2	3
IPEX USA, INC	3	1	4
IQE INC	2	1	3
ISOTHERMAL COMM COLLEGE	5	5	10
ITG BRANDS LLC	2	2	4
J E HERNDON CO	1		1
JACKSON BOE	8	8	16
JACKSON PAPER MFG CO	1	1	2
JAMES M PLEASANTS CO	1	1	2
JDL CASTLE CORP	1	1	2
JOHNSON CONTROLS BATTERY GROUP, INC	1		1
JOHNSON CONTROLS INC	2		2
JOHNSTON PROP INC	1	2	3
JOWAT CORP	5	5	10
JOWAT CORPORATION	2	2	4
JOWAT INC	1	1	2
JPS COMPOSITE MATERIALS CORP		1	1
KAYSER ROTH CORPORATION	1	2	3
KEATING GRAVURE USA, LLC	1	1	2
KEN SMITH YARN CO	1	1	2
KENDRION-SHELBY	2	2	4
KERRS HMR CONCRETE	1	1	2
KIMBERLY CLARK	5	5	10
KINCAID FURNITURE	14	14	28
KINDER MORGAN SOUTHEAST TERMINAL	3	3	6
KINDER MORGAN TRANSMIX GROUP	1	1	2
KOHLER COMPANY	1	1	2
KOOPMAN DAIRIES INC	2	2	4
KOURY CORPORATION	54	54	108
KOURY VENTURES	6	6	12

Customer Bill Name	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	Grand Total
KROGER CO	5	5	10
KROGER LIMITED PARTNERSHIP I	1	1	2
KSM CASTINGS NC INC	1	1	2
KYOCERA INDUSTRIAL	2	2	4
L B PLASTICS INC	6	6	12
L S STARRETT CO	1	2	3
LENOVO INC	1	1	2
LEXINGTON FURNITURE IND	1	1	2
LINCOLN HARRIS	1	1	2
LINDE LLC	1	1	2
LORILLARD CORP	1	1	2
LORILLARD TOBACCO CO	1	1	2
LOUISIANA-PACIFIC CORPORATION	1	1	2
LOWES FOODS	40	32	72
LOWE'S HOME CENTERS, INC	89	90	179
LOWES OF FRANKLIN #717	2	2	4
LOWE'S OF FRANKLIN #717	1	1	2
LYDALL THERMAL ACOUSTICAL INC	4	4	8
MAGNOLIA CASTLE LLC	1	1	2
MANNINGTON WOOD FLOORS	1		1
MANUAL WOODWORKERS & WEAVERS INC	2	2	4
MARTIN MARIETTA MATERIALS INC	72	74	146
MARVES INDUSTRIES, LLC	1	1	2
MAUSER CORP		4	4
MCCREARY MODERN INC	8	8	16
MCDOWELL HOSPITAL INC	1		1
MCMICHAEL MILLS INC	6	6	12
MEADOWS & OHLY 4 LLC	5	5	10
MECK CNTY JAIL CENTRAL	1	1	2
MECKLENBURG COUNTY	15	2	17
MEDIA GENERAL OPERATIONS INC	1	1	2
MERCK SHARP & DOHME CORP	3	3	6
MEREDITH WEBB PRINT	3	3	6
MERITOR HEAVY VEHICLE SYSTEMS	1	1	2
MERITOR HEAVY VEHICLE SYSTEMS LLC	1	1	2
METROMONT CORPORATION	2	2	4
MICHELIN AIRCRAFT TIRE CO	1	1	2
MICHELIN NORTH AMERICA	10	10	20
MILES TALBOTT	2	2	4
MILLERCOORS LLC	1	1	2
MILLIKEN & COMPANY	2	2	4
MINT MUSEUM OF CRAFT & DESIGN	1	1	2
MODERN DENSIFYING		2	2
MOHICAN MILLS	4	4	8
MOM BRANDS COMPANY	1		1
MOORE WALLACE NORTH AMERICA INC	1	1	2
MORTON CUSTOM PLASTICS, LLC	2	1	3
MOUNT VERNON MILLS INC	1	1	2
NATIONAL PIPE & PLASTICS	2	2	4
NC BAPTIST HOSPITAL	10	10	20
NC BLUMENTHAL PAC	1	1	2
NC CENTER FOR PUBLIC TV	2	1	3
NC OWNER LLC	14		14
NCFLA II OWNER LLC	3		3
NETAPP, INC	2	2	4
NEW EXCELSIOR, INC		1	1
NEW GENERATION YARNS		1	1
NEW SOUTH LUMBER COMPANY INC	3	3	6
NGK CERAMICS USA	2	2	4
NORDSTROM INC	2	1	3
NORFOLK SOUTHERN	2	2	4
NORTEL NETWORKS	12	12	24
NORTHROP GRUMMAN GUIDANCE & ELECTRONICS COMPANY, INC	2	2	4
NOVANT HEALTH INC	10	8	18
OAK FOREST HEALTH AND REHABILITATION CO	1	1	2
O'MARA, INC.	1	1	2
OMNISOURCE SOUTHEAST	5	10	15
ONEAL STEEL INC	4	4	8
OPTICAL EXPERTS MANUFACTURING	1	1	2
ORACLE FLEXIBLE PACKAGING	5	4	9
OWENS ILLINOIS, INC	2	2	4
PACTIV LLC		3	3
PAPER STOCK DEALERS	1	1	2
PARDEE MEMORIAL HOSPITAL	14	14	28
PARK RIDGE HOSPITAL	9	8	17
PARKDALE AMERICA LLC	10	10	20
PARKDALE MILLS, INC	2	3	5
PARKER HANNIFIN CORPORATION	9	8	17

Customer Bill Name	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	Grand Total
PARKWAY 214 N TRYON LLC	1		1
PARKWAY 550 SOUTH CALDWELL LLC	1		1
PARSONS INC	2	2	4
PARTON LUMBER CO	6	8	14
PBM GRAPHICS INC	2	2	4
PEPSI BOTTLING VENTURES, LLC	3	3	6
PERFORMANCE FIBERS OPERATIONS INC	5	5	10
PERMA TECH INC	1	1	2
PET DAIRY	4	4	8
PFRS SOUTH TRYON CORP	1		1
PHARR YARNS, LLC	5	5	10
PINE HALL BRICK COMPANY, INC	2	2	4
PINE NEEDLE LNG COMPANY	1	1	2
PITTSBURGH GLASS WORKS LLC	1	1	2
PLANTATION PIPE LINE	3	3	6
PLYCEM USA, INC	1	1	2
POLK COUNTY SCHOOLS	7	7	14
POLYMER GROUP, INC	1	1	2
PPG INDUSTRIES FIBER GLASS PRODUCTS, INC	3	4	7
PPG INDUSTRIES INC	2	2	4
PRECOR MANUFACTURING LLC	1	1	2
PRESBYTERIAN HOSPITAL	5	7	12
PRINTPACK INC	1	1	2
PRO LINE PRINTING	5	5	10
PROCTER & GAMBLE MANUFACTURING COMPANY	8	7	15
QUALICAPS INC	3	3	6
R F MICRO DEVICES	3	3	6
RALPH LAUREN CORPORATION	3		3
RD AMERICA LLC	1	1	2
REGAL CINEMAS INC	5	5	10
RITE AID CORPORATION	3	3	6
RITZ CARLTON CHARLOTTE		1	1
RJ REYNOLDS TOBACCO CO	5	4	9
ROCKINGHAM COMM COLLEGE	1		1
ROCK-TENN CONVERTING CO	1	1	2
ROCK-TENN CONVERTING CO.	9	6	15
ROUNDPOINT FINANCIAL GROUP	1		1
ROWAN SALISBURY SCHOOLS	5	2	7
RUTHERFORD COUNTY SCHOOLS	4	4	8
RUTHERFORD HOSPITAL INC	6	6	12
SALISBURY MACHINERY	1	1	2
SAMS EAST INC	10	10	20
SANS TECHNICAL FIBERS, LLC	3	3	6
SAPA BURLINGTON LLC	3		3
SCHAEFER SYSTEMS	8		8
SCHNEIDER MILLS, INC	1	1	2
SCM METAL PRODUCTS INC	3	3	6
SEALED AIR CORPORATION	3	3	6
SECURITY NATIONAL PROPERTIES HOLDINGS LLC	16		16
SELEE CORP	2	2	4
SENTINEL NC-1,LLC	3	3	6
SGL CARBON, LLC	1	1	2
SHAMROCK CORPORATION	9		9
SHAW INDUSTRIES GROUP, INC	6	6	12
SHERATON IMPERIAL	3	3	6
SHUFORD YARNS,LLC	1		1
SHURTAPE TECHNOLOGIES	1		1
SIERRA NEVADA BREWING CO	1	1	2
SKF SEALING SOLUTIONS	1	1	2
SNIDER TIRE,INC	2	2	4
SONOCO CORRIFLEX DISPLAY & PACKAGING,LLC	3	3	6
SONOCO CRELLIN INC	2	2	4
SONOCO PRODUCTS	1	1	2
SOUTH GRANVILLE WATER AND SEWER AUTHORITY	3	3	6
SOUTHERN METALS CO	7	7	14
SOUTHFORK INDUSTRIES	2	2	4
SOUTHWESTERN COMMUNITY COLLEGE	12	12	24
STAMPSOURCE	1	1	2
STAR PAPER TUBE INC	2		2
STEFANO FOODS	3	3	6
STEWART SUPERABSORBENTS, LLC	1	1	2
STIEFEL LABORATORIES INC	2	2	4
STOCKHAUSEN INC	2	2	4
STONEFIELD CELLARS WINERY LLC	1	1	2
STONEVILLE LUMBER CO	1	1	2
SUMITOMO ELECTRIC ESC, INC		1	1
SUMITOMO ELECTRIC LIGHTWAVE CORPORATION	4	4	8
SUNSET HILL INVESTMENTS LLC	1	1	2

Customer Bill Name	DSM YR14 (1/1/14-12/31/14) RIDER OPT-OUT	EE YR14 (01/01/14-12/31/14) RIDER OPT-OUT	Grand Total
SWAIN COUNTY SCHOOLS	6		6
SYMCOR INC	1	1	2
SYNGENTA BIOTECHNOLOGY INC	2	1	3
SYNTHETICS FINISHING	9	9	18
T5@KINGS MOUNTAIN II, LLC	1		1
TARGET STORES	23	23	46
TEAM INDUSTRIES	1	1	2
TECHNIBILT LTD	3	3	6
TECHNIMARK INC	11	10	21
TERRA-MULCH PRODUCTS, LLC		3	3
THE CYPRESS OF CHARLOTTE CLUB, INC	11	11	22
THE DAVID H MURDOCK CORE LABORATORY BUILDING OWNERS ASSOCIATION, INC.	1	1	2
THE GC NET LEASE (CHARLOTTE) INVESTORS LLC	1	1	2
THE LINCOLN NATIONAL LIFE INSURANCE COMPANY	1		1
THE NC A&T UNIVERSITY	1	1	2
THE NC AT UNIVERSITY A&T FOUNDATION LLC	1	1	2
THE NC OFFICE OF INFORMATION TECHNOLOGY SERVICES	3	3	6
THE TIMKEN COMPANY	3	3	6
THOMAS BUILT BUSES	4	4	8
TIME WARNER CABLE, INC	2	2	4
TIME WARNER CABLE, INC.	1	1	2
TIME-WARNER	11	11	22
TIMKENSTEEL CORPORATION	1	1	2
TOWN OF MOORESVILLE		1	1
TOWN OF VALDESE	3	3	6
TRANSCONTINENTAL GAS	2	3	5
TRANSYLVANIA COMMUNITY HOSPITAL	1		1
TRANSYLVANIA COUNTY SCHOOLS	11	11	22
TRELLEBORG COATED SYSTEMS US, INC	1	1	2
TRIAD WINDOW DES & I	1	1	2
TRIBAL CASINO GAMING ENTERPRISES HARRAH'S CASINO & HOTEL		1	1
TROPICAL NUT & FRUIT CO	1	1	2
TYCO ELECTRONICS CORPORATION	18	17	35
UNC - CHAPEL HILL	24	24	48
UNC GREENSBORO	21	20	41
UNCC	18	16	34
UNIFI INC	1	1	2
UNIFI MANUFACTURING, INC	3	4	7
UNILIN FLOORING NC LLC	4	3	7
UNITED PARCEL SERV	2	1	3
UNITED STATES COLD STORAGE	1	1	2
UNIVERSAL FOREST PRODUCTS	2	2	4
UPM - RAFLATAC, INC	1	1	2
US AIRWAYS, INC.	4		4
US COTTON LLC	1	1	2
US FOODS, INC	1	1	2
VALASSIS COMMUNICATIONS	1	1	2
VALDESE WEAVERS	7	3	10
VALSPAR CORP	3	3	6
VANGUARD FURNITURE INC	8	8	16
VERIZON WIRELESS	5	5	10
VICTORY INDUSTRIAL PARK, LLC	10	10	20
VULCAN CONSTRUCTION MATERIALS, L P	50	50	100
W S FORSYTH COUNTY SCHOOLS	90	90	180
WAKE FOREST UNIVERSITY	4	3	7
WAKE FOREST UNIVERSITY HEALTH SCIENCES	12	12	24
WAL-MART STORES EAST,LP	62	62	124
WATTS REGULATOR COMPANY	7	7	14
WAYNE FARMS LLC	10	10	20
WBTV LLC	2	2	4
WELLS FARGO BANK NA	7	1	8
WESTERN CAROLINA UNIVERSITY	1	1	2
WEYERHAEUSER COMPANY	1		1
WF PROPERTY OWNER LP	1		1
WIELAND COPPER PRODUCTS LLC	1	1	2
WINDWARD PRINT STAR INC	1	1	2
WINGATE UNIVERSITY	20	20	40
WINSTON TOWER MAIN LLC	1	1	2
ZINK IMAGING INC	1	1	2
Total	3,432	2,799	6,231

Duke Energy Carolinas, LLC
List of Industrial and Commercial Customers that have opted-out Vintage 2015
Docket Number E-7, Sub 1105

Customer Bill Name	Number of Accounts		Grand Total
	DSM YR15 (1/1/15-12/31/15) RIDER OPT-OUT	EE YR15 (01/01/15-12/31/15) RIDER OPT-OUT	
DSM YR 2015 RIDER OPT-OUT	3,436		
EE YR 2015 RIDER OPT-OUT		2,727	
1520 SOUTH BOULEVARD LLC	1	1	2
200 NORTH COLLEGE CHARLOTTE LLC	1		1
301 S MCDOWELL STREET HOLDING LLC	1		1
A & T STATE UNIV	14	11	25
A G INDUSTRIES INC	1	1	2
A W NORTH CAROLINA INC	6	6	12
ABCO AUTOMATION INC	1	1	2
ABERCROMBIE TEXTILES LLC		2	2
ABSS FACILITIES DEPT	7	7	14
ADVANCED MACHINE & FABRICATION, INC.	2	2	4
ADVANCED TECHNOLOGY	2	1	3
AFFILIATED COMPUTER SERVICE	3	3	6
AIR PRODUCTS & CHEMICALS, INC	3	3	6
ALADDIN MANUFACTURING CORPORATION	2	2	4
ALCAN PACKAGING FOOD AND TOBACCO, INC	2	2	4
ALDERSGATE	3	3	6
ALEXANDER COUNTY SCHOOLS	2	2	4
ALEXANDER FABRICS, INC	2	2	4
ALLIED DIE CASTING CO OF NC	2	2	4
ALLSTATE INSURANCE	1	1	2
ALLVAC, A DIVISION OF TDY INDUSTRIES, INC	1	1	2
AMERICAN & EFIRD LLC	7	9	16
AMERICAN CAMPUS LLC	1		1
AMERICAN CONVERTING, CO. LTD	2	2	4
AMERICAN EXPRESS TRAVEL RELATED SERVICES COMPANY, INC		1	1
AMERICAN FIBER & FINISHING	1	1	2
AMERICAN TOBACCO POWER HOUSE LLC	2		2
AMERICAN YARNS LLC	3	3	6
ANDALE INC	3	3	6
APPLE INC	1		1
AQUA PLASTICS INC	2	2	4
ARARAT ROCK PRODUCTS	1	1	2
ARMACELL LLC	8	6	14
ASHLEY FURNITURE	6	6	12
AT&T BELLSOUTH	3	3	6
AT&T MOBILITY LLC	1		1
AT&T WIRELESS SERVICE		1	1
BAKER FURNITURE COMPANY	9	9	18
BAKERY FEEDS INC	2	2	4
BALDOR ELECTRIC COMPANY	5	5	10
BALLANTYNE RESORT, LLC	1		1
BANK NOTE CORP	3	3	6
BANK OF AMERICA	6	3	9
BARNHARDT MANUFACTURING COMPANY INC	4		4
BASF CORPORATION	4	4	8
BAY STATE MILLING	4	4	8
BB&T	7	6	13
BELL SOUTH MOBILITY	1	1	2
BELLSOUTH	7	5	12
BELLSOUTH BSC	8	7	15
BELLSOUTH COMMUNICATIONS, LLC	1		1
BEMIS MANUFACTURING CO	4	4	8
BENJAMIN COOPER		1	1
BERNHARDT FURNITURE COMPANY	4		4
BERRY TRI PLASTICS		1	1
BESTCO	4	4	8
BESTREADS INC	2	2	4
BEVERLY KNITS INC	5	5	10
BIC CORPORATION	1	1	2
BI-LO, LLC	21	23	44
BIOMERIEUX, INC	3	1	4
BISSELL BETSILL, LLC	1		1
BISSELL CO	4		4
BISSELL COMPANIES	68		68
BISSELL DEVELOPMENT	1		1
BISSELL GOLF	1		1
BISSELL HOTEL 6 LLC	1		1
BISSELL HOTELS #7, LLC	1		1
BISSELL HOTELS 5 LLC	1		1
BISSELL HOTELS 8, LLC	1		1
BJ'S WHOLESALE CLUB	2	2	4
BLACKWELL STREET MANAGMENT COMPANY, LLC	3		3
BLUE RIDGE COMMUNITY COLLEGE	17	15	32
BLUE RIDGE HEALTH CARE	1		1
BONSET AMERICA CORP	1	1	2
BOXBOARD PROD INC	1		1
BOYLE BUILDING, LLC	1		1
BOYLE BUILDING, LLC	1		1
BRASS CRAFT MFG CO		1	1
BRAXTONS SAWMILL	1	1	2
BRAXTONS SAWMILL, INC	2		2
BREVARD COLLEGE	19	19	38
BRIGHT ENTERPRISES INC	2	1	3
BSN MEDICAL INC	2	2	4
BURLINGTON TECHNOLOGIES INC		1	1
CABARRUS COUNTY SCHOOLS	58	56	114
CALICO TECHNOLOGIES INC	3	3	6
CAMBRIDGE CC HOLDING COMPANY LLC	1		1
CAMFIL USA INC	2	2	4
CAPITAL BROADCASTING COMPANY	8		8
CARAUSTAR INC	4	2	6
CARAUSTAR INDUSTRIES	3	2	5
CARDINAL FLOAT GLASS	1	1	2
CARGILL, INCORPORATED	4	4	8
CARLISLE FOOD SERVIC	1	1	2
CAROLINA BEVERAGE GROUP, LLC	3	3	6
CAROLINA CONTAINER	4	4	8
CAROLINA PERLITE CO	1	1	2
CAROLINA TRACTOR & EQUIPMENT COMPANY	5	5	10
CAROLINA VILLAGE	4	4	8
CAROLINA YARN	2	2	4
CAROLINAS HEALTHCARE SYSTEM	16	3	19
CASE FARMS	3	3	6
CASTLE & COOKE NORTH CAROLINA LLC	4	4	8

OFFICIAL COPY

Mar 09 2016

Customer Bill Name	DSM YR15 (1/1/15-12/31/15) RIDER OPT-OUT	EE YR15 (01/01/15-12/31/15) RIDER OPT-OUT	Grand Total
CATAWBA COLLEGE	1		1
CATAWBA VALLEY MEDICAL CENTER	1	1	2
CATERPILLAR	2	2	4
CBL ASSOCIATES MANAGEMENT, INC	1	1	2
CEDAR FAIR SOUTHWEST, INC	3	3	6
CELGARD, LLC	8	8	16
CENTURION MOREHEAD LLC	1		1
CENTURY FURNITURE, LLC	7	13	20
CERTAINTED CORP	1	3	4
CHAPEL HILL/ CARRBORO SCHO	59		59
CHARLOTTE COUNTRY DAY SCHOOL	12		12
CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT	1		1
CHARLOTTE LATIN SCHOOLS, INC	1	1	2
CHARLOTTE OBSERVER PUBLISHING COMPANY	2	2	4
CHARLOTTE PIPE & FOUNDRY	16	16	32
CHEMTURA CORPORATION	1	1	2
CHEROKEE BOYS CLUB	3	3	6
CHEROKEE INDIAN HOSPITAL	1	1	2
CHESAPEAKE TREATMENT COMPANY, LLC	1	1	2
CHILDRENS HOME INC	2	2	4
CIM URBAN REIT PROPERTIES VIII LP	1		1
CINEBARRE, LLC	2	2	4
CISCO SYSTEMS INC	1		1
CITY OF ASHEVILLE	1	2	3
CITY OF BURLINGTON	71	30	101
CITY OF CHARLOTTE	4	4	8
CITY OF DURHAM	24	23	47
CITY OF GREENSBORO	4	4	8
CITY OF HENDERSONVILLE	1	4	5
CITY OF HICKORY		1	1
CITY OF KANNAPOLIS	19	23	42
CITY OF WINSTON SALEM	1		1
CK THREE TOWER CENTER,LLC	1	1	2
CLAPPS NURSING HOME CENTER	11	11	22
CLARIANT CORPORATION	4	4	8
CLEARWATER PAPER CORPORATION	5	3	8
CLEMENT PAPPAS NC, INC	7		7
CLEVELAND COUNTY SCHOOLS	5	5	10
CLONDALKIN PHARMA & HEALTHCARE, INC	157		157
CMBE	7		7
CMC-NORTHEAST INC	1		1
CMHA	2	2	4
COATS AMERICAN		5	5
COCA COLA BOTTLING CO CON	3	3	6
COLE CREDIT INCOME OPERATING PARTNERSHIP LP		5	5
COLONIAL PIPELINE	8	8	16
COLUMBIA PLYWOOD CORPORATION	2	2	4
COMMONWEALTH BRANDS	8	8	16
COMMSCOPE, INC.	1	1	2
CONOVER LUMBER CO		1	1
CONSOLIDATED METCO INC	2	2	4
CONTINENTAL AUTOMOTIVE SYSTEMS, INC		2	2
COPLAND FABRICS INC	1	1	2
CORMETECH INC	5	4	9
CORNING CABLE SYSTEMS	4	4	8
CORNING INC	5	5	10
COSTCO WHOLESALE INC	45	32	77
CPCC	13	14	27
CREE INC	1	1	2
CSHV SOUTHPARK 6100 FAIRVIEW, LLC	2	2	4
CULP INC	1	1	2
CV COLISEUM HOLDING LLC	6	5	11
DAIMLER TRUCKS NORTH AMERICA, LLC	3	3	6
DAIRY FRESH	2	2	4
DALCO NONWOVENS, LLC	15	15	30
DAVIDSON COLLEGE	3	3	6
DAVIDSON COUNTY COMMUNITY COLLEGE	2	2	4
DELTA APPAREL, INCORPORATED	1		1
DIAMOND VIEW I LLC	1	1	2
DIAMOND VIEW II	1	1	2
DISCOVERY PLACE INC	1	1	2
DISNEY WORLDWIDE SERVICES INC	2	2	4
DIVERSE LABEL PRINTING LLC	13	13	26
DOOSAN INFRACORE PORTABLE POWER - A DIVISION OF CLARKE EQUIPMENT	2	2	4
DUKE UNIVERSITY	1	1	2
DURHAM COUNTY GOVERNMENT	1	1	2
DURHAM COUNTY HOSPITAL CORPORATION	1	1	2
DYNAYARN USA, L.L.C.	1	1	2
E I DUPONT CO	1	1	2
E J VICTOR INC	1	1	2
EAST COAST LUMBER CO	1	1	2
EAST DECK INC	1		1
EASTERN BAND OF CHEROKEE INDIANS	6	6	12
ECMD INC	4	4	8
EISAI INC	1	1	2
ELASTIC FABRICS OF AMERICA	2	2	4
ELASTRIX LLC	2	2	4
ELON UNIVERSITY	69	69	138
EMC CORPORATION	2	2	4
ENGINEERED CONTROLS INTERNATIONAL INC	4	4	8
ESSENTRA PACKAGING US, INC		4	4
ETHAN ALLEN	2		2
EVONIK STOCKHAUSEN,INC	3	3	6
FAIRYSTONE FABRICS	4	4	8
FERGUSON SUPPLY & BOX	1	1	2
FIBER & YARN PRODUCTS, INC	1	1	2
FILTRONA GREENSBORO, INC	4	4	8
FIRESTONE FIBERS & TEXTILES COMPANY, LLC	2		2
FIRST STATES INVESTORS 104.LLC	5		5
FLEXTRONICS AMERICA, LLC	3	3	6
FLINT TRADING CO	2	2	4
FMC-LITHIUM CORP	5	4	9
FOCKE & CO, INC	1	1	2
FOOD LION	225	186	411
FORESTVIEW HIGH SCHOOL PTA	1		1
FREIGHTLINER OF CLEVELAND, LLC	1		1
FREUDENBERG IT LP*	4	4	8
FREUDENBERG NONWOVEN	1	1	2
FRITO-LAY, INC	1	1	2
FRONTIER SPINNING MILLS, INC		2	2
FURNITURELAND SOUTH	8		8
G & I V RESOURCE SQUARE 5 LP		1	1
GALENOR DESIGNS, LLC	1	1	2

OFFICIAL COPY

Mar 09 2016

Customer Bill Name	DSM YR15 (1/1/15-12/31/15) RIDER OPT-OUT	EE YR15 (01/01/15-12/31/15) RIDER OPT-OUT	Grand Total
GARDNER WEBB UNIV		1	1
GASTON CO SCHOOLS	38		38
GASTON COLLEGE	7	6	13
GBORO NEWS & RECORD	2	2	4
GE LIGHTING SOLUTIONS LLC	6	6	12
GENERAL ELECTRIC	2	2	4
GENPAK LLC	3	3	6
GENUINE PARTS COMPANY	2	2	4
GERDAU AMERISTEEL US INC	2	2	4
GILDAN ACTIVE WEAR INC	3		3
GILDAN YARNS, LLC		2	2
GLAXOSMITHKLINE LLC	7	7	14
GLEN HIGH SCHOOL	1	1	2
GLEN RAVEN INC	2	2	4
GOLF CLUB AT BALLANTYNE RESORT	2		2
GRAY MANUFACTURING TECHNOLOGIES LLC	2	2	4
GRIFFIN INDUSTRIES	2	2	4
GUILFORD COLLEGE*	44	42	86
GUILFORD COUNTY SCHOOLS*	225	170	395
GUILFORD TECH COMM COLL	18	18	36
HALYARD NORTH CAROLINA, INC		1	1
HAN FENG INC		1	1
HANES COMPANIES INC	1	1	2
HANSON BRICK EAST LLC	3	3	6
HARRIS TEETER INC	69	69	138
HB BISSELL	1		1
HENDERSON COUNTY GOVERNMENT	3	2	5
HENDERSON COUNTY SCHOOLS	14	15	29
HENDERSONVILLE HEALTH & REHAB	1	1	2
HENKEL CORPORATION	6	6	12
HERBALIFE INTERNATIONAL OF AMERICA INC	1	1	2
HERITAGE HOME GROUP LLC	3	5	8
HICKORY CITY SCHOOLS	13	13	26
HICKORY READY MIXED	2	2	4
HICKORY SPRINGS MANUFACTURING COMPANY	24	29	53
HIGHWOODS PROPERTIES	55	55	110
HIGHWOODS REALTY LIMITED PARTNERSHIP	1	1	2
HIGHWOODS REALTY LTP	1	1	2
HINES GLOBAL REIT HOCK PLAZA I LLC	1	1	2
HINES INTEREST LIMITED PARTNERSHIP	2		2
HITACHI METALS NC LTD	1	1	2
HONDA POWER EQUIPMENT	1	1	2
HORSEHEAD CORPORATION	1	1	2
HUNTSMAN INTERNATIONAL LLC	2	2	4
IBM CORPORATION	1	1	2
IGM RESINS USA INC		1	1
INCHEM CORPORATION	2	2	4
INDUSTRIAL TIMBER &	2		2
INDUSTRIAL WOOD PROD	3	3	6
INDUSTRIAL WOOD PRODUCTS	3	3	6
INFO-GEL, LLC	3	3	6
ING CLARION REALTY SERVICES LLC	3		3
INGLES MARKETS, INC.	45	44	89
INGREDION INCORPORATED	1	1	2
INTERNATIONAL PAPER	7	6	13
INTERNATIONAL TEXTILE GROUP INC	1	2	3
IPEX USA, INC	3	1	4
IQE INC	2	1	3
ISOTHERMAL COMM COLLEGE	5	5	10
ITG BRANDS LLC	2	2	4
J E HERNDON CO	1		1
JACKSON BOE	8	8	16
JACKSON PAPER MFG CO	1	1	2
JAMES M PLEASANTS CO	1	1	2
JDL CASTLE CORP	1	1	2
JOHNSON CONTROLS BATTERY GROUP, INC	1		1
JOHNSON CONTROLS INC	2		2
JOHNSTON PROP INC	1	2	3
JOWAT CORP	5	5	10
JOWAT CORPORATION	2	2	4
JOWAT INC	1	1	2
JPS COMPOSITE MATERIALS CORP		1	1
KAYSER ROTH CORPORATION	1	2	3
KEATING GRAYVURE USA, LLC	1	1	2
KEN SMITH YARN CO	1	1	2
KENDRION-SHELBY	2	2	4
KERRS HMR CONCRETE	1	1	2
KIMBERLY CLARK	5	4	9
KINCAID FURNITURE	14	14	28
KINDER MORGAN SOUTHEAST TERMINAL	3	3	6
KINDER MORGAN TRANSMIX GROUP	1	1	2
KOHLER COMPANY	1	1	2
KOOPMAN DAIRIES INC	2	2	4
KOURY CORPORATION	54	52	106
KOURY VENTURES	6	6	12
KROGER CO	5	5	10
KROGER LIMITED PARTNERSHIP I	1	1	2
KSM CASTINGS NC INC	1		1
KYOCERA INDUSTRIAL	2	2	4
L B PLASTICS INC	6	6	12
L S STARRETT CO	1	2	3
LENOVO INC	1	1	2
LEXINGTON FURNITURE IND		1	1
LIGGETT GROUP INC	1		1
LINCOLN HARRIS	1	1	2
LINDE LLC	1	1	2
LORILLARD CORP	1	1	2
LORILLARD TOBACCO CO	1	1	2
LOUISIANA-PACIFIC CORPORATION	1	1	2
LOWE'S FOODS	40	34	74
LOWE'S HOME CENTERS, INC	90	87	177
LOWE'S OF FRANKLIN #717	2	2	4
LOWE'S OF FRANKLIN #717	1	1	2
LYDALL THERMAL ACOUSTICAL INC	4	1	5
MAGNOLIA CASTLE LLC	1	1	2
MANNINGTON WOOD FLOORS	1		1
MANUAL WOODWORKERS & WEAVERS INC	2	2	4
MARTIN MARIETTA MATERIALS INC	72	74	146
MARVES INDUSTRIES, LLC	1	1	2
MAUSER CORP		4	4
MCCREARY MODERN INC	8	8	16
MCDOWELL HOSPITAL INC	1		1
MMICHAEL MILLS INC	6	6	12

OFFICIAL COPY

Mar 09 2016

Customer Bill Name	DSM YR15 (1/1/15-12/31/15) RIDER OPT-OUT	EE YR15 (01/01/15-12/31/15) RIDER OPT-OUT	Grand Total
MEADOWS & OHLY 4 LLC	5	5	10
MECK CNTY JAIL CENTRAL	1	1	2
MECKLENBURG COUNTY	15	1	16
MEDIA GENERAL OPERATIONS INC	1	1	2
MERCK SHARP & DOHME CORP	3	3	6
MEREDITH WEBB PRINT	3	3	6
MERITOR HEAVY VEHICLE SYSTEMS	1	1	2
MERITOR HEAVY VEHICLE SYSTEMS LLC	1	1	2
METROMONT CORPORATION	2	2	4
MICHELIN AIRCRAFT TIRE CO	1	1	2
MICHELIN NORTH AMERICA	10	10	20
MILES TALBOTT	2	2	4
MILLERCOORS LLC	1	1	2
MILLIKEN & COMPANY	2	2	4
MINT MUSEUM OF CRAFT & DESIGN	1	1	2
MODERN DENSIFYING		2	2
MOHICAN MILLS	4	4	8
MOM BRANDS COMPANY	1		1
MOORE WALLACE NORTH AMERICA INC	1	1	2
MORTON CUSTOM PLASTICS, LLC	2	2	4
MOUNT VERNON MILLS INC	1	1	2
NATIONAL PIPE & PLASTICS	2	2	4
NC BAPTIST HOSPITAL	10	10	20
NC BLUMENTHAL PAC	1	1	2
NC CENTER FOR PUBLIC TV	2	1	3
NC OWNER LLC	14		14
NCFLA II OWNER LLC	3		3
NETAPP, INC	2	1	3
NEW EXCELSIOR, INC		1	1
NEW GENERATION YARNS		1	1
NEW SOUTH LUMBER COMPANY INC	3	3	6
NGK CERAMICS USA	2	2	4
NORDSTROM INC	2	1	3
NORFOLK SOUTHERN	2	2	4
NORTEL NETWORKS	12	12	24
NORTHROP GRUMMAN GUIDANCE & ELECTRONICS COMPANY, INC	2	2	4
NOVANT HEALTH INC	10	8	18
OAK FOREST HEALTH AND REHABILITATION CO	1	1	2
O'MARA, INC.	1	1	2
OMNISOURCE SOUTHEAST	5	10	15
ONEAL STEEL INC	4	4	8
OPTICAL EXPERTS MANUFACTURING	1	1	2
ORACLE FLEXIBLE PACKAGING	5	4	9
OWENS ILLINOIS, INC	2	2	4
PACTIV LLC		3	3
PAPER STOCK DEALERS	1	1	2
PARDEE MEMORIAL HOSPITAL	14	14	28
PARK RIDGE HOSPITAL	8	9	17
PARKDALE AMERICA LLC	10	10	20
PARKDALE MILLS, INC	2	3	5
PARKER HANNIFIN CORPORATION	9	3	12
PARKWAY 214 N TRYON LLC	1		1
PARKWAY 550 SOUTH CALDWELL LLC	1		1
PARSONS INC	2	2	4
PARTON LUMBER CO	6	8	14
PBM GRAPHICS INC	2	2	4
PEPSI BOTTLING VENTURES, LLC	3	3	6
PERFORMANCE FIBERS OPERATIONS INC	5	5	10
PERMA TECH INC	1	1	2
PET DAIRY	4	4	8
PFRS SOUTH TRYON CORP	1		1
PHARR YARNS, LLC	5	5	10
PINE HALL BRICK COMPANY, INC	2	2	4
PINE NEEDLE LNG COMPANY	1	1	2
PITTSBURGH GLASS WORKS LLC	1	1	2
PLANTATION PIPE LINE	3	3	6
PLYCEM USA, INC	1	1	2
POLK COUNTY SCHOOLS	7	7	14
POLYMER GROUP, INC	1	1	2
PPG INDUSTRIES FIBER GLASS PRODUCTS, INC	3	4	7
PPG INDUSTRIES INC	2	2	4
PRECOR MANUFACTURING LLC	1	1	2
PRESBYTERIAN HOSPITAL	5	7	12
PRINTPACK INC	1	1	2
PRO LINE PRINTING	5	5	10
PROCTER & GAMBLE MANUFACTURING COMPANY	8	1	9
QUALICAPS INC	3	3	6
R F MICRO DEVICES	3	3	6
RALPH LAUREN CORPORATION	3		3
RD AMERICA LLC	1	1	2
REGAL CINEMAS INC	5	5	10
RITE AID CORPORATION	3	3	6
RITZ CARLTON CHARLOTTE		1	1
RJ REYNOLDS TOBACCO CO	5	4	9
ROCKINGHAM COMM COLLEGE	1		1
ROCK-TENN CONVERTING CO	1	1	2
ROCK-TENN CONVERTING CO.	9	9	18
ROUNDPOINT FINANCIAL GROUP	1		1
ROWAN SALISBURY SCHOOLS	5	1	6
RUTHERFORD COUNTY SCHOOLS	4	3	7
RUTHERFORD HOSPITAL INC	6	6	12
SALISBURY MACHINERY	1	1	2
SAMS EAST INC	10	10	20
SANS TECHNICAL FIBERS, LLC	3	1	4
SAPA BURLINGTON LLC	3		3
SCHAEFER SYSTEMS	8		8
SCHNEIDER MILLS, INC	1	1	2
SCM METAL PRODUCTS INC	3	3	6
SEALED AIR CORPORATION	3	3	6
SECURITY NATIONAL PROPERTIES HOLDINGS LLC	16		16
SELEE CORP	2	2	4
SENTINEL NC-1,LLC	3	3	6
SGL CARBON, LLC	1	1	2
SHAMROCK CORPORATION	9		9
SHAW INDUSTRIES GROUP, INC	6	6	12
SHERATON IMPERIAL	3	3	6
SHUFORD YARNS,LLC	1		1
SHURTAPE TECHNOLOGIES	2		2
SIERRA NEVADA BREWING CO	1	1	2
SKF SEALING SOLUTIONS	1	1	2
SNIDER TIRE,INC	2	2	4
SONOCO CORRIFLEX DISPLAY & PACKAGING,LLC	3	3	6
SONOCO CRELLIN INC	2	2	4

OFFICIAL COPY

Mar 09 2016

Customer Bill Name	DSM YR15 (1/1/15-12/31/15) RIDER OPT-OUT	EE YR15 (01/01/15-12/31/15) RIDER OPT-OUT	Grand Total
SONOCO PRODUCTS	1	1	2
SOUTH GRANVILLE WATER AND SEWER AUTHORITY	3	3	6
SOUTHERN METALS CO	7	3	10
SOUTHFORK INDUSTRIES	2	2	4
SOUTHWESTERN COMMUNITY COLLEGE	12	12	24
STAMPSOURCE	1	1	2
STAR PAPER TUBE INC	2		2
STEFANO FOODS	3	3	6
STEWART SUPERABSORBENTS, LLC	1	1	2
STIEFEL LABORATORIES INC	2	2	4
STOCKHAUSEN INC	2	2	4
STONEFIELD CELLARS WINERY LLC	1	1	2
STONEVILLE LUMBER CO	1	1	2
SUMITOMO ELECTRIC ESC, INC		1	1
SUMITOMO ELECTRIC LIGHTWAVE CORPORATION	4	4	8
SUNSET HILL INVESTMENTS LLC	1	1	2
SWAIN COUNTY SCHOOLS	6		6
SYMCOR INC	1	1	2
SYNGENTA BIOTECHNOLOGY INC	2	1	3
SYNTHETICS FINISHING	9	8	17
T5@KINGS MOUNTAIN II, LLC	1		1
TARGET STORES	23	23	46
TAYLOR KING FURNITUR	2	2	4
TEAM INDUSTRIES	1	1	2
TECHNIBILT LTD	3	3	6
TECHNIMARK INC	11	11	22
TERRA-MULCH PRODUCTS, LLC		3	3
THE CYPRESS OF CHARLOTTE CLUB, INC	11	11	22
THE DAVID H MURDOCK CORE LABORATORY BUILDING OWNERS ASSOCIATION, INC.	1	1	2
THE GC NET LEASE (CHARLOTTE) INVESTORS LLC	1	1	2
THE LINCOLN NATIONAL LIFE INSURANCE COMPANY	1		1
THE NC A&T UNIVERSITY	1	1	2
THE NC AT UNIVERSITY A&T FOUNDATION LLC	1		1
THE NC OFFICE OF INFORMATION TECHNOLOGY SERVICES	3	3	6
THE TIMKEN COMPANY	3	3	6
THOMAS BUILT BUSES	4	4	8
TIME WARNER CABLE, INC	2	2	4
TIME WARNER CABLE, INC.	1	1	2
TIME-WARNER	11	11	22
TIMKENSTEEL CORPORATION	1	1	2
TOWN OF VALDESE	3	3	6
TRANSCONTINENTAL GAS	2	3	5
TRANSYLVANIA COMMUNITY HOSPITAL	1		1
TRANSYLVANIA COUNTY SCHOOLS	11	11	22
TRELLEBORG COATED SYSTEMS US, INC	1	1	2
TRIAD WINDOW DES & I	1	1	2
TROPICAL NUT & FRUIT CO	1	1	2
TYCO ELECTRONICS CORPORATION	18	16	34
UNC - CHAPEL HILL	24	24	48
UNC GREENSBORO	21	21	42
UNCC	18	16	34
UNIFI INC	1	1	2
UNIFI MANUFACTURING, INC	3	5	8
UNILIN FLOORING NC LLC	4	4	8
UNITED PARCEL SERV	2	2	4
UNITED STATES COLD STORAGE	1	1	2
UNIVERSAL FOREST PRODUCTS	2	2	4
UPM - RAFLATAC, INC	1	1	2
US AIRWAYS, INC.	4		4
US COTTON LLC	1	1	2
US FOODS, INC	1	1	2
VALASSIS COMMUNICATIONS	1	1	2
VALDESE WEAVERS	7	7	14
VALSPAR CORP	3	3	6
VANGUARD FURNITURE INC	8	8	16
VERIZON WIRELESS	5	5	10
VICTORY INDUSTRIAL PARK, LLC	10	9	19
VULCAN CONSTRUCTION MATERIALS, L P*	50	49	99
W S FORSYTH COUNTY SCHOOLS	92	80	172
WAKE FOREST UNIVERSITY	4	3	7
WAKE FOREST UNIVERSITY HEALTH SCIENCES	12	12	24
WAL-MART STORES EAST,LP	62	62	124
WATTS REGULATOR COMPANY	7	7	14
WAYNE FARMS LLC	10	10	20
WBTV LLC	2	2	4
WELLS FARGO BANK NA	7		7
WESTERN CAROLINA UNIVERSITY	1		1
WEYERHAEUSER COMPANY	1		1
WF PROPERTY OWNER LP	1		1
WIELAND COPPER PRODUCTS LLC	1	1	2
WINDWARD PRINT STAR INC	1	1	2
WINGATE UNIVERSITY	20	20	40
WINSTON TOWER MAIN LLC	1	1	2
ZINK IMAGING INC	1		1
Total	3,436	2,727	6,163

*Freudenberg Performance Materials LP - Has opted-in 1 account to the Vintage 2016 EE Rider

*Guilford College - Has opted-in 6 accounts to the Vintage 2016 EE Rider

*Guilford County Schools - Has opted-in 7 accounts to the Vintage 2016 EE Rider

*Vulcan Construction Materials, L P - Has opted-in 3 accounts to the Vintage 2016 Rider

OFFICIAL COPY

Mar 09 2016

Duke Energy Carolinas, LLC
List of Customers that Opted-out and subsequently Opt-In
Docket Number E-7, Sub 1105

EE Programs	
Opted-Out of Vintage 2014 and not Vintage 2015	Number of Accounts
APPLE INC	1
BARNHARDT MANUFACTURING COMPANY INC	1
BI-LO, LLC	1
BLUE RIDGE COMMUNITY COLLEGE	2
BOXBOARD PROD INC	1
BRIGHT ENTERPRISES INC	1
CARAUSTAR INC	2
CHARLOTTE COUNTRY DAY SCHOOL	11
CLEMENT PAPPAS NC, INC	1
DRAKA COMTEQ, INC	1
ETHAN ALLEN	2
FIBER & YARN PRODUCTS, INC	1
FOOD LION	37
GUILFORD COLLEGE	1
GUILFORD COUNTY SCHOOLS	2
HENDERSON COUNTY GOVERNMENT	1
INGLES MARKETS, INC.	1
KIMBERLY CLARK	1
KOURY CORPORATION	2
KSM CASTINGS NC INC	1
LOWE'S HOME CENTERS, INC	3
LYDALL THERMAL ACOUSTICAL INC	3
MECKLENBURG COUNTY	1
NETAPP, INC	1
PARKER HANNIFIN CORPORATION	5
PROCTER & GAMBLE MANUFACTURING COMPANY	6
ROWAN SALISBURY SCHOOLS	1
RUTHERFORD COUNTY SCHOOLS	1
SANS TECHNICAL FIBERS, LLC	2
SOUTHERN METALS CO	4
SYNTHETICS FINISHING	1
TOWN OF MOORESVILLE	1
TRIBAL CASINO GAMING ENTERPRISES HARRAH'S CASINO & HOTEL	1
TYCO ELECTRONICS CORPORATION	1
VICTORY INDUSTRIAL PARK, LLC	1
VULCAN CONSTRUCTION MATERIALS, L P	1
W S FORSYTH COUNTY SCHOOLS	10
WELLS FARGO BANK NA	1
WESTERN CAROLINA UNIVERSITY	1
Total	116

DSM Programs	
Opted-Out of Vintage 2014 and not Vintage 2015	Number of Accounts
CERTAINTED CORP	2
FOOD LION	1
HENDERSON COUNTY SCHOOLS	1
LEXINGTON FURNITURE IND	1
PARK RIDGE HOSPITAL	1
Total	6

Duke Energy Carolinas, LLC
Share Savings Incentive Calculation
Docket Number E-7, Sub 1105
Estimate January 1, 2017 - December 31, 2017

		<u>System</u>
NPV of AC - Res EE ¹		\$ 85,215,902
NPV of AC - Non Res EE		164,583,408
NPV of AC - DSM		107,403,096
Total NPV of Avoided Costs	A	\$ 357,202,406
Program Costs - Res EE ¹		\$ 35,761,232
Program Costs - Non Res EE		53,170,885
Program Costs - DSM		31,544,171
Total Program Costs	B	\$ 120,476,288
Net Savings	C=A-B	\$ 236,726,118
Sharing Percentage	D	11.50%
Shared Savings - Res EE		\$ 5,687,287
Shared Savings - Non Res EE		12,812,440
Shared Savings - DSM		8,723,776
Total Shared Savings	E=(A-B)*D	\$ 27,223,504

1) Excludes AC and Program Costs associated with Income Qualified Energy Efficiency and Weatherization Assistance, which is deemed to be cost recovery only.

EMV Activities

Planned Evaluation, Measurement and Verification (EMV) Activities through the rate period (Dec. 31, 2016)

Evaluation is a term adopted by Duke Energy Carolinas (DEC), and refers generally to the systematic process of gathering information on program activities, quantifying energy and demand impacts, and reporting overall effectiveness of program efforts. Within evaluation, the activity of measurement and verification (M&V) refers to the collection and analysis of data at a participating facility/project. Together this is referred to as "EM&V."

Refer to the accompanying Evans Exhibit 12 chart for a schedule of process and impact evaluation analysis and reports that are currently scheduled.

Energy Efficiency Portfolio Evaluation

DEC has contracted with an independent, third-party evaluation consultant to provide the appropriate EM&V support, including the development and implementation of an evaluation plan designed to measure the energy and demand impacts of the residential and non-residential energy efficiency programs.

Typical EM&V activities:

- Develop evaluation action plan
- Process evaluation interviews
- Collect program data
- Verify measure installation and performance through surveys and/or on-site visits
- Program database review
- Impact data analysis
- Reporting

The process evaluation provides unbiased information on past program performance, current implementation strategies and opportunities for future improvements. Typically, the data collection for process evaluation consists of surveys with program management, implementation vendor(s), program partner(s), and participants; and, in some cases, non-participants. A statistically representative sample of participants will be selected for the analysis.

The impact evaluation provides energy and demand savings resulting from the program. Impact analysis may involve engineering analysis (formulas/algorithms), billing analysis, statistically adjusted engineering method, and/or building simulation models, depending on the program and the nature of the impacts. Data collection may involve surveys and/or site visits. A statistically representative sample of participants is selected for the analysis. Duke Energy Carolinas intends to follow industry-accepted methodologies for all measurement and

verification activities, consistent with International Performance Measurement Verification Protocol (IPMVP) Options A, C or D depending on the measure.

The field of evaluation is constantly learning from ongoing data collection and analysis, and best practices for evaluation, measurement and verification continually evolve. As updated best practices are identified in the industry, DEC will consider these and revise evaluation plans as appropriate to provide accurate and cost-effective evaluation.

Demand Response Program Evaluation

DEC has contracted with an independent, third-party evaluation consultant to provide an independent review of the evaluation plan designed to measure the demand impacts of the residential and non-residential demand response programs and the final results of that evaluation.

Typical EM&V activities:

- Collect program data
- Process evaluation interviews
- Verify operability and performance through on-site visits
- Collect interval data
- Program database review
- Benchmarking research
- Dispatch optimization modeling
- Impact data analysis
- Reporting

The process evaluation provides unbiased information on past program performance, current implementation strategies and opportunities for future improvements. Typically, the data collection for process evaluation consists of surveys with program management, implementation vendor(s), program partner(s), and participants; and, in some cases, non-participants. A statistically representative sample of participants will be selected for the analysis.

The impact evaluation provides demand savings resulting from the program. Impact analysis for Power Manager involves a simulation model to calculate the duty cycle reduction, and then an overall load reduction. Impact analysis for PowerShare involves statistical modeling of an M&V baseline load shape for a customer, then modeling the event period baseline load shape and comparing to the actual load curve of the customer during the event period.

The field of evaluation is constantly learning from ongoing data collection and analysis, and best practices for evaluation, measurement and verification continually evolve. As updated best practices are identified in the industry, DEC will consider these and revise evaluation plans as appropriate to provide accurate and cost-effective evaluation.

EM&V EFFECTIVE DATE TIMELINE

This chart contains the expected timeline with end of customer data sample period for impact evaluation and when the impact evaluation report is expected to be completed.
Unless otherwise noted, original impact estimates are replaced with the first impact evaluation results, after which time subsequent impact evaluation results are applied prospectively.

Program	Program/Measure	2014				2015			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Appliance Recycling	Refrigerator, Freezer	1st EM&V	Report					2nd EM&V	Report
Energy Efficiency Education (K12 Curriculum)	Energy Efficiency Education (K12 Curriculum)							3rd EM&V	Report
Energy Efficient Appliance and Devices	Lighting - Smart Saver RCFL							3rd EM&V	Report
	Lighting - Specialty Bulbs			1st EM&V	Report				
	SF Water EE Products							1st EM&V	Report
	HP Water Heater & Pool Pumps								
HVAC Energy Efficiency	Residential Smart Saver AC and HP								
Income-Qualified Energy Efficiency	Tune & Seal Measures			1st EM&V	Report				
	Weatherization								
	Refrigerator Replacement								
Multi-Family Energy Efficiency	Low Income Neighborhood			1st EM&V	Report				
	MF Water EE Products							1st EM&V	Report
My Home Energy Report	Lighting (CFL Property Manager)								
Residential Energy Assessments	MyHER	Report							
Non-Residential Smart Saver Energy Efficiency Custom	Home Energy House Call								
Non-Residential Smart Saver Energy Efficiency Food Service	Non-Res SmartSaver Custom Rebate								
Non-Residential Smart Saver Energy Efficiency HVAC Products	Non-Res Smart Saver Energy Efficiency Food Service								2nd EM&V
Non-Residential Smart Saver Energy Efficiency Lighting	Non-Res Smart Saver Energy Efficiency HVAC Products								2nd EM&V
	Non-Res Smart Saver Prescriptive Lighting								
Non-Residential Smart Saver Energy Efficiency Motors Pumps Drives	Non-Res Smart Saver Prescriptive Other								
Non-Residential Smart Saver Energy Efficiency Process Equipment	Non-Res SmartSaver Prescriptive (VFDs or other)								2nd EM&V
Small Business Energy Saver	Non-Res Smart Saver Energy Efficiency Process Equip								2nd EM&V
Smart Energy in Offices	SBES								
	SEIO	Report							

Original Estimate	
1st EM&V	
2nd EM&V	
3rd EM&V	
4th EM&V	

Program	Program/Measure	2016				2017				2018			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Appliance Recycling	Refrigerator, Freezer							3rd EM&V	Report				
Energy Efficiency Education (K12 Curriculum)	Energy Efficiency Education (K12 Curriculum)									4th EM&V	Report		
Energy Efficient Appliance and Devices	Lighting - Smart Saver RLED						4th EM&V	Report					
	Lighting - Specialty Bulbs						2nd EM&V	Report					
	SF Water EE Products									2nd EM&V	Report		
	HP Water Heater & Pool Pumps					Report							
HVAC Energy Efficiency	Referral and Non-Referral HVAC Measures							2nd EM&V	Report				
Income-Qualified Energy Efficiency	Weatherization						1st EM&V	Report				2nd EM&V	Report
	Refrigerator Replacement						1st EM&V	Report					
	Low Income Neighborhood			2nd EM&V	Report							3rd EM&V	Report
Multi-Family Energy Efficiency	Lighting & Water EE Products			2nd EM&V	Report								
My Home Energy Report	MyHER			3rd EM&V	Report							4th EM&V	Report
Residential Energy Assessments	Home Energy House Call						3rd EM&V	Report					
Business Energy Reports	BER								1st EM&V	Report			
EnergyWise Business	EnergyWise Business (EE measure)									1st EM&V	Report		
Non-Residential Smart Saver Energy Efficiency Custom	Custom Rebate & Custom Assessment					2nd EM&V	Report						
Non-Residential Smart Saver Prescriptive	All Prescriptive Technologies	Report					3rd EM&V	Report					
Small Business Energy Saver	SBES			1st EM&V	Report					2nd EM&V	Report		
Smart Energy in Offices	SEIO						2nd EM&V	Report					



Impact Evaluation and Review of the 2014 Power Manager Program® Carolinas

September 16, 2015

Duke Energy
400 South Tryon Street
Charlotte, North Carolina 28202

This page intentionally left blank.

Prepared by:

Duke Energy Carolinas and
Cadmus

Contact: Danielle Maple, Analyst
Duke Energy
Demand Response Analytics

Table of Contents

Executive Summary.....	ii
Program Year 2014 Highlights	ii
Introduction	1
Program Participation	1
Analytical Methodology	3
Operability Study	3
Setup Factor	3
Shed Factor	4
Operability Study Findings	5
Impact Study.....	5
Measurement and Verification Sample	5
Test Events	6
Impact/Switch Realization Rate	6
PY2014 Load Impact Results	7
PY2014 Program Capacity	8
Independent Third-Party Review of Impacts.....	9
Appendix A.....	10
2011 Operability Study for Duke Energy Carolinas Cannon Load Control Devices	10

Executive Summary

Power Manager is a voluntary residential load control program available to Duke Energy Carolinas homeowners with qualified central air conditioning. Each year, program customers receive a monthly bill credit for participating during the summer months of June through September. Participants agree to allow Duke Energy Carolinas to cycle their air conditioning units during peak periods of energy demand, when energy costs are high, or for emergency purposes when a program-induced full-shed period would aid in the reliability of delivering energy to the region.

Duke Energy Carolinas conducted the Program Year 2014 (PY2014) impact evaluation using a variety of commonly accepted, utility industry statistical practices and applications to measure and report results of the program. These included sample selection and validation, air conditioner duty cycle modeling, model simulations, switch device operability analysis, weather normalization, and monthly capability weighting of expected capacity. The approaches employed by Duke Energy Carolinas were then reviewed by an independent, third-party evaluator (Cadmus) commensurate with standard evaluation, measurement, and verification (EM&V) industry practice. Based on research conducted by Cadmus in other jurisdictions, as well as a critical review of the processes used for Power Manager, the findings for PY2014 are comprehensive and credible.

Program Year 2014 Highlights

- There were 183,117 active switches installed at the end of September 2014
- For PY2014, the operability study conducted in Carolinas revealed that Power Manager switch devices were operational at a 94.5% rate (see Table 1)
- For PY2014, the total summer Carolinas Power Manager Program capacity at the meter—adjusted for peak normal weather and de-rated for operability—was 398.73 MW
- During PY2014, there were four (4) Power Manager events and two (2) test events in Carolinas.

Table 1. PY2014 Program Summary Table

Program Year	Active Switches	Summer Capacity	Operability Rate
PY2014	183,117	398.73 MW	94.5%

Introduction

Power Manager is a voluntary residential load control program available to Duke Energy Carolinas homeowners with qualified central air conditioning. Each year, program customers receive a monthly bill credit for participating during the summer months of June through September. Participants agree to allow Duke Energy Carolinas to cycle their air conditioning units during peak periods of energy demand, when energy costs are high, or for emergency purposes when a program-induced full-shed period would aid in the reliability of delivering energy to the region.

Duke Energy Carolinas conducted the Program Year 2014 (PY2014) impact evaluation using a variety of commonly accepted, utility industry statistical practices and applications to measure and report results of the program. These included sample selection and validation, air conditioner duty cycle modeling, model simulations, switch device operability analysis, weather normalization, and monthly capability weighting of expected capacity. The approaches employed by Duke Energy Carolinas were then reviewed by an independent, third-party evaluator (Cadmus) commensurate with standard evaluation, measurement, and verification (EM&V) industry practice. Based on research conducted by Cadmus in other jurisdictions, as well as a critical review of the processes used for Power Manager, the findings for PY2014 are comprehensive and credible.

Program Participation

When a customer enrolls in the Power Manager Program, Duke Energy Carolinas professionally installs a switch device at the customer premise that allows the air conditioning unit to be cycled for a temporary basis. Participating customers receive an \$8 credit per month on their July through October electric bills.

The switch devices are installed outside the residence in close proximity to the air conditioning unit and they cycle the air conditioner unit in response to event signals sent over Duke Energy Carolinas' paging network.

Duke Energy Carolinas may call Power Manager cycling events on non-holiday weekdays during the summer months of June through September. There were 183,117 active switches enrolled at the end of September 2014 (see Table 2).

Table 2. Power Manager Program Participation Summary

Program Year	Active Switches	Summer Capacity ¹
PY2014	183,117	398.73 MW
PY2013	183,402	327.8 MW
PY2012	185,542	267.3 MW

¹ Capacity increase is due to switch replacements from Comverge/PLC to Cannon switches. See Table 3 for detailed breakdown between switch type.

Table 3. Power Manager Program Participation Summary

Program Year	Cannon Switches	Comverge & PLC Switches
PY2014	170,254	12,863
PY2013	106,927	76,475
PY2012	73,807	111,735

Analytical Methodology

Duke Energy Carolinas conducted the impact evaluation of the Power Manager Program in a three step approach:

1. Tested the operability of the active switch devices installed at the customer premises
2. Calculated the impact or demand reduction per switch during events as determined by a duty cycle analysis
3. Provided documentation to Cadmus for review and approval as the independent EM&V contractor

Operability Study

For PY2014, Duke Energy Carolinas determined the operability of the active switch devices installed at the customer premises using a representative sample group of customers. There are two components of device operability: the setup factor and the shed factor.

- **Setup Factor** - Quantifies the proper installation and configuration of switch devices in the sample group (including the physical installation, wiring, and programming)
- **Shed Factor** - Quantifies performance during actual load control events for switches with the correct setup, and measures the switch effectiveness at achieving the programmed load shed

Combined, the setup and shed factors provide an overall operability rate, which is used to de-rate the program impacts and capacity.

Setup Factor

The setup factor used in this evaluation was established in the 2011 Operability Study, which occurs every four years. In May 2011, Duke Energy Carolinas selected a random sample of 150 households with 180 switch devices² from the population of Power Manager participants in the Carolinas. The sample size was designed to target $\pm 5\%$ precision at the 90% confidence level. The combination of households selected from the Carolinas met the $\pm 5\%$ precision at the 90% confidence level.

² Multiple switch devices are installed at a single household with more than one air conditioning unit enrolled in the program.

In July 2011, Duke Energy Carolinas collected switch data from the sample group, downloading it directly from the switch devices. A total of eight (8) households were dropped from the operability study (reflecting 15 participating switches) due to the following reasons:

- 1 switch due to access problems (gates on households, large dogs)
- 4 switches due to terminated participation in the Power Manager Program
- 10 switches from which data could not be retrieved

Table 4. PY2011 Operability Group Removals

	Households	Switches
Beginning Sample Group	150	180
Removals from Sample Group	(8)	(15)
Final Sample Group	142	165

The final operability sample group size was 142 households with 165 load control devices. Table 5 summarizes the Operability group observations pertaining to the setup factor.

Table 5. Operability Group Observations of Setup Factor

Reason for Removal from Operability Study	Switch Device Count	Qualifying Multiplier	Weighted Factor
Nonfunctional switch	6	0.00	0
Switch disconnected from AC after the first event ³	2	0.143 ⁴	0.286
Switch disconnected from AC after the second event	1	0.286	0.286
Switch set up correctly	156	1.00	156
Total	165		156.572
Set-Up Factor	0.9489		

Duke Energy Carolinas calculated the setup factor to be 94.89%.

$$\text{Setup Factor} = \text{Total Weighted Factor} / \text{Total Switch Device Count}$$

Shed Factor

As defined in Appendix A, Duke Energy Carolinas used the 99.56% shed factor from the last operability study findings in the PY2011 report.

$$\text{Shed Factor} = \text{Total Weighted Factor} / \text{Total Switch Device Count}$$

³ Three devices were found to be disconnected at the end of the control season, but device data logs showed control during one or two events at the start of the season.

⁴ This is a multiplier based off the number of events the switch was active for. In 2011 there were 7 Power Manager events.

Operability Study Findings

The operability study performed in 2011 revealed that Power Manager switch devices were operational at a 94.5% rate. Duke Energy Carolinas applied this de-rate factor to all program switch devices to more accurately represent the available program capacity and kW reduction during events.

The following calculation determined switch operability:

$$94.89\% [2011 \text{ sample group setup factor}] * 99.56\% [2011 \text{ sample group shed factor}] = 94.5\%$$

Table 6 shows de-rating factors used for the 2014 impact evaluation. Cannon factors in Duke Energy Carolinas were determined by operability studies conducted in 2011. Comverge factors in Duke Energy Carolinas were determined by an operability study in 2010. Another operability study for non-Cannon switches is not expected due to the near completion of the replacement of these older devices. The next Operability study for the Cannon switches in the Carolinas will be completed during PY2015.

Table 6. De-Rating Factors for Impact Evaluation

Switch Type	Carolinas
Cannon	0.945
Comverge	0.399
PLC	0.399

Impact Study

Power Manager load control was activated in Duke Energy Carolinas during six days of the summer of 2014. There were two test events and four Power Manager events.

Measurement and Verification Sample

In the research group for the Carolinas, there were 168 households with 211 switches. These households are equipped with Cannon switches and at the end of the season the switch run time data is collected along with interval meter data.

The historical profile is a component of calculating impacts. This information is obtained via downloads from the Cannon switches. The historical profile is a 24-hour run-time profile covering every switch and the percentage of run time for those hours. The run-time profile is made up of 'Saved Dates' which are high temperature dates that are not inclusive of event dates. Each 'Saved Date' goes into the run-time profile with one-eighth weighting.

Adjusters and gears are instructions telling the switch how long to shed. The adjusters are a part of Target Cycling which uses the historical profile to calculate shed time. The lower the adjuster, the greater impact achieved.

Test Events

For operational purposes Duke Energy Carolinas had two test events for Power Manager. The June 10th, 2014 event included an hour of cycling and then an hour of full shed. See Table 7 for test event impacts.

Table 7. Test Events

Date	Hour (EDT)	NC De-Rated Impact (MW)	SC De-Rated Impact (MW)	NC Switch Count (1.3 kW)	SC Switch Count (1.3 kW)	Temperature (°F)
6/5/2014	14	106.84	38.10	136,678	50,493	87°
	15	121.01	43.16			89°
6/10/2014	16	146.30	53.25	136,488	50,457	90°
	17 (Full Shed)	262.26	95.41			91°

Impact/Switch Realization Rate

Table 8 details the realization rate between the actual impact/switch and expected impact/switch on an event day. The programming of the switch, including gears and adjusters alter the impact/switch during an event. For PY2015, the gears and adjusters are being corrected to closely target the 1.3 kW expected. The calculation for the realization rate is:

$$\text{Realization Rate (\%)} = \text{Actual Impact} / \text{Expected Impact}$$

Table 8. Impact Realization Rate

Date	Hour (EDT)	Expected Impact/Switch kW	Actual Impact/Switch (Cannon) kW	Realization Rate (%) (Cannon)	Actual Impact/Switch (Comverge)	Realization Rate (%) (Comverge)
6/18/2014	17	1.3	1.299	100	1.355	104
9/2/2014	16	1.3	1.512	116	1.294	100
	17	1.3	1.605	123	1.401	108
	18	1.3	1.619	125	1.416	109
9/11/2014	16	1.3	1.555	120	1.334	103
	17	1.3	1.591	122	1.371	105
	18	1.3	1.638	126	1.412	109
9/16/2014	16	1.3	1.533	118	1.314	101
	17	1.3	1.616	124	1.390	107
	18	1.3	1.617	124	1.395	107

PY2014 Load Impact Results

Table 9 details the calculated demand reduction per switch device under peak normal weather and using the de-rated impact from the operability study.

Table 9. Demand Reduction per Switch Device

Switch Type	Control Strategy	Potential Impact (kW)	De-rating Factor	De-rated Impact (kW)
Cannon	TC 1.3	1.29	0.945	1.22
	Full Shed	2.31	0.945	2.18
Comverge	FC 67%	1.36	0.399	0.54
	Full Shed	2.31	0.399	0.92
PLC	Full Shed	2.31	0.399	0.92

Table 10. Impact Results by Event Date

Date	Hour (EDT)	NC De-Rated Impact (MW)	SC De-Rated Impact (MW)	NC Switch Count (1.3 kW)	SC Switch Count (1.3 kW)	Temperature (°F)
6/18/2014	17	149.13	54.29	136,488	50,457	92°
9/2/2014	16	179.00	65.47	135,539	50,251	93°
	17	190.26	69.60			93°
	18	191.89	70.20			93°
	18	191.89	70.20			93°
9/11/2014	16	184.45	67.48	135,386	50,105	89°
	17	188.68	69.03			88°
	18	194.32	71.10			87°
	18	194.32	71.10			87°
9/16/2014	16	181.80	66.51	135,386	50,105	85°
	17	191.73	70.15			85°
	18	191.86	70.20			85°
	18	191.86	70.20			82°

PY2014 Program Capacity

Table 11 details the PY2014 total Carolinas Power Manager Program capacity, adjusted for peak normal weather, de-rated, and calculated at the meter. The last column of Table 11 shows the average capacity of the Power Manager program across the summer months in 2014.

Table 11. PY2014 Program Capacity, Carolinas (MWs)

State	Control Strategy	June	July	August	September	Summer Capacity
Carolinas	Cycling	215.77	218.80	223.23	225.31	220.78
Carolinas	Full Shed	389.45	395.09	403.26	407.11	398.73

Table 12 shows the summer monthly load reduction under peak normal weather conditions. Table 13 shows the peak normal weather conditions used to calculate the results in Table 12. The system peak is calculated to occur in the hour 4:00-5:00 pm EDT in Carolinas.

Table 12. Shed kW/switch with Peak Normal Weather

Switch Type	Control Strategy	Potential Impact	De-rated Impact
Cannon	TC 1.3	1.29	1.22
	Full Shed	2.31	2.18
Comverge	FC 67%	1.36	0.54
	Full Shed	2.31	0.92
PLC	Full Shed	2.31	0.92

Table 13. Peak Normal Weather

Hour	Carolinas	
	Temp	Dewpt
11	89	69
12	91	69
13	92	68
14	94	68
15	93	69
16	95	67
17	95	66
18	95	67

Independent Third-Party Review of Impacts

Duke Energy Carolinas conducted the impact analysis of the Power Manager Program. Cadmus reviewed the results presented in this report as well as a spreadsheet with a sample of impact figures to ensure proper methodology.

Cadmus reviewed the current operability rate for PY2014 of 94.5% and determined Duke Energy Carolinas is in good standing.

Given this additional information, the numbers represented in this report most closely reflect actual conditions on the day of an event and are therefore determined to be the reasonable demand reduction assumptions. Cadmus determined that Duke Energy Carolina's impact evaluation provides an accurate estimate of PY2014 program impacts.

Appendix A

The following data is from the PY2011 Power Manager EM&V Report

2011 Operability Study for Duke Energy Carolinas Cannon Load Control Devices

Cannon devices were instructed to execute a Target Cycle. With Target Cycle, each device calculates a unique shed time for each hour of load control based on the Amps parameter for the attached AC unit (entered into the device at installation) and the expected hourly run-time of the attached AC unit stored in the historical profile registers. Expected run-time is accumulated in the historical profile by saving run-time of the attached AC unit on days with weather conditions similar to load control days.

Table 14 shows the list of events occurred during the summer of 2011 for Cannon switches. The data collection included both device scan data and device data logs. Device data logs contain hourly shed minutes and hourly run-time for the attached AC unit. We obtained shed minutes during each hour of load control from device data logs and this information was used to assess shed performance of devices.

Table 14. SE PM events for Cannon devices

Event Date	Event Duration (EDT)
6/21/2011	2:30 – 5:00 pm
7/11/2011	2:30 – 6:00 pm
7/13/2011	2:30 – 6:00 pm
7/20/2011	2:30 – 5:00 pm
7/21/2011	2:30 – 5:00 pm
7/29/2011	2:30 – 5:00 pm
8/2/2011	3:30 – 6:00 pm

The shed factor measures correct response by properly configured devices to paging signals sent immediately prior to and during a load control event. In the PY2011 study, 159 devices were properly configured to shed. The shed factor was calculated by dividing the total non-zero shed event hours by total event hours for each device. Table 15 summarizes the results pertaining to the shed factor. From this data, the shed factor estimate is 99.56%.

Table 15. Shed Factor

Factor	Count	Weighted Factor
0.615	1	0.615
0.769	1	0.769
0.923	1	0.923
1	156	156
Sum	159	158.307
Shed Factor	0.9956	

$$\text{Shed Factor} = \text{Sum of Weighted Factor} / \text{Total count}$$



Energy Efficiency in Schools Program

Revised February 29, 2016

Evaluation, Measurement, & Verification for Duke Energy North Carolina and Duke Energy
South Carolina

This page left blank.

Prepared by:

Cadmus

This page left blank.

Table of Contents

Evaluation Summary	iv
Program Description.....	iv
Evaluation Objectives	iv
High-Level Impact Findings.....	iv
Energy Efficiency in Schools Program Savings	iv
Net Impacts.....	v
Evaluation Parameters.....	vii
High-Level Process Findings	vii
Stakeholder Feedback.....	vii
Energy Efficiency Home Kit	vii
Energy Saving Tools and Behaviors.....	viii
Previous and Future Experience with Energy Efficiency Home Kit Items.....	viii
Participant Feedback	ix
Conclusions and Recommendations	ix
Introduction	1
Program Description.....	1
Program Design and Goals	2
Evaluation Methodology.....	4
Stakeholder Interviews.....	4
Participant Surveys.....	4
Billing Analysis	5
Engineering Analysis.....	5
Net-to-Gross Analysis	5
Threats to Validity, Sources of Bias, and How These Were Addressed.....	5
Billing Analysis.....	5
Engineering Analysis	6
Process Evaluation Findings.....	7
Stakeholder Interviews.....	7
Communication.....	7
Program Delivery	7

Promotion and Marketing	9
School Incentives	9
Duke Energy and Implementer Data Tracking	9
Market Barriers and Program Challenges	10
Program Feedback and Suggestions	10
Participant Surveys	10
Student Discussion of Performance	11
Energy Efficiency Home Kit	11
Use of Energy Efficiency Home Kit Items	11
Energy Saving Behaviors	13
Previous and Future Experience with Energy Efficiency Home Kit Items	15
Satisfaction	19
Impact Evaluation Findings	25
Energy Efficiency in Schools Program Savings	25
Billing Analysis	28
Engineering Analysis	32
CFLs	32
Energy-Efficient Showerhead	34
Faucet Aerators	34
Outlet Gasket Insulators	35
Limelight Night Light	35
Water Heater Temperature Card	36
Net-to-Gross Findings	36
Summary Form	Error! Bookmark not defined.
Appendix A. Participant Household Characteristics and Demographics	39
Appendix B. Impact Algorithms	42
General Impact Algorithms by Measure	42
CFLs	42
Outlet Gasket Insulators	42
Energy-Efficient Showerhead	44
Faucet Aerators	45

Water Temperature Card.....	46
Limelight Night Lights	47
Appendix C. Billing Analysis Regression Details	48
References.....	49
Appendix D. Engineering Analysis Energy Efficiency Home Kit Savings Details.....	50
Appendix E. Net-to-Gross Ratio Calculations.....	51
Lighting Freeridership	51
Non-Lighting Freeridership	55
Spillover Estimation	57
Appendix F. Energy Efficiency in Schools Program Participant Survey.....	59
Appendix G. Energy Efficiency in Schools Program Participant Survey Frequency Tables	60

Evaluation Summary

Duke Energy engaged Cadmus (the Cadmus team) to perform process and impact evaluations of the Duke Energy Carolinas' Energy Efficiency Education for Schools Program (Energy Efficiency in Schools Program).¹ This report covers the impact and process evaluation findings for the evaluation period of June 1, 2014, through May 31, 2015.

Program Description

The Energy Efficiency in Schools Program is an energy conservation program available to K-12 students in Indiana, Ohio, North Carolina, South Carolina, and Kentucky public and private schools. The Energy Efficiency in Schools Program provides principals and teachers with an innovative math and science-related curriculum that educates students about energy, natural resources, electricity, ways in which energy is wasted, and ways to use resources wisely. Duke Energy partners with three third-party contractors to implement the program: The National Theatre for Children (NTC), AM Conservation, and Relationship 1.

The Energy Efficiency in Schools Program launched in 2011. While program stakeholders update the storyline and curriculum each year, the focus remains on energy efficiency, and the program's delivery mechanisms have not been changed. The current program uses a pirate-themed storyline to educate students in kindergarten through eighth grade. The program uses classroom and take-home assignments to engage students' families and to encourage students, in concert with their families, to complete a home energy survey, thus receiving an Energy Efficiency Home Kit; this contains energy-saving measures such as CFLs and energy-efficient showerheads. The program offers the contests, classroom activities, and prizes to encourage program participation and use of the Energy Efficiency Home Kit.

Evaluation Objectives

The Cadmus team's evaluation objectives included estimating energy savings, documenting program operations, and identifying improvement opportunities for future program implementation and customer experience with the program.

High-Level Impact Findings

This section summarizes the Cadmus team's key findings for the evaluation period.

Energy Efficiency in Schools Program Savings

The Cadmus team conducted a billing analysis to estimate overall net energy savings for each household participating in the Energy Efficiency in Schools Program in North and South Carolina (the Duke Energy Carolina system). The Cadmus team also conducted an engineering analysis to estimate the relative

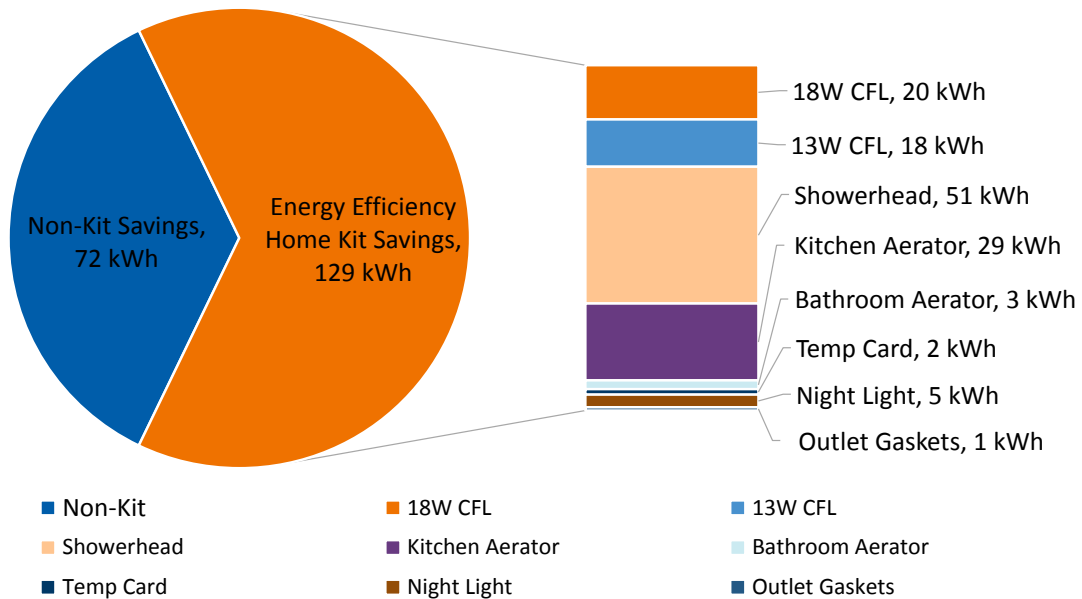
¹ While the tariffed program name is Energy Efficiency Education Program for Schools, the working title is Energy Efficiency in Schools program.

savings contributions from the items provided in the Energy Efficiency Home Kit and a net-to-gross analysis to account for freeridership and spillover. By conducting billing, engineering, and net-to-gross analysis, the Cadmus team was able to determine what portion of each household's net energy savings resulted from the installation of items from the Energy Efficiency Home Kit and what portion of the savings resulted from energy-saving actions and behaviors taken by participants.

Based on the billing analysis results, households saved approximately 201 kWh on average as a result of participating in the Energy Efficiency in Schools Program. Findings from the engineering analysis, which relied on data from participant surveys, indicated that approximately 64% (129 kWh) of the average household savings resulted from participants installing Energy Efficiency Home Kits items; the Cadmus team then estimated that the remaining 36% of the household savings resulted from energy saving actions (including non-like spillover) and behaviors taken by participants because of the education they received through the program.

Figure 1 shows the average energy savings per participating household (201 kWh) broken out by Energy Efficiency Home Kit measures and participant actions.

Figure 1. Energy Savings from Energy Efficiency Home Kit and Behaviors



Net Impacts

To conduct the impact analysis, the Cadmus team compared the customer's electric meter readings before and after the program; as such, the billing analysis represents net savings, and we did not need to calculate gross savings. As shown in Table 1, Table 2, Table 3, the Energy Efficiency in Schools Program did not meet its net energy and demand savings goals.

Table 1. Program Projected, Claimed, and Evaluated Net Energy Impacts

Program	Net Savings Goal (kWh)*	Net Reported Savings (kWh)**	Net Evaluated Savings (kWh)***
Energy Efficiency in Schools Program	6,065,200	6,035,464	5,387,202

* Based on previously evaluated savings of 236 kWh per Energy Efficiency Home Kit and the program goal of delivering 25,700 Energy Efficiency Home Kits from July 2014 through June 2015.

** Based on previously evaluated savings of 236 kWh per Energy Efficiency Home Kit and the reported delivery of 25,574 Energy Efficiency Home Kits from July 2014 through June 2015.

*** Based on the reported delivery of 26,802 Energy Efficiency Home Kits from June 2014 through May 2015.

Table 2. Program Projected, Claimed, and Evaluated Net Peak Demand Impacts

Program	Net Savings Goal (kW)*	Net Reported Savings (kW)**	Net Evaluated Savings – Summer Coincident (kW)***	Net Evaluated Savings – Winter Coincident (kW)****
Energy Efficiency in Schools Program	514	511	1,265	1,294

*Based on previously evaluated savings of 0.02 kW per Energy Efficiency Home Kit and the program goal of delivering 25,700 Energy Efficiency Home Kits from July 2014 through June 2015.

**Based on previously evaluated savings of 0.02 kW per Energy Efficiency Home Kit and the reported delivery of 25,574 Energy Efficiency Home Kits from July 2014 through June 2015.

***Based on the reported delivery of 26,802 Energy Efficiency Home Kits from June 2014 through May 2015 and DSMore modeled kW savings of 0.047 kW.

****Based on the reported delivery of 26,802 Energy Efficiency Home Kits from June 2014 through May 2015 and DSMore modeled kW savings of 0.048 kW.

Table 3. Household Net Energy and Demand Savings—2015

Program Year Evaluated	Annual Energy Savings Per Participant (KWh)	Annual Demand Savings Per Participant – Summer Coincident (kW)*	Annual Demand Savings Per Participant – Winter Coincident (kW)*
2015	201	.047	.048

*Based on DSMore modeling.

Evaluation Parameters

The Cadmus team used a billing analysis to conduct the impact evaluation of the Energy Efficiency in Schools Program. Table 4 lists parameters for these activities.

Table 4. Evaluated Parameters with Value and Units

Parameter	Value	Units
Average Billing Analysis Savings per Home	201	kWh/household (net savings)

Table 5 lists the start and end dates for activities conducted for the impact evaluation, along with the total number of interviews and participants included in the analysis.

Table 5. Sample Period Start and End Dates and Dates Evaluation Activities Conducted

Evaluation Component	Sample Period	Dates Conducted	Total Conducted
Stakeholder Interviews	-	May 2015	5
Participant Surveys (used for engineering and net-to-gross analysis)	June 1, 2014 – April 30, 2015	May 2015	510
Billing Analysis	June 1, 2014 – May 27, 2015	July - August 2015	26,526

High-Level Process Findings

The section summarizes the Cadmus team's key findings for the evaluation period.

Stakeholder Feedback

Interviews with program stakeholders (program management and implementation staff) focused on elements of program process and delivery, which have remained fundamentally unchanged since the previous evaluation. Stakeholders reported that the program ran smoothly and was successful at engaging and entertaining students. Duke Energy offers multiple contests and incentives to encourage schools and students to get the most value out of the program by ordering Energy Efficiency Home Kits and installing the included items.

Stakeholders reported minimal challenges with the Energy Efficiency in Schools Program this year. As with previous evaluations, stakeholders reported that the program requirement that participants can only receive one Energy Efficiency Home Kit during a three-year period may be impacting participation.

Energy Efficiency Home Kit

The Cadmus team asked respondents a series of questions regarding their use of the items in the Energy Efficiency Home Kits. Specifically, we asked participants to indicate one of the following outcomes:

- They were currently using the item (or had used it in the case of single-use items).
- They were not currently using the item, but planned to in the future.

- They were not currently using the item, and were not intending to use it.
- They had installed the item but had removed it.

Participants most often reported installing the lighting items included in the Energy Efficiency Home Kits (installation rates greater than 75%). Respondents reported much lower installation rates for the kitchen aerator (33%), bathroom aerator (30%), showerhead (36%), and outlet gasket insulations (15%) at the time of the survey. Forty percent of respondents said they used the water heater temperature card that was included in the Energy Efficiency Home Kit, while 20% reported using the water flow meter bag. Participants who did not currently have items installed (either because they had never installed the measures or installed and subsequently removed the measures) provided the following explanations for low satisfaction with the items:

- Dissatisfied with item performance.
- Item could not be installed or used because it does not fit.
- Item was difficult to install or use.
- Item was damaged or defective.
- Dissatisfied with quality.

Energy Saving Tools and Behaviors

The Energy Efficiency Home Kit also included an informational booklet (Energy Savers booklet). When we asked survey respondents to estimate how much of the information they had read, 43% (n=510) said they had read most or all of the information, 35% said they had read some of the information, 18% reported they had glanced at the information, and 4% said they did not look at the Energy Savers booklet at all. Respondents who read at least some of the information reported that the booklet was easy to understand, informative, and helpful.

The Cadmus team asked survey respondents who read the Energy Savers booklet what actions they took based on the prescriptive advice found inside. Participants most frequently reported turning off electronics when not in use (87%) and choosing efficient CFL and LED lighting (83%); nearly one-half of the participants reported sealing leaks (46%) and maintaining and upgrading HVAC equipment (44%).

Previous and Future Experience with Energy Efficiency Home Kit Items

The survey asked respondents about their experience with energy saving items similar to those included in the Energy Efficiency Home Kit prior to and after participating in the program. Respondents reported having installed CFLs most frequently (79%, n=482) prior to participating in the program, followed by energy-efficient showerheads (33%, n=470). When we asked respondents if they had ever intended to purchase items similar to those provided in the Energy Efficiency Home Kit prior to participating in the program, 50% (n=487) of respondents said they had not been intending to purchase CFLs because they already have them installed throughout their homes, and 23% (n=461) reported the same for LEDs. The percentage of respondents who said they intended to purchase or might have purchased the items provided in the Energy Efficiency Home Kit range from 11% (n=449) for outlet gasket insulators up to

28% (n=481) for energy-efficient showerheads. When we asked participants if they purchased additional energy efficiency items on their own after receiving the Energy Efficiency Home Kit, 44% (n=510) said they had, with CFLs and LEDs purchased most frequently by these respondents.

Participant Feedback

Survey respondents reported high levels of satisfaction overall with the program and the items included in the Energy Efficiency Home Kit. The Limelight night light most frequently received favorable feedback, followed by the kitchen aerator and the water heater temperature card. Conversely, respondents gave the bathroom aerator the lowest satisfaction ratings, most often citing “lower water pressure” and “not fitting on faucet” as the reasons for their dissatisfaction.

When we asked survey respondents if their knowledge of how to save energy and reduce energy bills had changed after participating in the program, 37% (n=485) responded that their knowledge had increased “somewhat.”

Conclusions and Recommendations

The Cadmus team’s evaluation revealed a few areas for potential improvements. This section summarizes conclusions resulting from our process and impact evaluation activities and provides potential areas Duke Energy could explore to further refine program operations or expand program benefits.

Conclusion: The Energy Efficiency in Schools Program is successful as measured by multiple metrics, though opportunities for increasing participation and energy savings may exist. While the program did not meet participation and savings goals, the NTC performance results in energy savings within student homes (through installation of Energy Efficiency Home Kit items and encouraging behavior changes).

Recommendation: Continue using the same program delivery mechanism and processes. Consider providing schools with additional incentives for engaging in energy-saving installations and behaviors. One potential option would be offering a financial incentive to the school with the highest evaluated per-student energy savings.

Conclusion: Duke Energy may be able to increase energy savings realized by Energy Efficiency Home Kit items by adjusting the quantity and type of items. Opportunities for increasing savings through modifications to the Energy Efficiency Home Kit may exist. The Cadmus team noted that similar energy education programs, offering slightly different kit configurations, are achieving greater energy savings per kit. Additionally, lower installation rates for showerhead and faucet aerators result in lower energy savings for the Energy Efficiency in Schools Program. Some participants also indicated quality or performance issues with the Energy Efficiency Home Kit items.

Recommendations: Consider modifying the quantity and type of items included in the Energy Efficiency Home Kits, if Duke Energy finds it cost-effective and sufficiently beneficial to do so. Because participants installed lighting measures most often and these measures received the highest satisfaction

ratings, consider increasing lighting measures included in Energy Efficiency Home Kits. Additionally, to address quality issues and make products more attractive to participants, consider researching higher quality models of items provided in the Energy Efficiency Home Kit. Consideration may also be given to reducing or eliminating measures that are less frequently installed.

Conclusion: The Energy Efficiency in Schools Program successfully engages students through the NTC presentation and may be able to increase energy savings by engaging parents. While most respondents remembered discussing aspects of the Energy Efficiency in Schools Program presentation with their children, they also indicated that their knowledge about energy and reducing energy bills stayed the same after their children participated in the Energy Efficiency in Schools Program. The business reply cards, currently completed and returned by parents, may provide an opportunity to educate and connect at the household level.

Recommendations: Consider increasing outreach to adults in the students' households through modifications to business reply cards included in Energy Efficiency Home Kits or through additional follow-up surveys. Use of participant surveys may prompt parents to follow up on installing items from their Energy Efficiency Home Kits and may serve as a reminder about potential energy-saving activities. The business reply cards, currently used to survey parents and assess installation rates, also could be modified to provide additional education. For example, in addition to asking if parents installed the CFLs included in the Energy Efficiency Home Kits, the survey could provide information on how much energy each CFL saves in the average home.

Conclusion: Staff from participating schools and non-participating schools may offer additional insights into the primary factors motivating school and student participation, as well as the primary barriers to participation. Stakeholders reported that recruitment of new schools can be challenging. Feedback from staff at participating schools has been limited in previous evaluations and interviews with non-participating schools have not yet been conducted. More in-depth discussions with school staff may reveal opportunities for increasing student participation within the schools and identifying barriers to school participation.

Recommendations: Future evaluations should consider including additional, in-depth, phone interviews with school staff that have participated in the program and with staff at schools that have not participated in the program. Interviews should be designed to capture participation reasons, participation barriers, and suggestions for helping schools and students participate in the program. Samples should be determined based on the number of schools in the service territory.

Conclusion: Potential opportunities may exist for Energy Efficiency Home Kit items not installed by participants. Participants do not install all items provided in the Energy Efficiency Home Kits and may dispose of items they do not install.

Recommendations: Consider providing schools with bins to collect unused Energy Efficiency Home Kit items for inclusion in future Energy Efficiency Home Kits. When communicating with students, include education about reducing waste and information on how returned, unused items will be used.

Conclusion: Less than half (36%) of energy savings attributable to the program came from participants changing their behaviors or making additional energy efficiency improvements. It is possible that students and their families may already be engaging in energy saving behaviors prior to attending the performances.

Recommendations: Future evaluations should consider including a control group in the billing analysis. Cadmus recommends two groups for billing analysis: program Energy Efficiency Home Kit participants; and a control group of homes not exposed to the performances and outreach (provided those populations are available). The billing analysis will allow a deeper understanding of the savings attributed to behavior change versus energy efficiency improvements.

Introduction

Program Description

The Energy Efficiency Education Program for Schools (Energy Efficiency in Schools Program) is an energy conservation program available to K-12 students in Indiana, Ohio, Kentucky, North and South Carolina (Carolina system) public and private schools in Duke Energy's service territory (this report focuses on findings from the evaluation of the Duke Energy Carolina system only). The Energy Efficiency in Schools Program provides principals and teachers with an innovative math and science-related curriculum that educates students about energy, natural resources, electricity, ways in which energy is wasted, and ways to use natural resources wisely. In implementing the program, Duke Energy partners with the following three, third-party contractors:

- The National Theatre for Children (NTC), the implementer of the Energy Efficiency in Schools Program. NTC develops and presents live theatrical productions with targeted material for elementary and middle school students.
- AM Conservation, which is the fulfillment vendor for the Energy Efficiency Home Kits.
- Relationship 1, which is Duke Energy's data management vendor. Relationship 1 processes all Energy Efficiency Home Kit requests and surveys, verifies eligibility, hosts the program website, maintains the program dashboard, and provides data reporting.

Duke Energy launched the Energy Efficiency in Schools program in 2011. While NTC updates the storyline and curriculum each year, the focus remains on energy efficiency, and program delivery mechanisms have not been changed. The current program uses a pirate-themed storyline to educate students in elementary schools and an improvisational storyline to educate middle school students. The program uses classroom and take-home assignments to engage student's families and to encourage students to complete a home energy survey with their families to receive an Energy Efficiency Home Kit. The Energy Efficiency Home Kit contains the following measures and materials:

- 1.5 gpm energy-efficient showerhead
- 1.5 gpm kitchen faucet aerator with swivel and flip valve
- Water flow meter bag
- Water temperature gauge card (Hot Water Temperature Card)
- 13-watt ENERGY STAR®-rated mini compact fluorescent bulb (60-watt incandescent equivalent), with 12,000 hour life
- 18-watt ENERGY STAR-rated mini compact fluorescent bulb (75-watt incandescent equivalent), with 12,000 hour life
- 1.0 gpm needle spray bathroom faucet aerator
- Combination pack of switch and outlet gasket insulators—eight outlets and four socket gasket insulators

- Energy-efficient Limelight style night light
- Duke Energy-labeled U.S. Department of Energy (DOE) Energy Savers booklet
- Roll of Teflon tape for showerhead
- Product information and instruction sheet
- Glow ring toy

Non-Duke Energy customers at participating schools can receive a smaller Energy Efficiency Home Kit, containing the following materials:

- Water flow meter bag
- Water temperature gauge card (Hot Water Temp Card)
- 13-watt ENERGY STAR-rated mini compact fluorescent bulb (60-watt incandescent equivalent), with 12,000 hour life
- Eight outlet gasket insulators
- Duke Energy-labeled DOE Energy Savers booklet
- Product information and instruction sheet
- Glow ring toy

Program Design and Goals

The primary goal of the Energy Efficiency in Schools Program is to educate students about energy, natural resources, how to make electricity, ways in which energy is wasted, and ways to use these resources wisely. Additionally, Duke Energy strives to meet the following goals through the program:

- Integrate grade-appropriate energy efficiency learning activities and Duke Energy's Energy Efficiency Home Kit into existing science and math-based curricula.
- Achieve target participation and energy impacts through delivery of Energy Efficiency Home Kits and participant installation of energy-saving measures in eligible households.
- Create program sustainability by reaching new participants each year (i.e., participants who have not received an Energy Efficiency Home Kit in the previous three years).

The Energy Efficiency in Schools Program met its 2014-2015 participation goals in the Carolina system, with 26,802 Energy Efficiency Home Kits delivered to households within Duke Energy's service territory during the evaluation period.

Table 6 lists the program goals and actual performance.

Table 6. Energy Efficiency Home Kit Participation Goals and Actual Performance

Program Year*	Participation Goal	Actual Participation
2014-2015	25,700	26,802**

* Program year defined as July 1, 2014, through June 30, 2015.

** Duke Energy reported Energy Efficiency Home Kits distributed during the evaluation period, June 1, 2014, through May 31, 2015.

Evaluation Methodology

In evaluating Duke Energy's Energy Efficiency in Schools Program, the Cadmus team identified the following objectives:

- Estimate the program's net energy savings through billing analysis;
- Estimate energy and demand savings resulting from installation of Energy Efficiency Home Kit items through engineering analysis;
- Assess freeridership and spillover through participant surveys;
- Assess the program's performance against goals; and
- Assess participant experience, satisfaction, and decision-making motivations.

Stakeholder Interviews

Cadmus conducted interviews with two program managers and three members of the implementation staff to capture insights about program operations and challenges. Specifically, Cadmus interviewed the following individuals:

- Duke Energy Program Staff
 - Program Manager: Christine Smith (5/12/2015)
 - Residential Market Manager: Lari Granger (5/12/2015)
- NTC Program Staff
 - Program Manager: Katie Miesen (05/14/2015)
- AM Conservation Staff
 - Senior Account Executive: Charlene Moody (05/14/2015)
- Relationship 1 Staff
 - Chief Operating Officer: Howard Mertz (05/27/2015)

Participant Surveys

The Cadmus team designed participant surveys to cover impact evaluation and process evaluation topics, including use of Energy Efficiency Home Kit items, energy saving behavior changes, freeridership, spillover, decision-making, and satisfaction. Duke Energy administered the online surveys and the Cadmus team analyzed the survey responses. Duke Energy sent survey invitations to 11,362 eligible customers who received Energy Efficiency Home Kits between June 16, 2014, and March 4, 2015.² Eighty-five percent (n=813) of participants who began the online survey remembered receiving the Energy Efficiency Home Kit, while 11% said they did not receive the Energy Efficiency Home Kit. Four

² There were 26,802 Energy Efficiency Home Kits distributed through the program (reported), but only 11,362 e-mail addresses were included in the available participant data. Duke Energy contacted survey respondents by e-mail and conducted the survey online.

percent could not recall if they had received the Energy Efficiency Home Kit. We did not ask respondents who did not receive or did not recall receiving the Energy Efficiency Home Kit any further questions about the program. In total, 510 respondents went on to complete the entire survey (376 customers from North Carolina and 134 customers from South Carolina). The survey sampling methodology achieved $\pm 3.6\%$ precision at the 90% confidence interval based on the total 26,802 participants who received Energy Efficiency Home Kits during the evaluation period.

Billing Analysis

The billing analysis relied on consumption data for 26,526 electric customers who participated in the program between June 2014 and May 2015.³ The Cadmus team tested two panel regression models to estimate program impact on post-treatment electric consumption, controlling for individual customers' fixed effects mean usage, month-specific trends, weather effects, and participation in other Duke Energy programs. Ultimately, we selected and used the model with the best precision values to estimate net energy savings per household. The results were statistically significant at the 90% confidence level.

Engineering Analysis

The Cadmus team conducted an engineering analysis to determine the Energy Efficiency Home Kit's contribution to the household net energy savings (determined through the billing analysis). We collected data through participant surveys and used energy savings algorithms and variable inputs taken from the Mid-Atlantic, Ohio and Illinois Technical Reference Manuals (TRMs). We used the analysis results, in conjunction with the net-to-gross analysis, to estimate net energy savings for items included in the Energy Efficiency Home Kits.

Net-to-Gross Analysis

To provide context for the net energy savings estimated through the billing analysis and to inform engineering calculations, the Cadmus team conducted a net-to-gross analysis. We used participant surveys to collect data necessary to estimate participant freeridership and spillover.

Threats to Validity, Sources of Bias, and How These Were Addressed

Billing Analysis

The model specification used in the billing analysis attempted to avoid the potential of omitted variable bias by including monthly variables to capture any non-program effects affecting energy usage as well as other Duke Energy offers. The two models tested by the Cadmus team did not correct for self-selection bias as the program remains voluntary. Given that many customers in the population participated in late 2014 or early 2015, the number of post-treatment months' worth of billing data were few. This led to an

³ While the Cadmus team calculated program savings based on the 26,802 kits reported distributed through the program during the evaluation period (June 1, 2014 through May 31, 2015), we conducted the billing analysis of electric participants who met specific consumption requirements and passed through a screening process for the period June 1, 2014 through May 27, 2015.

unbalanced panel between the pre- and post-period billing months which could have impacted the precision of the models' estimates. In order to help correct for this unbalanced panel, Cadmus tested a second model which utilized a matching method. This is discussed in more depth in the Billing Analysis section below. Additionally, as the program design did not include a control group, we could not control for naturally occurring changes in consumption during the post-period.

Engineering Analysis

To estimate per-unit, net savings for each item in the Energy Efficiency Home Kit, the Cadmus team used engineering algorithms and variable inputs from Mid-Atlantic, Ohio and Illinois TRMs, along with participant-specific inputs captured through the participant survey. As this analysis relied, in part, on participant responses, results could have been affected by self-selection bias, false-response bias, or positive-result bias.

Process Evaluation Findings

This chapter presents the Cadmus team's process evaluation findings for Duke Energy's Energy Efficiency in Schools Program and divides the findings into two sections: Stakeholder Interviews and Participant Surveys. Table 7 lists the primary evaluation activities and the dates the Cadmus team conducted each activity.

Table 7. Process Evaluation Data Collection and Analysis

Evaluation Component	Dates of Data Collection	Total Conducted
Stakeholder Interviews	May 12-27, 2015	5
Participant Surveys	May 5-18, 2015	510

Stakeholder Interviews

The Cadmus team interviewed program stakeholders to gain an in-depth understanding of the program and to identify its successes and challenges. Results of these discussions follow below, presented by topic.

Communication

All program staff and partners reported they communicate on a regular basis and that communications are positive and effective. Duke Energy conducts weekly conference calls with NTC and Relationship 1 to discuss scheduling, communications, problems that arise, and associated solutions and program delivery strategies. During those meetings, NTC and Relationship 1 report to Duke Energy about any issues they have identified during the week. NTC and Duke Energy meet in-person twice a year.

In addition, NTC corresponds with Duke Energy via e-mail on a daily basis. NTC staff stated that Duke Energy welcomed any program suggestions, such as adjusting the marketing plan and introducing new initiatives. In addition, AM Conservation staff attends in-person meetings with Duke Energy four times throughout the year. None of the program stakeholders reported communication issues or concerns.

Program Delivery

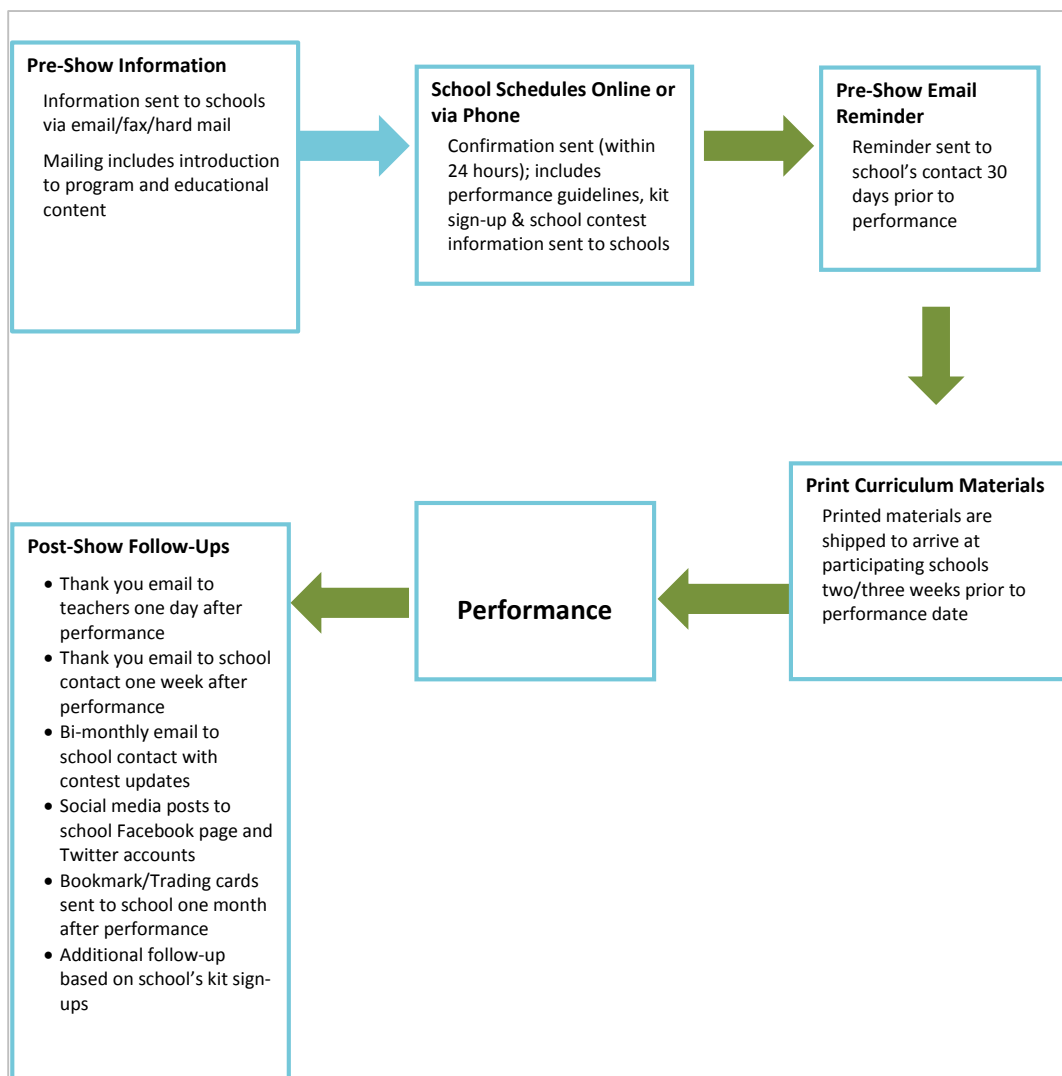
NTC delivers the Energy Efficiency in Schools Program to interested schools within Duke Energy's service territory. NTC contacts principals through mass mailings, occurring two to three times a year, as well as through smaller, more targeted efforts throughout the year. Once a school decides to participate in the program, NTC provides scheduling information for the performance. NTC has flexibility in choosing schools and grades, based on scheduling, routes, and the saturation of previous participants from past participation. If any issue arises with weather, NTC contacts affected schools to schedule a new appointment to maintain participation rates.

Once the principal (or other school administrator) has confirmed the performance date and time, NTC delivers the curriculum materials to the principal's attention for teacher distribution two weeks prior to the performance. Materials include school posters, teacher guides, and classroom and family activity

books. After attending the NTC performance, students are encouraged to complete a home energy survey with their family (via their activity book or online) to receive an Energy Efficiency Home Kit that contains specific energy efficiency measures to reduce home energy consumption. Non-Duke Energy customers at participating schools can receive a smaller Energy Efficiency Home Kit, designed specifically for noncustomers.

NTC also produces contest materials for the performance and conducts follow-up outreach activities to encourage future participation. Follow-up outreach includes newsletters and engaging in social media. Figure 2 shows the full program performance process.

Figure 2. K-12 Performance Delivery Process*



*Image provided courtesy of Duke Energy.

Promotion and Marketing

Program and implementation staff provided feedback regarding outreach and offerings delivered through the program. As in previous years, Duke Energy provided NTC with zip codes within Duke Energy's territory in North and South Carolina and supplied statistics on the number of Duke Energy customers within each zip code. This allowed NTC to target schools more likely to have a high number of Duke Energy customers' children enrolled. In total, 1,270 of the 1,652 eligible schools in North and South Carolina participated in the program this year. This number includes schools that have participated in the past and newly participating schools.

School Incentives

Duke Energy offers the following incentives to schools and students to encourage participation in the program:

- **Contests.** NTC sends invitations to participate in the program via e-mail and mail to the school principal or other administrator. During the interviews, NTC staff said that schools participate because it is an engaging activity for the students, and they are further incentivized by the contests provided by NTC. Each participating school in the Carolinas system is eligible to win a \$10,000 prize for enrolling a minimum of 75 students.
- **Theatrical Performance.** The theatrical performance changes each school year according to NTC policy. Duke Energy reviews and approves the script before NTC performs it at the schools.
- **Classroom Activities.** NTC provides the teachers with a workbook containing classroom activities and an online whiteboard.⁴
- **Household Prizes.** Eligible households that sign up to receive an Energy Efficiency Home Kit and return the business reply card are entered into a drawing to receive a family prize package valued at \$2,500.
- **Energy Efficiency Home Kits.** The Energy Efficiency Home Kits are available to student family and teacher households that have not received an Energy Efficiency Home Kit in the previous three years.

Duke Energy and Implementer Data Tracking

NTC maintains a database of participating and eligible schools, including school staff and student counts. When NTC receives a request for an Energy Efficiency Home Kit, Relationship1 and Duke Energy review the request for eligibility. Duke Energy uploads the verified list of participants weekly for AM Conservation, and AM Conservation then distributes the Energy Efficiency Home Kits, sending out shipments approximately once a week.

⁴ All whiteboard activities are in SMARTboard notebook format and can be found online at: <https://www.resourcereward.org/tour-central.html>.

AM Conservation's system uses FedEx to track shipments; customers may inquire about the status of their order.

The Cadmus team identified minimal issues during the interviews. AM Conservation reported that customers who have billing addresses other than their home addresses may not be aware when their Energy Efficiency Home Kits have been delivered. For example, if a P.O. Box is on file as the customer's billing address, and the customer does not check the P.O. Box regularly, the Energy Efficiency Home Kit may be returned to the utility by post office. AM Conservation also reported that customers occasionally move after ordering an Energy Efficiency Home Kit. In both instances, AM Conservation notes in the database that the customer did not receive an Energy Efficiency Home Kit and is not subject to the three-year waiting period to receive another Energy Efficiency Home Kit.

Market Barriers and Program Challenges

Both program and vendor staff agreed that the most challenging part of the program every year is recruiting new schools. Interviewed staff said that due to a limited number of schools to reach out to, it was difficult to recruit more schools each year. According to Duke Energy, roughly half of the targeted schools contacted through the program go on to participate.

Stakeholders also said that keeping past participants engaged in the program was another challenge. Because participants can only receive Energy Efficiency Home Kits every three years, AM Conservation recommended distributing different Energy Efficiency Home Kits to customers who have participated within the past three years to ensure further participation in the program.

Program Feedback and Suggestions

Program and implementation staff provided feedback and suggestions when asked about what worked well for the program and what changes could be considered for future years.

Interviewed staff reported that the program is working well across multiple components. They stated that marketing is efficient at getting the word out and reaching new households. Staff also said that the presentation provides a positive message and actions participants can take to improve energy efficiency in their homes. NTC staff said that, overall, the program improves every year and that "It teaches. It entertains. It inspires."

The Cadmus team asked program staff and partner staff what suggestions they have to increase program participation. Duke Energy staff recommended more in-depth, prioritized targeting of schools by working with Duke Energy community leaders in areas where there are strong relationships with schools. AM Conservation and NTC suggested having different Energy Efficiency Home Kits for households that have already participated in the program within the three-year limit.

Participant Surveys

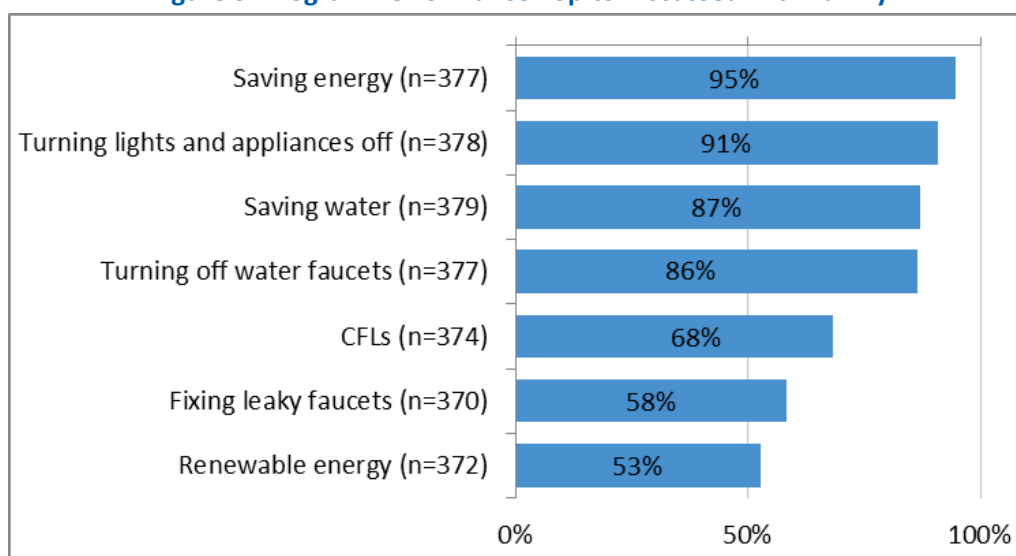
The Cadmus team analyzed feedback from online surveys completed by 510 Duke Energy customers who received Energy Efficiency Home Kits through the Energy Efficiency in Schools Program. This section

presents the results of our analysis by topic. Except where noted, the Cadmus team excluded “don’t know” and “refused” responses, which is reflected in accompanying n-values.

Student Discussion of Performance

When asked if they remembered discussing the NTC performance with their children, 73% (n=510) of the survey respondents answered yes, with almost all respondents reporting “energy savings” and “turning lights and appliances off” as specific topics they discussed with their children (Figure 3). Only about half of the respondents recalled talking to their children about renewable energy and fixing leaky faucets.

Figure 3. Program Performance Topics Discussed with Family



Source: Participant Survey Questions A2.1-7. Did your child say they heard about...?
(Multiple responses permitted.)

Energy Efficiency Home Kit

The survey included questions about participants' experiences with the Energy Efficiency Home Kit, including their recollection of receiving the Energy Efficiency Home Kit, use of energy saving items, and satisfaction with the items.

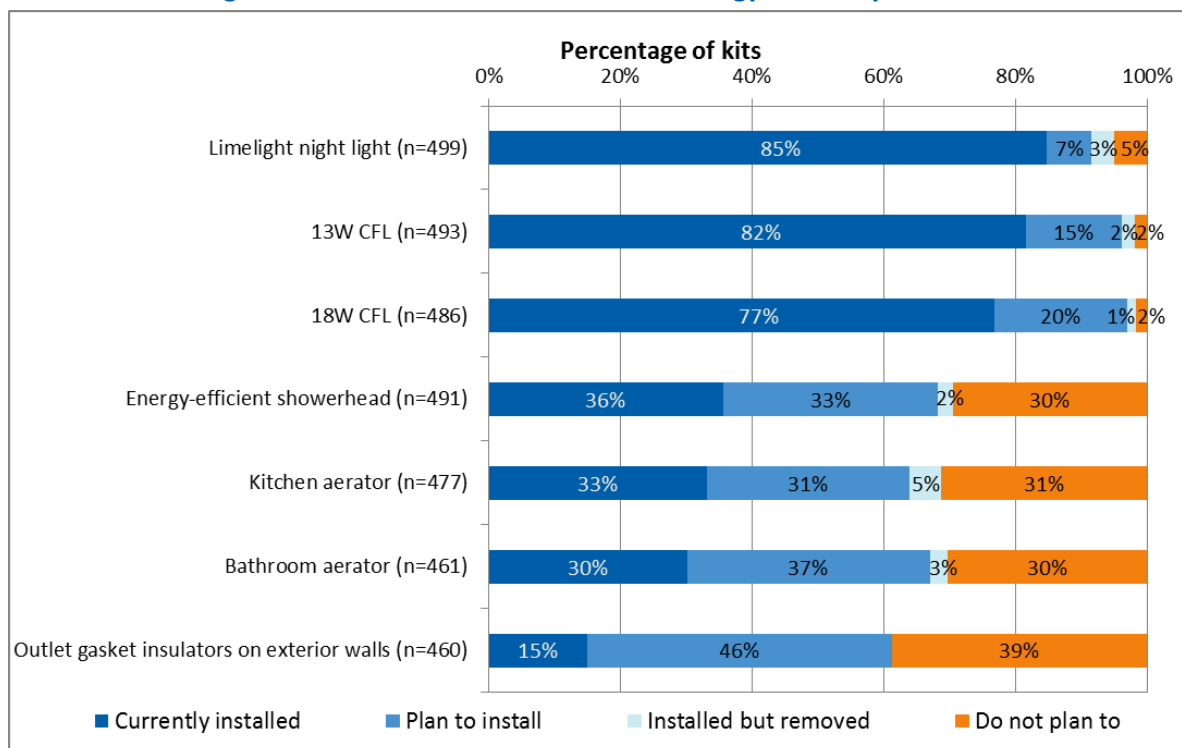
Use of Energy Efficiency Home Kit Items

The survey included a series of questions regarding participants' use of the items in the Energy Efficiency Home Kits. Specifically, the survey asked respondents to choose one of the following outcomes:

- Currently using the item (or had used it in the case of single-use items).
- Not currently using the item but planned to use it in the future.
- Not currently using the item and not intending to use it.
- Installed the item but already removed it.

Survey respondents reported installing the lighting items included in the Energy Efficiency Home Kits most often, as shown in Figure 4. Fifteen-percent of respondents installed the outlet gasket insulators on exterior walls (where they provide energy savings), though nearly half of the respondents still intended to install these measures. Less than 5% of respondents installed and then removed the bathroom aerator, showerhead, Limelight night light, or CFLs. Five percent of respondents installed and then removed the kitchen aerator.

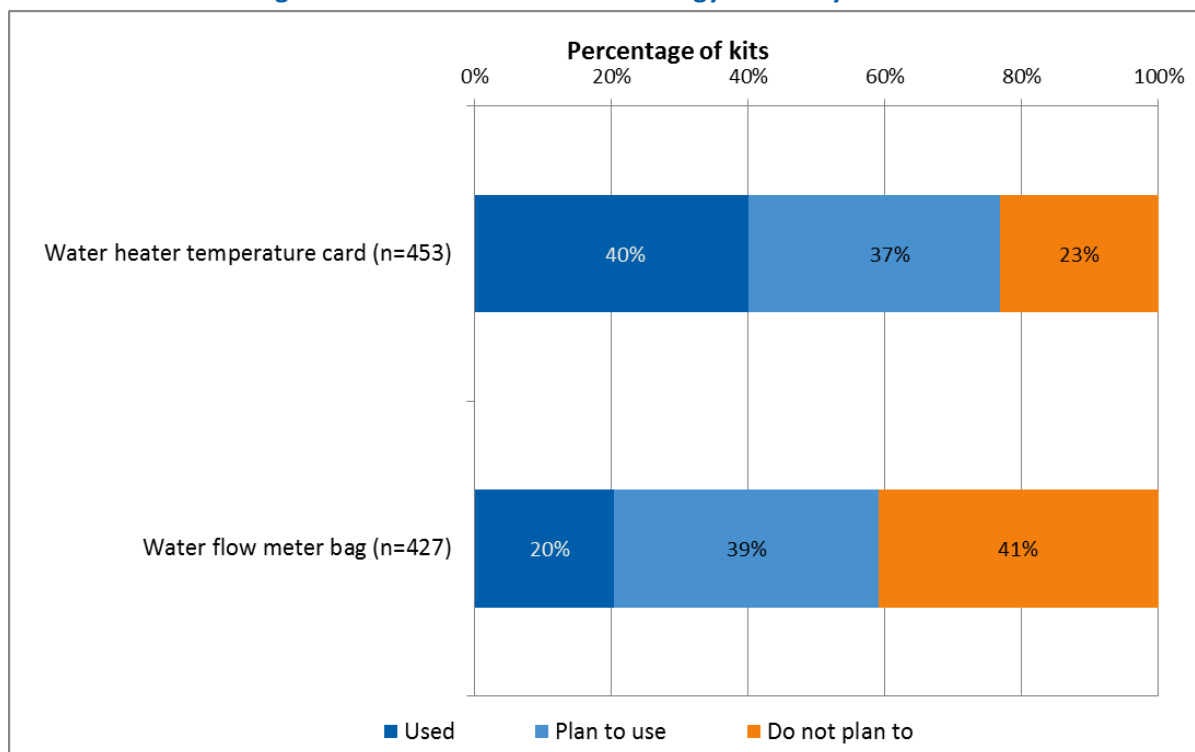
Figure 4. Installation of Items from the Energy Efficiency Home Kit



Source: Participant Survey Questions. Are the [items] that were provided in the Energy Efficiency Home Kit currently installed in your home?

The Energy Efficiency Home Kit also includes a water temperature gauge card and a water flow meter bag. When asked if they used the additional energy efficiency tools included with the Energy Efficiency Home Kit, almost half of the respondents checked their water temperature using the card. Less than a quarter of respondents used the bag to check water flow.

Figure 5. Use of Items from the Energy Efficiency Home Kit



Source: Participant Survey Questions. Did you use the [item] that was provided with the kit?

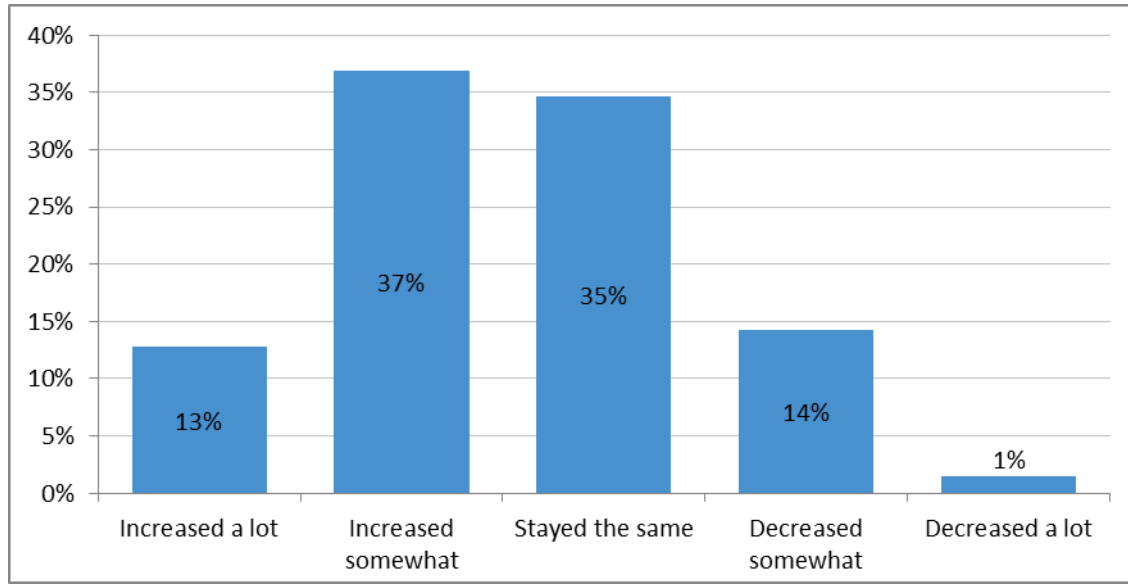
Appendix F. Energy Efficiency in Schools Program Participant Survey contains further detail about the installation and use of items provided in the Energy Efficiency Home Kits.

Energy Saving Behaviors

The Energy Efficiency Home Kit also included an informational booklet (Energy Savers booklet). When asked to estimate how much of the information they had read in the Energy Savers booklet, 43% of respondents (n=510) reported they had read most or all of the information, 35% had read some, 18% had glanced at the information, and 4% did not look at the Energy Savers booklet at all.

When asked if their knowledge of how to save energy and reduce energy bills had increased or decreased after their households' participation in the program, 50% (n=485) of respondents reported that their knowledge had increased somewhat or a lot (Figure 6). Sixteen percent of respondents reported their knowledge had decreased somewhat or a lot.

Figure 6. Increased Knowledge of How to Save Energy and Reduce Utility Bill

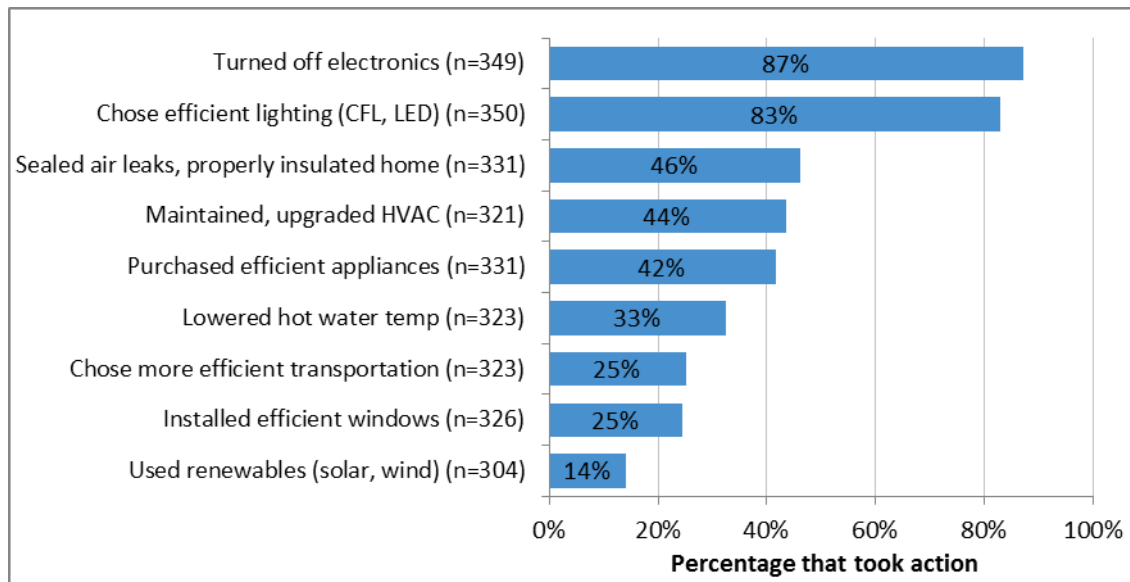


Source: Participant Survey Question A84. Since receiving the kit, has your knowledge of how to save energy and reduce your utility bill... (n=485)

The majority of the respondents who read at least some of the Energy Savers booklet agreed that it was easy to understand (83%, 311 out of 375) and informative (80%, 303 out of 379). Appendix F. Energy Efficiency in Schools Program Participant Survey contains further detail about participant responses to the Energy Savers booklet.

Despite the fact that many survey respondents reported that their knowledge of how to save energy and reduce utility bills did not change based on the information provided, many did make one or more behavior changes as a result of participating in the program. The survey asked survey respondents who read the Energy Savers booklet what actions they have taken based on the prescriptive advice in the booklet (Figure 7). Respondents most frequently turned off electronics when not in use (87%) and choose efficient CFL and LED lighting (83%), and about half of the respondents sealed air leaks (46%) and maintained and upgraded HVAC equipment (44%). Appendix F. Energy Efficiency in Schools Program Participant Survey contains further detail about the actions respondents took as a result of reading the Energy Savers booklet.

Figure 7. Actions Taken Based on Energy Savers Booklet



Source: Participant Survey Questions A82.1-9.

Based on the advice in the booklet, have you taken any of the following actions?
(Multiple responses permitted. Percentages are of total number of respondents and exceed 100%.)

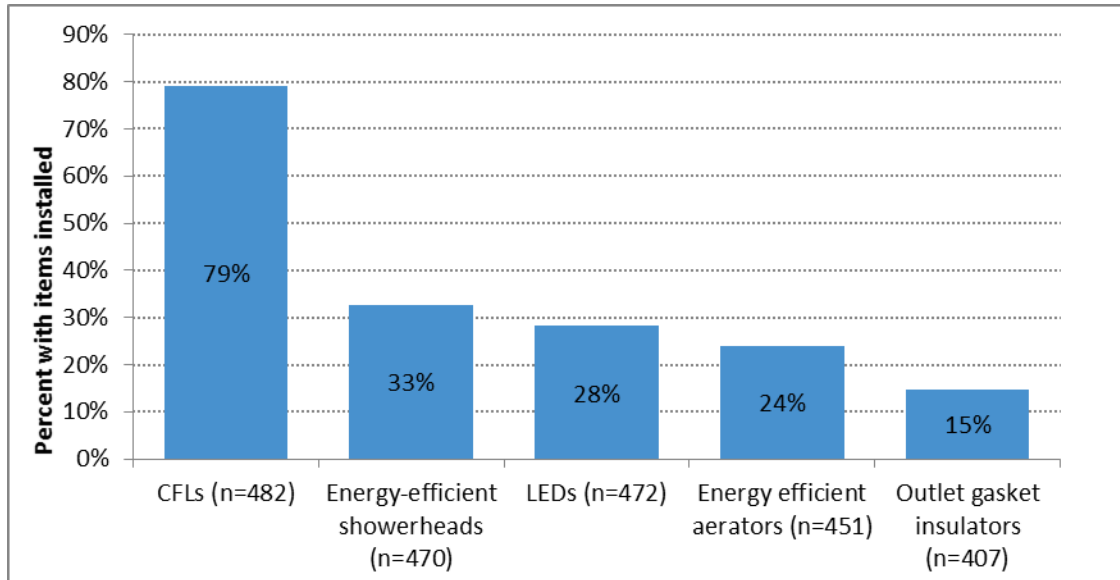
Previous and Future Experience with Energy Efficiency Home Kit Items

The survey include questions about participants' experiences with energy saving items similar to those included in the Energy Efficiency Home Kit before and after participating in the program.

Energy Efficient Items Installed Before the Program

When asked if they had previously installed items similar to the ones provided in the Energy Efficiency Home Kit prior to participating in the program, 79% (n=482) of survey respondents had CFLs installed before the program (Figure 8).

Figure 8. Items Installed Before the Program



Source: Source: Participant Survey Questions A14, A21, A35, A49, and A59.

Did you have any [items] installed in your home before receiving the kit?

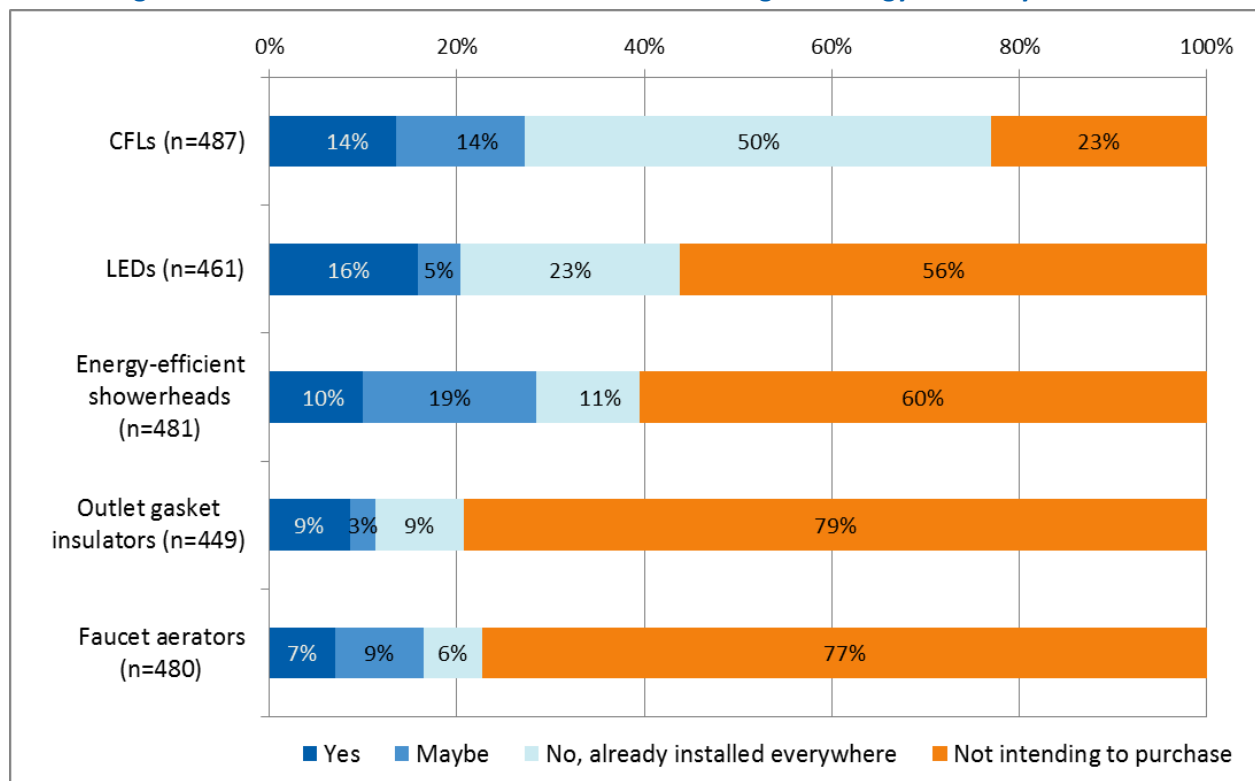
(Multiple responses permitted; percentages are for the total number of respondents and exceed 100%.)

Appendix F. Energy Efficiency in Schools Program Participant Survey contains additional information about CFLs and LEDs respondents installed before participating in the program.

Intention to Purchase Energy Efficient Items

Figure 9 shows which items from the Energy Efficiency Home Kit survey respondents were intending to purchase before participating in the program. Fifty percent (n=487) were not intending to purchase CFLs because they already had them installed throughout their homes, and 23% (n=461) reported the same for LEDs. Eleven percent (n=449) of respondents intended to or thought they may purchase outlet gasket insulators, and 28% (n=481) reported the same for energy-efficient showerheads. (Note: the Cadmus team used these survey questions to estimate freeridership for respondents who installed these measures; the results presented here include all survey respondents, including those who did not install these measures.)

Figure 9. Intention to Purchase Items Before Receiving the Energy Efficiency Home Kit



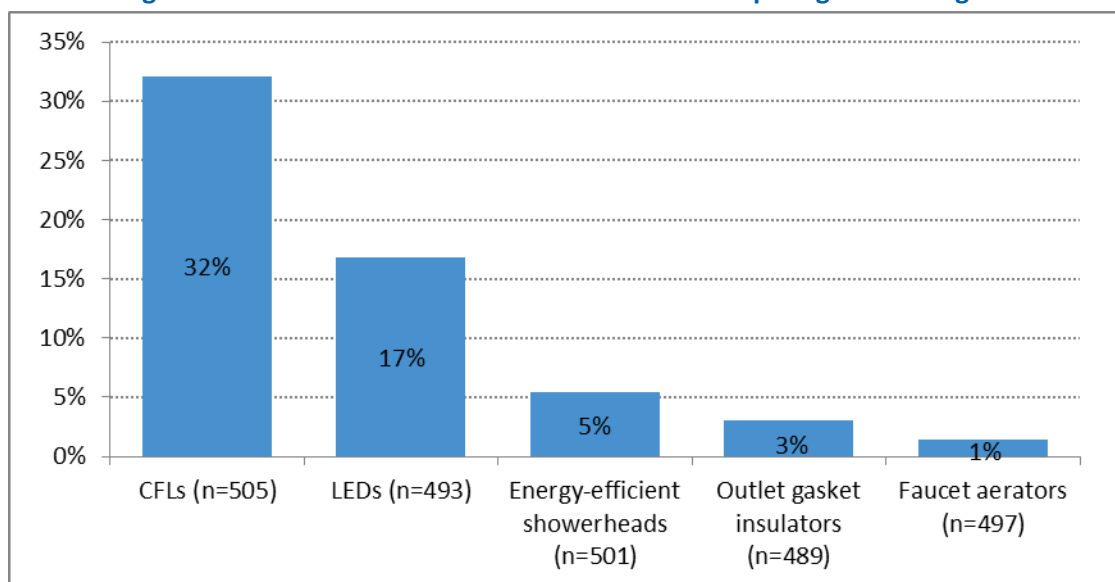
Source: Participant Survey Questions A16, A23, A36, A50, and A60.

Were you planning on buying [items] for your home before you received the kit?

Additional Items Purchased and Installed Since Receiving the Energy Efficiency Home Kit

Forty-four percent of (n=510) respondents purchased additional energy efficiency items after receiving the Energy Efficiency Home Kit (Figure 10). CFLs and LEDs were the items most frequently purchased by respondents. Appendix F. Energy Efficiency in Schools Program Participant Survey contains more information about additional measures survey respondents purchased and installed after the program.

Figure 10. Purchase of Additional Items Since Participating in the Program



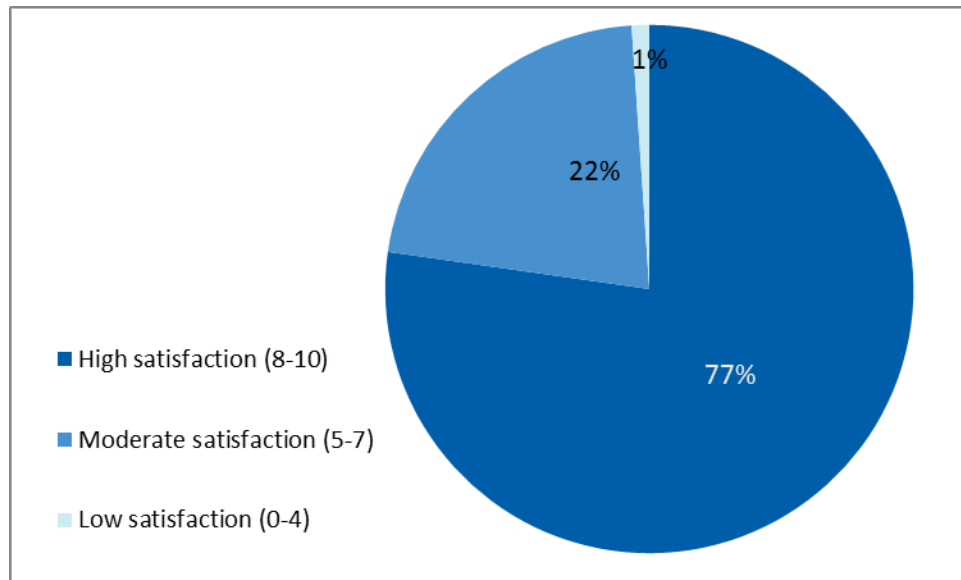
Source: Participant Survey Questions A17, A24, A37, A51, and A61.
Have you purchased any additional [items] since receiving the kit?

Satisfaction

Program Satisfaction, Improvements, and Benefits

When asked to rate their overall satisfaction with the program on a 10-point scale, where 0 indicates *extremely dissatisfied* and 10 indicates *extremely satisfied*, 77% of respondents (n=466) provided satisfaction ratings of 8 or higher; this includes 50% of respondents who gave the program a 10 out of 10 (Figure 11). Only 1% of respondents gave the program satisfaction ratings of 4 or lower. The average satisfaction rating for the program was 8.7 and the median rating was 9 out of 10.

Figure 11. Overall Satisfaction with the Program



Source: Participant Survey Question A85. Thinking about the Duke Energy/The National Theatre for Children Program overall, on a scale from 0 to 10, where 0 is *extremely dissatisfied* and 10 is *extremely satisfied*, how would you rate your overall satisfaction with the program? (n=466)

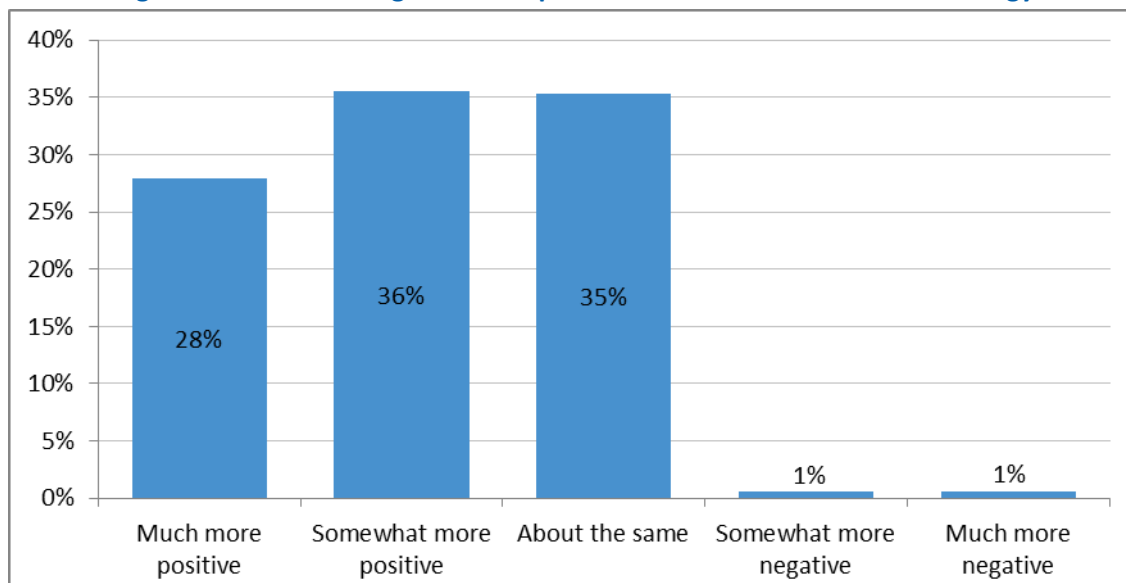
When asked for suggestions to improve this program, 25 of the 510 surveyed participants offered the responses summarized in Table 8.

Table 8. Participant Suggestions to Improve the Program

Suggestion	Count of responses (n=25)
Provide additional Energy Efficiency Home Kit items (one respondent made two suggestions): <ul style="list-style-type: none"> • LEDs (four mentions) • Sensors to control lights automatically (two mentions) • Ceiling fan light bulbs (two mentions) • Include more CFLs or coupons for CFLs (one mention) 	8
Allow customers to customize the Energy Efficiency Home Kit items for their home	3
Provide more informational material with the program	2
Make the program ongoing, rather than once per school year	2
Make sure Energy Efficiency Home Kits include all items (these respondents claimed they did not receive items in their Energy Efficiency Home Kits)	2
Place a list of all Energy Efficiency Home Kit items contained in the Energy Efficiency Home Kit on top of the items so that you see the list as soon as you open the box	1
Give the Energy Efficiency Home Kits to children at school rather than shipping them by mail	1
Give students homework assignments relating to this program	1
Include more visual aids for younger children	1
Do not include water usage in the program, focus only on energy conservation	1
Make the Energy Efficiency Home Kits more “mom-friendly”; my husband had to do all the installations	1
My two children thought we would receive two Energy Efficiency Home Kits and were disappointed; make sure to communicate that the limit is one Energy Efficiency Home Kits per household	1
Do not offer the pizza party prize	1

When asked if participation in the program made them feel more positively or more negatively toward their utility, 63% of respondents (n=501) felt more positive toward Duke Energy, while only 1% felt more negative (Figure 12).

Figure 12. Effect of Program Participation on Attitude Towards Duke Energy

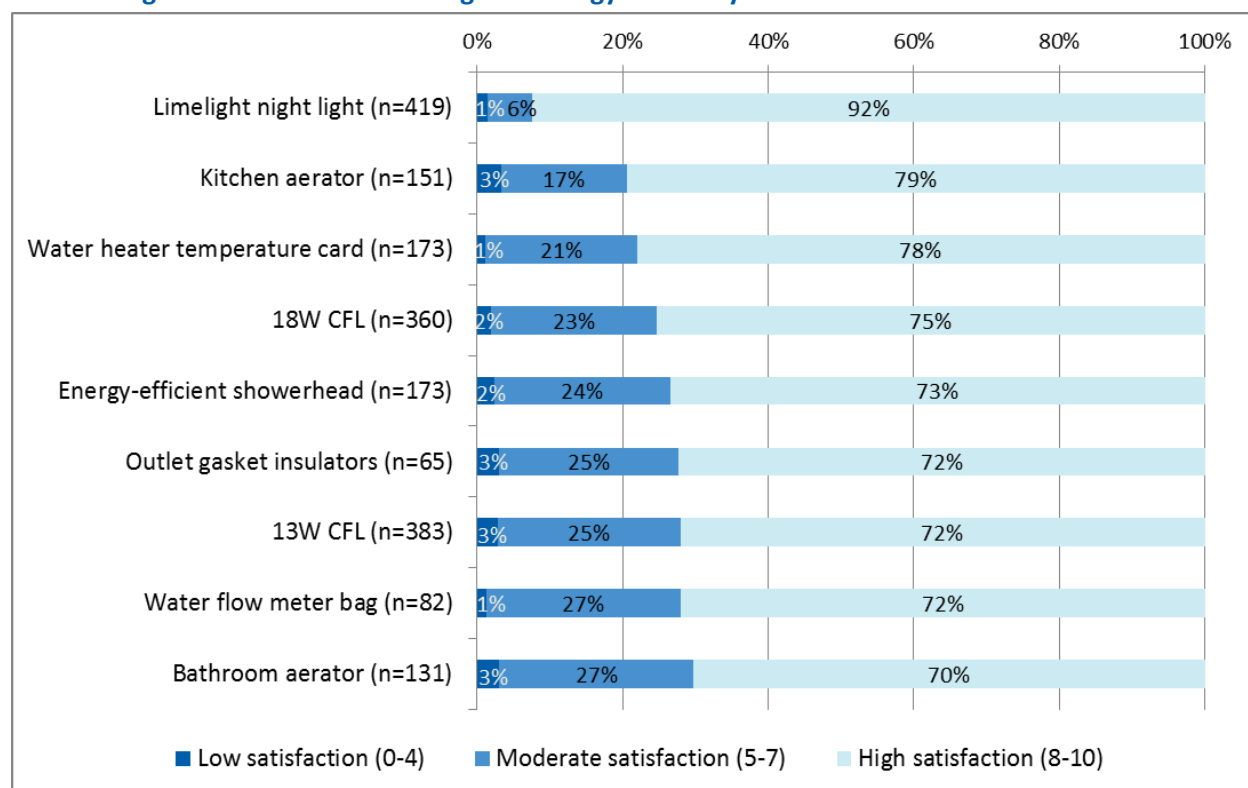


Source: Participant Survey Question A91. As a result of participating in the National Theatre for Children Program, would you say your attitude toward Duke Energy is... (n=501)

Satisfaction with Energy Efficiency Home Kit Items

The survey asked respondents who reported using or installing items provided in the Energy Efficiency Home Kit to rate their satisfaction with these items on a 10-point scale, where 0 is *extremely unsatisfied* and 10 is *extremely satisfied*. The Limelight night light received the highest satisfaction ratings, with 92% of respondents reporting high satisfaction. Figure 13 shows the satisfaction ratings for each of the Energy Efficiency Home Kit items. The average satisfaction rating for all installed or used items is 8.7 on a 10-point scale, ranging from 8.4 (13-watt CFL and bathroom aerator) to 9.4 (Limelight night light).

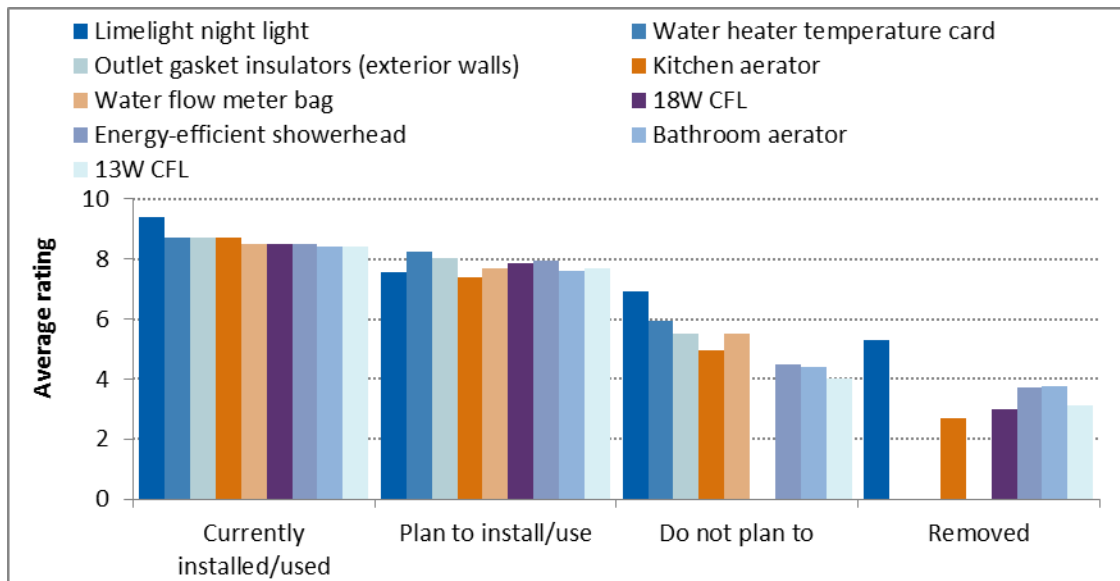
Figure 13. Satisfaction Ratings for Energy Efficiency Home Kit Items Installed or Used



Source: Participant Survey Questions A9, A11, A33, A44, A47, A57, A68, A74, and A78. On a scale from 0 to 10, where 0 is *extremely dissatisfied* and 10 is *extremely satisfied*, how satisfied are you with...

The survey also asked participants who reported they had not installed or used an item from the Energy Efficiency Home Kit to rate their satisfaction with the items using the same 10-point satisfaction scale (Figure 14). Respondents who still planned to use or install these items gave satisfaction ratings that were only slightly lower than those who had already used or installed the items (average rating of 7.8 for items they planned to use or install). Respondents who did not plan to install or use these items gave much lower satisfaction ratings (average rating 5.0), and respondents who installed but then removed items gave the lowest ratings of all (average rating 3.6).

Figure 14. Satisfaction Ratings for Energy Efficiency Home Kit Items not Installed or Used



Source: Participant Survey Questions. On a scale from 0 to 10, where 0 is *extremely dissatisfied* and 10 is *extremely satisfied*, how satisfied are you with... (Valid n=173 to 457 by measure.)

Respondents who gave satisfaction ratings of 4 or lower on the 10-point scale for an Energy Efficiency Home Kit measure offered the following reasons for their low satisfaction. Table 9 lists a summary of satisfaction ratings, by reason, for each measure. These responses include participants who installed these items but then removed them.

Table 9. Reasons for Low Satisfaction with Energy Efficiency Home Kit Measures

Reason for Lower Satisfaction (count of responses)	CFLs	Shower-heads	Aerators	Outlet gasket insulators	Water flow meter bag	Water heater temp card	Limelight night light	Total
Dissatisfied with performance of product	22	17	27	1		2	8	77
Dissatisfied with quality	14	13	14	1				42
Does not fit / cannot install		3	20	3				26
Damaged / defective item	9		3				2	14
Difficult to install / use					4	1		5
Other reasons	5	1	2			1	2	11

Impact Evaluation Findings

This chapter presents the results of the Cadmus team's impact evaluation for Duke Energy Carolina's Energy Efficiency in Schools Program. The findings divide into four sections: Program Savings, Billing Analysis, Engineering Analysis, and Net-to-Gross Analysis. Table 10 lists the primary evaluation activities and the dates in which the Cadmus team conducted them.

Table 10. Impact Evaluation Data Collection and Analysis

Evaluation Component	Participation Dates	Data Source(s)	Dates of Data Collection/Analysis
Billing Analysis	June 1, 2014 – May 27, 2015	<ul style="list-style-type: none"> Utility billing data (n= 26,526 program participants) 	July - August 2015
Engineering Analysis	June 16, 2014 - March 4, 2015	<ul style="list-style-type: none"> Participant survey (n=510) Illinois TRM Ohio Draft TRM Mid-Atlantic TRM 	May 2015/ July – August 2015
Net-to-Gross Analysis	June 16, 2014 - March 4, 2015	<ul style="list-style-type: none"> Participant survey (n=510) 	May 2015/ July – August 2015

Energy Efficiency in Schools Program Savings

Cadmus conducted a billing analysis to estimate overall net energy savings per household for the Energy Efficiency in Schools Program in the Duke Energy Carolina system. We also performed an engineering analysis to estimate relative savings contributions from the items provided in the Energy Efficiency Home Kit and a net-to-gross analysis to account for freeridership and spillover adjustments. By conducting billing, engineering, and net-to-gross analyses, Cadmus determined which portion of the net energy savings achieved per household resulted from installation of items from the Energy Efficiency Home Kit and which portion resulted from energy saving actions and behaviors taken by participants.

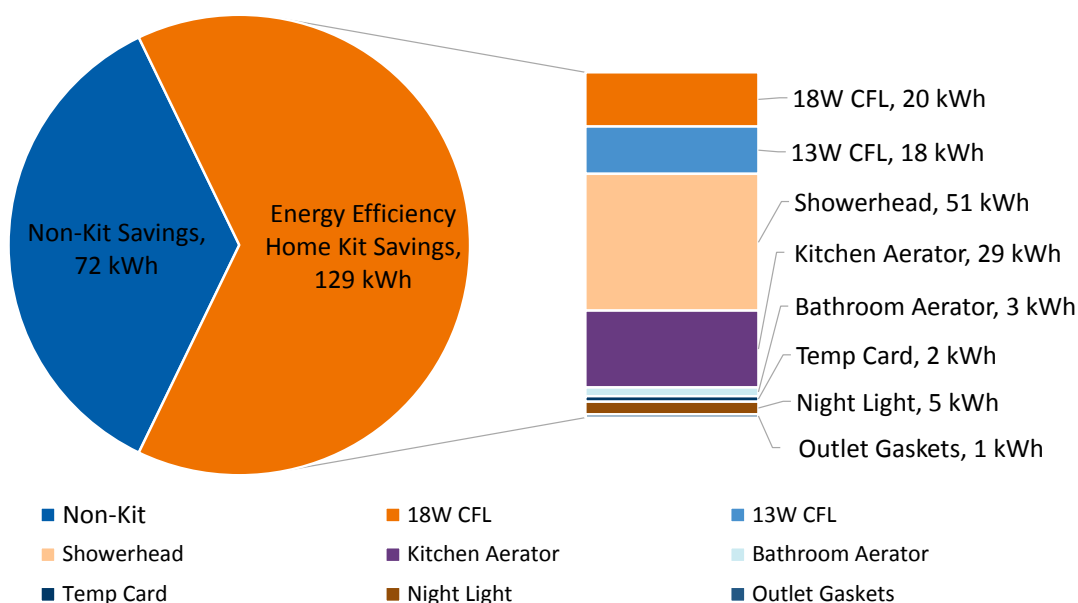
Results of the billing analysis indicate that the average participant household saved approximately 201 kWh as a result of participating in the Energy Efficiency in Schools Program. Results from the engineering results indicate that approximately 64% (129 kWh) of this savings came from participants installing Energy Efficiency Home Kits items. The remaining 36% of the household savings resulted from participants taking energy saving actions and behaviors because of their education through the program. As discussed in the participant survey findings, participants reported taking the following energy saving actions in their homes:

- Turned off lights and electronic items when not in use;
- Sealed air leaks and properly insulated the home;
- Maintained and upgraded HVAC equipment and major household appliances;
- Used less heating and cooling (thermostat adjustments);
- Used lower power cycles or temperature settings for appliances;

- Conserved water and used water heater less;
- Installed shades, blinds, or curtains to better control heat and light from outdoors; and
- Installed timers, occupancy sensors, or motion detectors for lighting.

Cadmus used the proportion of energy savings associated with each item in the Energy Efficiency Home Kit to calculate its relative contribution to the overall household savings. Figure 15 shows the contribution of savings from each measure.

Figure 15. Energy Savings from Energy Efficiency Home Kit and Behaviors



In total, 26,802 Duke Energy participants received an Energy Efficiency Home Kit between June 2014 and May 2015, and the average participant saved 201 kWh.

Table 11 lists the total net program savings for the Energy Efficiency in Schools Program and Table 12 presents the Energy Efficiency Home Kit item metrics and savings details for the Energy Education in Schools Program. Finally, the following sections present detailed results from the billing analysis, engineering analysis, and net-to-gross analysis.

Table 11. Energy Efficiency in Schools Program Net Savings

Measure	Count*	Net kWh Savings per Participant	Net kWh
Duke Energy Efficiency Home Kit	26,802	201	5,387,202

* The number of Energy Efficiency Home Kits distributed, as reported by Duke Energy.

Table 12. Engineering Analysis Energy Efficiency Home Kit Savings Details

Metric	13W CFL	18W CFL	Energy- efficient showerhead	Kitchen Aerators	Bathroom Aerators	Hot Water Temp Card	Limelight Night Light	Outlet Gasket Insulators	Entire Energy Efficiency Home Kit
Units	Bulb	Bulb	Showerhead	Aerator	Aerator	Change	Light	12 pack	Kit
In-Service Rate	88%	85%	36%	33%	30%	7%	85%	6%	
Gross kW Per Unit	0.0027	0.0029	0.0064	0.0073	0.0066	0.0002	0.0000	0.0008	0.0269
Gross kWh Per Unit	26.03	29.81	50.97	24.95	2.86	1.77	4.12	1.24	141.74
Freeridership Rate	47.3%	47.3%	14.7%	0.0%	0.0%	0.0%	0.0%	16.3%	24.1%
Spillover Rate	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%
NTG Ratio	68.0%	68.0%	100.6%	115.3%	115.3%	115.3%	115.3%	99.0%	91.2%
Net kW Per Unit	0.0018	0.0020	0.0065	0.0084	0.0076	0.0002	0.0000	0.0007	0.0273
Net kWh Per Unit	17.70	20.27	51.26	28.76	3.30	2.04	4.75	1.22	129.32
Measure Life (Years)*	5	5	10	9	9	2	8	15	8
EUL Net kWh Per Unit	88.51	101.37	512.58	258.88	29.67	4.08	38.04	18.35	998.27

* To calculate overall measure life, the Cadmus team used a weighted average derived from the effective useful lives of the individual Energy Efficiency Home Kit items. We assigned weights based on each item's contribution to gross kWh savings.

Billing Analysis

Cadmus conducted a billing analysis of the participants in the Energy Efficiency in Schools Program in the Duke Energy Carolina System. Duke Energy reported deliveries of 26,802 Energy Efficiency Home Kits for the evaluation period ending May 31, 2015. Duke Energy provided billing data for the electric customers who participated in the Duke Energy Carolina System Energy Efficiency in Schools Program between June 1, 2014, and May 27, 2015.

Cadmus tested two panel model specifications (Model 1 and 2) to determine program impacts; the dependent variable was daily electricity consumption from January 2011 to May 2015. Table 13 shows the results of the selected 2015 billing analysis.

Table 13. Estimated Impact of Duke Energy Carolina System Energy Efficiency in Schools Program

Program Year Evaluated	kWh Per Participant Annual Savings (Net)
2015	201

For this analysis, Cadmus had access to data for both households (i.e., cross-sectional) and over time (i.e., time-series). With this type of data, also known as panel data, it was possible to control, simultaneously, for differences across households, as well as differences across time, through the use of a fixed-effects panel model specification. Fixed-effect refers to the model specification aspect that differences across homes that did not vary over the estimation period (such as square footage, heating system, etc.) could be explained, in large part, by customer-specific intercept terms that captured the net change in consumption due to the program, controlling for other factors that did change with time (e.g., the weather).

Because the consumption data in the panel model included months before and after the installation of measures through the program, we could define the period of program participation (or the participation window) for each customer. This feature of the panel model allowed for the pre-installation months of consumption to act as controls for post-participation months. Because we knew the month of participation in the program for each participant, we were able to construct customer specific models that measured the change in usage consumption immediately before and after the date of program participation, while also controlling for weather and customer characteristics such as participation in other Duke Energy efficiency programs.⁵

The fixed effects model can be viewed as a type of simple differencing model that captures all home characteristics independent of time and determines the energy consumption level within customer-

⁵ The participation month is defined by the date that the household receives the Energy Efficiency Home Kit, as reported by the vendor. We assumed participants installed the kits in the same month they were delivered.

specific constant terms. The following equation describes the general fixed-effect panel data model used in the evaluation:

$$y_{it} = \alpha_i + \beta x_{it} + \varphi P_{it} + \theta T + \delta DP_{it} + \varepsilon_{it}$$

Where:

y_{it} = average daily consumption for home i during month t

α_i = constant term for home i (the fixed-effect)

T = indicator variables for each month-year in the analysis

P = indicator variable for whether the month is pre- or post-treatment. This variable equals 1 in months following the arrival of the Energy Efficiency Home Kit and 0 otherwise.

DP = indicators for other utility-sponsored programs⁶

$\beta, \varphi, \vartheta, \delta$ = vectors of estimated coefficients

x = vector of non-program variables that represent factors causing changes in energy consumption for home i during month t (i.e., weather)

ε = error term for home i during month t .

With this specification, the only information necessary for estimation included those factors that vary month-to-month for each customer and that affected energy use, which were effectively weather conditions and participation in other Duke Energy programs. The model captured other non-measurable time-variant factors (such as economic conditions and season loads) through the use of monthly indicator variables.⁷ To control for weather effects, we included cooling degree days and heating degree days in the model.⁸

To estimate the effect of the Energy Efficiency in Schools Program, we included an indicator variable that was equal to one for all months after the household participated in the program. The coefficient on this variable was the savings associated with the program. In order to account for differences in billing days, we normalized the usage by days in the billing cycle.

⁶ See Table 29 for the list of other programs.

⁷ Wooldridge, Jeffrey. *Econometric Analysis of Cross Section and Panel Data*. Cambridge: MIT Press. 2002. pp. 283-284. Includes a discussion of this model and its applicability to program evaluation.

⁸ The cooling degree day and heating degree day variables were set using a 65 degree Fahrenheit base.

Cadmus used the equation above as the foundation to both Model 1 and Model 2, including the same set of variables in both specifications. The main difference between the two models were the months included in the dataset. Model 1 included all pre- and post- period months, and Model 2 set a restriction on the months (t), as described below.

Model 1 was used in the 2013 evaluation. In the 2015 evaluation, Cadmus tested Model 2 and found that it yielded results with improved precision.⁹ The imprecision in Model 1 is most likely due to the unbalanced panel present in the 2015 program year—the majority of participants received Energy Efficiency Home Kits at the end of calendar year 2014. This allowed for very little post-period data (the mean number of participants' post-month bills was only 5.8). Model 1 compared participants' consumption in these few post-months to that of nearly 35 pre-period months for the average participant. As a result, the month-year indicators were not able to absorb all the seasonal variation between consumption in the post-period months, which occurred mainly during lower-consumption winter and spring months and pre-period months.

To adjust for this limited post-installation data in Model 2, we paired pre- and post-installation months to prevent seasonal bias that would result from using mismatched months. For example, if participants received an Energy Efficiency Home Kit in November 2014, their post-period months would include six months (December 2014 to May 2015). In Model 2, we used these participant's pre-period consumption for the same six months in 2011 through 2013 dropping those years' remaining six months. This allowed for a direct comparison of pre- and post-months in the absence of many post-period months. As such, we did not include the month-year indicators (T, in the equation above). As shown in Table 14, Cadmus was able to estimate statistically significant savings using Model 2.

To account for customers with insufficient data, Cadmus used a number of screening methods. For both models, we removed customers' month-bills if they were less than 30 kWh or if they included less than 15 days when we assumed homes were vacant. We also excluded large outliers when annual consumption exceeded 60,000 kWh. We also removed customers who had fewer than 10 months of pre-period data. Model 2 involved additional screening at the customer level in order to adequately select pre- and post- month pairs. In Model 2, we limited the allowable amount of a customer's change in consumption from the mean pre-period months to the post-period months to $\pm 50\%$. In other words, if customers' usage shifted in the post-period by more than 50%, we excluded them from the dataset. This step removed 15.6% of customers who met this outlier criterion in the Model 2 dataset.

⁹ At the 90% confidence level, we divided the two-tailed critical value of 1.645 by the reported t-test of -6.34 from the 2013 evaluation, then took the absolute value and converted to a percentage to get 26%. The same methodology was used to determine precision for Model 2 in the current 2015 evaluation. If precision is found to be below 100% at the given confidence level, then the savings estimates are statistically significant, meaning that we can reject the Null hypothesis. Note that this precision calculation should not be confused with the 90/10 sampling rule used in the survey methodology.

Table 14. Detailed Savings Model Estimates

Evaluation Year	Number of Accounts	Model*	Number of Observations ^{2**}	Post-Coefficient (Daily kWh)	Yearly Savings Per Customer (kWh) ^{***}	Standard Error	T-Test	Precision	Mean Annual Per-Customer Pre-Usage	Percentage of Savings ^{****}
2013	29,220	Model 1	478,112	-0.646	236 (175,297)	0.10	-6.34	26%	17,484	1.35% (1.00%,1.70%)
2015	21,340	Model 2	489,276	-0.55	201 (166,236)	0.06	-9.51	17%	16,332	1.23% (1.02%, 1.44%)

*Model 1: ALL PRE/POST DATA: customer fixed-effects + weather + month-year indicators + other programs. Model 2: PAIRED MONTHS: customer fixed-effects + weather + other programs, 50% change or less.

**The exact number of observations for Duke Energy Carolina system from the 2013 study is not known, rather was estimated using the breakdown of account numbers by state.

***90% confidence intervals in parentheses.

****Percentage of savings calculated as yearly savings divided by pre-treatment usage. 90% confidence intervals in parentheses.

In Table 14, the dependent variable is the daily energy use and that a reduction in usage reflects positive savings. To calculate the annual kWh savings, Cadmus annualized the post-period coefficient by multiplying by 365, which resulted in 201 kWh savings per year. We calculated the equivalent percentage as the coefficient (daily kWh) divided by average pre-program usage—201 kWh divided by the average annual pre-program usage of 16,332 kWh. Appendix C. Billing Analysis Regression Details contains the complete estimated model, including weather and time factors.

Engineering Analysis

Cadmus used engineering analysis to determine the proportion of household energy savings resulting from use of items included in the Energy Efficiency Home Kit. In addition, the engineering estimates provide a ratio of coincident kW reduction to kWh savings. This section presents details of the engineering analysis and high-level results; additional details are provided in Appendix D. Engineering Analysis Energy Efficiency Home Kit Savings Details.

CFLs

The Energy Efficiency Home Kit distributed to Duke Energy customers included one 13-watt CFL and one 18-watt CFL. Table 15 lists the estimated savings associated with each of these CFLs.

Table 15. Savings Estimates per CFL Distributed to Duke Energy Customers*

Bulb Type	In Service Rate	Average Wattage of Bulb Removed	Average Adjusted Daily Hours of Use	Gross kWh	Gross kW	NTG	Net kWh	Net kW
13-watt	88%	41.7	2.85	26.03	0.0027	68.0%	17.70	0.0018
18-watt	85%	50.1	3.04	29.81	0.0029	68.0%	20.27	0.0020

*Cadmus obtained inputs to the engineering algorithm from participant surveys and the Mid-Atlantic TRM.

In Service Rate (ISR) Calculation

Cadmus adjusted the first-year ISR reported by survey participants to reflect future installations. An example of this adjustment follows.

Participant surveys indicated the 18-watt CFL distributed in the Energy Efficiency Home Kit's had a first year ISR of 77%. That is, 77% of the 18-watt CFLs distributed to survey participants were installed at the time of the survey. ISR is calculated to be 85% using the following formula:

$$\text{ISR} = \text{first year ISR} + (43\% * \text{remainder}) = 77\% + (43\% * 20\%) = 85\%$$

Where, the remainder is the percentage of bulbs that are not installed in the first year ($100\% - 77\% = 23\%$) less 3% for the 97% lifetime ISR.¹⁰ In this case, the remainder is 20%. The 43% represents the percentage of the remainder that will replace an incandescent bulb rather than a CFL.¹¹

Self-Reporting Bias

Previous CFL evaluations conducted for Duke Energy during 2010 to 2013 included customer surveys and lighting loggers. These studies compared customers' self-reported hours of operation to the actual hours of operation and showed that customers who responded to the survey overestimated their lighting usage by 27%.¹² As the 2015 impact evaluation did not employ lighting loggers, Cadmus did not have appropriate data to make a similar comparison for the Energy Efficiency in Schools Program. Consequently, we reduced the self-reported hours of use obtained from the survey by 27%, as established through the collection of data from previous programs. This bias applies to CFLs only.

Table 16 shows the unadjusted average hours-of-use values and the updated average hours-of-use values after we applied the self-reporting bias. The final value for the average daily hours of use for a Duke Energy customer is 2.85 for 13-watt CFLs and 3.04 for 18-watt CFLs.

Table 16. Adjusted Average Daily Hours of Use

Adjustment	Magnitude of Adjustment	Average Daily Hours of Use (13W)	Average Daily Hours of Use (18W)
Unadjusted	N/A	3.91	4.17
Self-Reporting Bias Applied	27%	2.85	3.04

¹⁰ Nexus Market Research, RLW Analytics, and GDS Associates. *New England Residential Lighting Markdown Impact Evaluation*. 2009.

¹¹ Nexus Market Research and RLW Analytics. *Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs*. 2004. Table 6-4: 24 out of 56 respondents indicated that they did not purchase the CFLs as spares.

¹² The adjustment for the self-reporting bias used in this study was determined using paired lighting logger and customer self-reported data from Duke Energy Kentucky, Ohio, North Carolina, South Carolina, and Indiana, referenced in the Duke Energy *Process and Impact Evaluation of the Energy Efficiency in Schools Program*. 2014.

Energy-Efficient Showerhead

Each Energy Efficiency Home Kit contained one energy-efficient showerhead. Thirty-six percent of survey respondents installed the energy-efficient showerheads, and approximately 68% of respondents' households use electric water heaters. Table 17 lists the ISR, electric water heater saturation, and savings estimates for this measure.

Table 17. Savings Estimates per Showerhead Distributed*

In Service Rate	Electric Water Heating**	gpm base	gpm low	Gross kWh	Gross kW	NTG	Net kWh	Net kW
36%	68%	2.35	1.5	50.97	0.0064	100.6%	51.26	0.0065

* Cadmus obtained inputs to the engineering algorithm from participant surveys and the Illinois and Mid-Atlantic TRMs.

**This measure produces zero kW or kWh savings in households that use gas water heaters.

Faucet Aerators

The Energy Efficiency Home Kits included one kitchen aerator and one bathroom faucet aerator. Thirty-three percent of survey respondents installed the kitchen aerators and 30% installed the bathroom aerators. Table 18 presents the ISR, electric water heater saturation, and savings estimates for this measure.

Table 18. Savings Estimates per Aerator Distributed*

Measure	In Service Rate	Electric Water Heating**	Gross kWh	Gross kW	NTG	Net kWh	Net kW
Kitchen Aerator	33%	68%	24.95	0.0073	115.3%	28.76	0.0084
Bathroom Aerator	30%	68%	2.86	0.0066	115.3%	3.30	0.0076

* Cadmus obtained inputs to the engineering algorithm from participant surveys and the Illinois and Mid-Atlantic TRMs.

**This measure produces zero kW or kWh savings in households that use gas water heaters.

Outlet Gasket Insulators

The Energy Efficiency Home Kits included a 12-pack of switch and outlet gasket insulators. Only 6% of survey respondents installed these items. Table 19 list the ISR, along with gross and net savings estimates per unit distributed.

Table 19. Savings Estimates per 12-Pack Distributed to Duke Energy Customers

In Service Rate*	Gross kWh	Gross kW	NTG	Net kWh	Net kW
6%	1.24	0.0008	99.0%	1.22	0.0007

* We only included outlet gasket insulators installed in exterior walls in the ISR, as outlet gasket insulators installed in interior walls do not result in energy savings.

Limelight Night Light

The Energy Efficiency Home Kits included one Limelight night light. The majority of survey respondents (85%) installed this measure. However, previous research indicates that approximately 58%¹³ of installations do not replace an existing light; in this case, the measure did not result in energy savings. Some participants replaced LED night lights with the Limelight night light, which resulted in minimal energy savings.

For installations that replaced an existing incandescent night light, we assumed that the replaced bulb was five watts. Once we factored in the new installations and LED replacement, the average wattage for replaced bulbs drops to 1.76 watts. Table 20 lists the ISR, average wattage, and average hours of use, along with gross and net savings estimates per unit distributed. We assumed that demand savings to be zero for this measure.

Table 20. Savings Estimates per Limelight Night Light Distributed

In Service Rate	Average Wattage Light Removed	Average Daily Hours of Use Base	Average Daily Hours of Use EE	Gross kWh	Gross kW	NTG	Net kWh	Net kW
85%	1.76	8	24	4.12	0.0000	115.3%	4.75	0.0000

¹³ Based on 2013 Duke Energy Energy Education Program Evaluation.

Water Heater Temperature Card

The Energy Efficiency Home Kits included a water heater temperature card. Survey results indicated that 7% of respondents used the card and went on to reduce the temperature of their hot water heater by an average of -7 degrees Fahrenheit. Table 21 lists the ISR and average temperature, along with gross and net savings estimates per unit distributed.

Table 21. Savings Estimates per Hot Water Temperature Card Distributed

In Service Rate	Electric Water Heating*	Average Temperature Adjustment (°F)	Gross kWh	Gross kW	NTG	Gross and Net kWh	Gross and Net kW
7%	68%	-7	1.77	0.0002	115.3%	2.04	0.0002

*This measure produces zero kW or kWh savings in households that use gas water heaters.

Net-to-Gross Findings

The presentation of freeridership and spillover is provided for informational purposes only; we did not use these estimates to adjust gross energy impacts to report net savings. Because the impact analysis approach compares the customer's electric meter readings before and after the program, the impact findings already represent net savings and do not need to be adjusted further. We conducted freeridership and spillover analysis for four measures to allow stakeholders to understand the degree of these influences. This section presents net-to-gross results; Appendix E. Net-to-Gross Ratio Calculations contains further information about the calculation of freeridership and spillover rates.

Cadmus calculated freeridership separately for the items in the Energy Efficiency Home Kit, as shown in Table 22.¹⁴

Table 22. Freeridership for Energy Efficiency Home Kit Items*

Measure (n=participants who installed the measure)	Number of Freeriders	Freeridership %
CFLs (n=432)	352	47.3%
Energy-efficient showerhead (n=175)	34	14.7%
Faucet aerators (n=194)	31	0.0%**
Outlet gasket insulators (n=69 on outside walls)	19	16.3%

*Freeridership questions were not asked for the Limelight night light and a 0% freeridership score is applied.

** Freeridership is deemed at 0.0% per the Illinois TRM. Savings for faucet aerators are calculated using a common practice baseline that includes previously installed low flow fixtures and accounts for use of faucets at less than rated flow rate, debris buildup, and water system pressures lower than rated flow rates.

Cadmus estimated spillover for the Energy Efficiency Home Kit portion of the program as 15.3% of the survey sample gross program savings (Table 23). Appendix E. Net-to-Gross Ration Calculations contains more information on the spillover estimation.

Table 23. Spillover for Energy Efficiency Home Kit Items *

Measure	Spillover %
CFL	14.32%
Energy-efficient showerhead	0.92%
Faucet aerators	0.04%
Outlet gasket insulators	0.02%
Overall	15.3%

* Survey sample program kWh savings used in the spillover calculation does not include behavior savings; it only includes Energy Efficiency Home Kit measure savings. The behavior kWh savings estimated for the program includes any “non-like” program measure spillover activity.

¹⁴ Energy education programs that provide energy kits to all student participants and do not require parents to request the energy kits commonly assume a net-to-gross ratio of 1.

Summary Form



OFFICIAL COPY
Mar 09 2016

Energy Efficiency in Schools Program

Duke Energy Carolina System
Completed EMV Fact Sheet
2015 Evaluation – Cadmus Group

Program Description

Energy Efficiency in Schools is designed to provide energy education and low-cost energy-efficiency measures to K-12 public and private school students. Participants in this program attend a presentation designed to educate students about energy and complete a home energy survey to receive free Energy Efficiency Home Kits by mail. The program also encourages energy-saving behaviors and actions through education, increased awareness, and family engagement.

Date	November 2, 2015
Region(s)	NC, SC
Evaluation Period	June 2014 to May 2015
Gross Energy Savings (kWh)	n/a
Net Coincident kW Impact (Summer/Winter)	1,265/1,294
Measure life	Various
Net Energy Savings (kWh)	5,387,202
Process Evaluation	Yes
Previous Evaluation(s)	Yes

Evaluation Methodology

To estimate net energy savings and demand reduction resulting from installing kit items and related actions and behavior changes through billing analysis, participant surveys, and TRM-based savings analyses.

Impact Evaluation Details

- Baseline Description: electric energy usage for the household absent the installation of kit items, behavior changes, and other program-related actions.
- Eligibility: a student in the household attended an eligible school and the household has not received an Energy Efficiency in Schools kit during the previous three years.
- Savings Calculation: Cadmus calculated net program savings using billing analysis, and performed an engineering analysis to determine the portion of savings contributed by the installation of kit items. When possible, Cadmus used averaged survey responses in place of TRM assumed values to give recent, regional values tailored to DEC's service territory. The engineering analysis of kit item savings included NTGR calculated from survey responses.

Appendix A. Participant Household Characteristics and Demographics

Table 24. Participant Household Characteristics and Demographics

Household Characteristics	Duke Energy North Carolina	Duke Energy South Carolina	Total Duke Energy Carolina System
Home Ownership	n=367	n=132	n=499
Home owner	72%	79%	74%
Renter	28%	21%	26%
Type of Home	n=374	n=134	n=508
Single-family home, detached construction	76%	74%	76%
Single-family home, manufactured or modular	5%	11%	7%
Single-family mobile home	5%	2%	4%
Two- or three-family attached homes	3%	2%	3%
Apartment homes (4+ families)	7%	7%	7%
Condominium	2%	1%	2%
Other	2%	2%	2%
Home Age	n=345	n=126	n=471
Built before 1959	16%	13%	15%
1960 – 1979	21%	21%	21%
1980 – 1989	10%	11%	10%
1990 – 1997	12%	12%	12%
1998 – 2000	9%	10%	10%
2001 – 2007	19%	23%	20%
2008 – present	11%	10%	11%
Home Size	n=343	n=123	n=466
500 – 999 square feet	8%	5%	8%
1,000 – 1,499 square feet	29%	30%	29%
1,500 – 1,999 square feet	28%	25%	27%
2,000 – 2,499 square feet	15%	26%	18%
2,500 – 2,999 square feet	9%	7%	8%
3,000 – 3,499 square feet	6%	5%	6%
3,500 – 3,999 square feet	3%	0%	2%
4,000 or more square feet	3%	2%	2%

Household Characteristics	Duke Energy North Carolina	Duke Energy South Carolina	Total Duke Energy Carolina System
Home Heating System*	n=364	n=127	n=491
Central forced air furnace	54%	51%	53%
Heat pump	35%	38%	36%
Electric baseboard heat	5%	6%	5%
Geothermal heat pump	1%	0%	1%
Other systems	5%	4%	5%
Home Cooling System	n=374	n=133	n=507
Central air conditioning	74%	73%	73%
Heat pump for cooling	20%	22%	21%
Wall or window AC unit(s)	5%	5%	5%
Geothermal heat pump	1%	0%	1%
None, do not cool the home	1%	0%	0.4%
Primary Fuel Used for Heating	n=373	n=133	n=506
Electricity	53%	60%	55%
Natural gas	37%	39%	37%
Oil or kerosene	2%	0%	2%
Wood	3%	0%	3%
Propane	4%	1%	3%
Solar	0.3%	0%	0.2%
None	0.3%	0%	0.2%
Primary Fuel Used for Water Heating	n=374	n=133	n=507
Natural gas	30%	26%	29%
Electricity	66%	73%	68%
Oil or kerosene	0.3%	0%	0.2%
Wood	1%	0%	1%
Bottled, tank or LP gas	2%	1%	2%

Household Characteristics	Duke Energy North Carolina	Duke Energy South Carolina	Total Duke Energy Carolina System
Number of People in the Household (Year-Round)	n=372	n=133	n=505
1	4%	5%	4%
2	12%	14%	12%
3	27%	23%	26%
4	31%	34%	32%
5	18%	18%	18%
6 or more	8%	6%	7%
Number of People Under Age 18 in the Household	n=370	n=132	n=502
Zero	12%	16%	13%
1	31%	27%	30%
2	37%	39%	37%
3	16%	12%	15%
4	4%	5%	4%
5	1%	2%	1%
Age of Respondent	n=370	n=132	n=502
18 – 24	1%	1%	1%
25 – 34	22%	25%	23%
35 – 44	47%	39%	45%
45 – 54	18%	22%	19%
55 – 64	8%	10%	9%
65 – 74	3%	2%	3%
75 or older	1%	2%	1%
Annual Household Income	n=367	n=133	n=500
Under \$15,000	5%	5%	5%
\$15,000 - \$29,999	13%	10%	12%
\$30,000 - \$49,999	17%	20%	18%
\$50,000 - \$74,999	23%	26%	23%
\$75,000 - \$99,999	11%	17%	13%
Over \$100,000	13%	7%	11%
Prefer not to answer	19%	15%	18%

* Some respondents reported more than one heating system, so the percentages total to more than 100%.

Appendix B. Impact Algorithms

General Impact Algorithms by Measure

CFLs

Gross Summer Coincident Demand Savings

$$\Delta kW = \text{ISR} \times \left[\frac{\text{Watts}_{\text{base}} - \text{Watts}_{\text{ee}}}{1000} \right] \times \text{CF} \times \text{WHF}_d$$

Gross Annual Energy Savings

$$\Delta kWh = \text{ISR} \times \left[\frac{(\text{Watts} \times \text{HOU})_{\text{base}} - (\text{Watts} \times \text{HOU})_{\text{ee}}}{1000} \right] \times 365 \times \text{WHF}_c$$

Where:

- ΔkW = gross coincident demand savings
- ΔkWh = gross annual energy savings
- Watts_{ee} = connected load of energy-efficient unit
- $\text{Watts}_{\text{base}}$ = connected (nameplate) load of baseline unit(s) displaced
- HOU = average daily hours of use (based on connected load)
- CF = coincidence factor = 0.09
- WHF_c = HVAC system interaction factor for annual electricity consumption = 0.984
- WHF_d = HVAC system interaction factor for demand = 1.18

The Cadmus team used the coincidence factor and HVAC interaction factors from the Mid-Atlantic TRM for this analysis.

Outlet Gasket Insulators

Gross Summer Coincident Demand Savings

$$\Delta kW = (\Delta \text{cfm/unit}) \times (\text{kW} / \text{cfm}) \times \text{DF} \times \text{CF}$$

Gross Annual Energy Savings

$$\Delta kWh = (\Delta \text{cfm/unit}) \times (\text{kWh} / \text{cfm})$$

Where:

ΔkW = gross coincident demand savings

ΔkWh = gross annual energy savings

$\Delta cfm/unit$ = unit infiltration airflow rate (ft^3/min) reduction for each measure

DF = demand diversity factor = 0.8

CF = coincidence factor = 1.0

kW/cfm = demand savings per unit cfm reduction

kWh/cfm = electricity savings per unit cfm reduction

Unit cfm savings per measure

We estimated the cfm reductions for each measure from equivalent leakage area (ELA) change data taken from the ASHRAE Handbook of Fundamentals (ASHRAE 2001). We then converted the equivalent leakage area changes to infiltration rate changes using the Sherman-Grimsrud equation:

$$Q = ELA \times \sqrt{A \times \Delta T + B \times V^2}$$

Where:

A = stack coefficient ($ft^3/min-in^4-^{\circ}F$) = 0.015 for one-story house

ΔT = average indoor/outdoor temperature difference over the time interval of interest ($^{\circ}F$)

B = wind coefficient ($ft^3/min-in^4-mph^2$) = 0.0065 (moderate shielding)

V = average wind speed over the time interval of interest measured at a local weather station at a height of 20 ft (mph)

Table 25 lists the location-specific data.

Table 25. Location Assumptions

Location	Average Outdoor Temp	Average Indoor/Outdoor Temp Difference	Average Wind Speed (mph)	Specific Infiltration Rate (cfm/in ²)
Charlotte	60	8	6.9	1.57

Table 26 lists measure ELA impact and cfm reductions.

Table 26. ELA Impacts and CFM Reductions

Measure	Unit	ELA change (in ² /unit)	ΔCfm/unit
Outlet Gasket Insulators	each	0.357	0.234

Unit Energy and Demand Savings

The Cadmus team calculated the energy and peak demand impacts of reducing infiltration rates from infiltration rate parametric studies conducted using the DOE-2 residential building prototype models, as described at the end of this appendix. Table 27 lists the savings per cfm reduction by heating and cooling system type. We weighted these data according to the HVAC system type weights, as shown in the table.

Charlotte, North Carolina

Table 27. Savings per CFM

Heating Fuel	Heating System	Cooling System	Weight	kWh/cfm	kW/cfm
Other	Any except Heat Pump	Any except Heat Pump	0.0042	2.48	0.00248
		None	0.0002	0	0
Any	Heat Pump	Heat Pump	0.2900	10.37	0.00248
Gas Propane Oil	Central Furnace	None	0.0036	0	0
		Room/Window	0.5470	2.48	0.00248
		Central AC			
Electricity	Electric baseboard/ central furnace	None	0.0030	17.01	0.00990
		Room/Window	0.1500	18.54	0.01485
		Central AC			
None	None	Any	0.0020	0	0
Total Weighted Average			1	7.21	0.00439

Energy-Efficient Showerhead

Gross Summer Coincident Demand Savings

$$\Delta kW = \Delta kWh / \text{Hours} * CF \text{ Gross Annual Energy Savings}$$

$$\Delta kWh = \%ElectricDHW * ((gpm_base * L_base - gpm_low * L_low) * Household * SPCD * 365.25 / SPH) * EPG_electric * ISR$$

Where:

$$\Delta kW = \text{gross coincident demand savings}$$

$$\Delta kWh = \text{gross annual energy savings}$$

%ElectricDHW	=	proportion of water heating supplied by electric resistance heating = 68%
gpm_base	=	flow rate of baseline showerhead = 2.35
gpm_low	=	flow rate of the energy-efficient showerhead = 1.5
L_base	=	shower length in minutes with baseline showerhead = 7.8
L_low	=	shower length in minutes with energy-efficient showerhead = 7.8
Household	=	average number of people per household = 2.50
SPCD	=	showers per capita per day = 0.6
365.25	=	average days per year
SPH	=	showerheads per household = 1.72
EPG_electric	=	energy per gallon of hot water supplied by electric = 0.100
ISR	=	in-service rate = 36%
Hours	=	annual electric DHW recovery hours for showerhead use = 221
GPH	=	gallons per hour recovery of electric water heater = 30.83
CF	=	coincidence factor for electric load reduction = 0.0278

Faucet Aerators

$$\Delta kW = \Delta kWh / \text{Hours} * CF$$

$$\Delta kWh = \%ElectricDHW * ((gpm_base * L_base - gpm_low * L_low) * Household * 365.25 * DF / FPH) * EPG_electric * ISR$$

Where:

%ElectricDHW	=	proportion of water heating supplied by electric resistance heating = 68%
gpm_base	=	average flow rate, in gallons per minute, of the baseline faucet "as-used." = 1.39
gpm_low	=	average flow rate, in gallons per minute, of the energy-efficient faucet aerator "as-used" = 0.94
L_base	=	average baseline daily length faucet use per capita = 4.5 kitchen; 1.6 bathroom
L_low	=	average retrofit daily length faucet use per capita = 4.5 kitchen; 1.6 bathroom

Household	=	average number of people per household = 2.50
365.25	=	average days in a year
DF	=	drain Factor = 75% kitchen; 90% bathroom
FPH	=	faucets Per Household = 1 kitchen; 2.65 bathroom
EPG_electric	=	energy per gallon of water used by faucet supplied by electric water heater = 0.080 kitchen; 0.063 bathroom
ISR	=	in-service rate = 33% kitchen; 30% bathroom
Hours	=	annual electric DHW recovery hours for faucet use per faucet = 75 kitchen; 9 bathroom
GPH	=	gallons per hour recovery of electric water heater = 30.83
CF	=	coincidence factor for electric load reduction = 0.022

Water Temperature Card

$$\Delta kW = \Delta kWh / \text{Hours} * CF$$

$$\Delta kWh = (UA * (T_{pre} - T_{post}) * \text{Hours}) / (3412 * RE_{electric})$$

Where:

U	=	overall heat transfer coefficient of tank (Btu/Hr-°F-ft ²) = 0.083
A	=	surface area of storage tank (square feet) = 24.99
T _{pre}	=	hot water setpoint prior to adjustment = 128
T _{post}	=	new hot water setpoint = 121
Hours	=	number of hours in a year = 8,766
RE_electric	=	recovery efficiency of electric hot water heater = 0.98
CF	=	summer peak coincidence factor for measure = 1

Limelight Night Lights

$$\Delta \text{kWh} = ((W_{\text{base}} * h_{\text{base}}) - (W_{\text{NL}} * h_{\text{NL}})) * 365 / 1000 * \text{ISR}$$

Where:

W_{NL} = watts per electroluminescent nightlight = 0.03

W_{base} = watts per baseline nightlight = 1.76

h_{NL} = average hours of use per day per electroluminescent nightlight = 24

h_{base} = average hours of use per day per baseline nightlight = 8

ISR = in-service rate per electroluminescent nightlight = 85%

The Cadmus team took the baseline fixture wattages and hours of use from the FES-L6a CFL and LED Lighting Residential work paper.

Appendix C. Billing Analysis Regression Details

Table 28 lists the regression output used in the billing analysis for Model 2.

Table 28. Model 2. Billing Analysis/Paired Months

Parameter	Parameter Estimate	Standard Error	95% Confidence Limits		Z	Pr > Z
avghdd_custnorm	1.3661	0.0094	1.3476	1.3845	145.12	<.0001
avgcdd_custnorm	2.5945	0.0383	2.5195	2.6695	67.78	<.0001
Free_CFL_custnorm	0.5141	0.0949	0.3281	0.7002	5.42	<.0001
CFL_special_custnorm	-0.3871	0.3787	-1.1293	0.355	-1.02	0.3066
HEHC_custnorm	-1.58	1.0049	-3.5495	0.3894	-1.57	0.1159
LowInc_Weath_custnor	-0.4329	0.9084	-2.2133	1.3475	-0.48	0.6337
PER_OHEC_custnorm	-1.8232	0.4461	-2.6977	-0.9488	-4.09	<.0001
SmSvr_HVAC_custnorm	-4.3242	0.6303	-5.5595	-3.0889	-6.86	<.0001
HVAC_tuneup_custnorm	1.4792	1.6992	-1.8513	4.8096	0.87	0.384
Insul_Seal_custnorm	8.4475	6.0679	-3.4454	20.3405	1.39	0.1639
Appl_Recycle_custnor	-1.1793	0.6682	-2.489	0.1304	-1.76	0.0776
Property_Mgr_custnor	-0.7336	0.3367	-1.3934	-0.0737	-2.18	0.0293
MyHER_custnorm	0.0343	0.0829	-0.1283	0.1968	0.41	0.6794
partpost_custnorm	-0.5501	0.0578	-0.6634	-0.4367	-9.51	<.0001

Table 29. Other Duke Energy Programs in the Duke Energy Carolina System

Program Name
Free CFLs
CFL Special
Home Energy House Call
Low Income Weatherization
Personalized Energy Report / Online Home Energy Check
Smart Saver HVAC
HVAC Tune-up
Insulation Sealing
Appliance Recycling
Property Manager
My Home Energy Report

References

Ittron, Inc., J.J. Hirsch and Associates, Synergy Consulting, and Quantum Consulting. *2004-2005 Database for Energy Efficiency Resources (DEER) Update Study: Final Report*. DEER. 2005. Available online: <http://www.energy.ca.gov/deer/>

Appendix D. Engineering Analysis Energy Efficiency Home Kit Savings Details

Table 30 lists the Energy Efficiency Home Kit metrics and savings details for each Energy Efficiency Home Kit item.

Table 30. Engineering Analysis Energy Efficiency Home Kit Savings Details

Metric	13W CFL	18W CFL	Energy-efficient showerhead	Kitchen Aerators	Bathroom Aerators	Hot Water Temp Card	Limelight Night Light	Outlet Gasket Insulators	Entire Energy Efficiency Home Kit
Units	Bulb	Bulb	Showerhead	Aerator	Aerator	Change	Light	12 pack	Kit
In-Service Rate	88%	85%	36%	33%	30%	7%	85%	6%	
Gross kW Per Unit	0.0027	0.0029	0.0064	0.0073	0.0066	0.0002	0.0000	0.0008	0.0269
Gross kWh Per Unit	26.03	29.81	50.97	24.95	2.86	1.77	4.12	1.24	141.74
Freeridership Rate	47.3%	47.3%	14.7%	0.0%	0.0%	0.0%	0.0%	16.3%	24.1%
Spillover Rate	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%
NTG Ratio	68.0%	68.0%	100.6%	115.3%	115.3%	115.3%	115.3%	99.0%	91.2%
Net kW Per Unit	0.0018	0.0020	0.0065	0.0084	0.0076	0.0002	0.0000	0.0007	0.0273
Net kWh Per Unit	17.70	20.27	51.26	28.76	3.30	2.04	4.75	1.22	129.32
Measure Life (Years)*	5	5	10	9	9	2	8	15	8
EUL Net kWh Per Unit	88.51	101.37	512.58	258.88	29.67	4.08	38.04	18.35	998.27

* To calculate overall measure life, the Cadmus team used a weighted average derived from the effective useful lives of the individual Energy Efficiency Home Kit items. We assigned weights based on each item's contribution to gross kWh savings.

Appendix E. Net-to-Gross Ratio Calculations

This report presents freeridership and spillover for informational purposes only. Cadmus did not use this calculation to adjust gross energy impacts to report net savings. Because our team compared customer's electric meter readings before and after the program for the impact analysis, our findings already showed net savings. We have included freeridership and spillover analysis here to help stakeholders to understand the degree to which freeridership and spillover influence the reported net savings.

Because Cadmus uses a different approach for estimating freeridership for energy-efficient lighting than it does for other energy-efficient measures, we have presented freeridership for lighting separately.

Lighting Freeridership

Cadmus used a three-step approach to estimate freeridership for CFLs. This approach accounts for the increasing prevalence of LED bulbs, a technology that has not been taken into consideration for the purposes of calculating freeridership until recently. In this approach, freeridership is based on the responses to questions about how many CFLs and LEDs were in the homes of participants prior to the program, whether or not they would have purchased CFLs or LEDs in the absence of the program, and their future purchasing intentions.¹⁵

Step One: Diffusion of Adoption Curve

A freeridership score for a participant in a CFL program is predominantly determined by their past behavior regarding the technology. Because the best predictor of future behavior is past behavior, it is assumed that the more CFLs and LEDs customers use in their home, the more likely they are to be freeriders. To assess past behavior, survey respondents are asked how many energy-efficient light bulbs (CFLs and LEDs) were already installed in their home before they received bulbs through the program.¹⁶ Their responses, seen in Table 31, are mapped to the diffusion of adoption curve shown in Figure 16. The resulting percentage is their baseline freeridership.

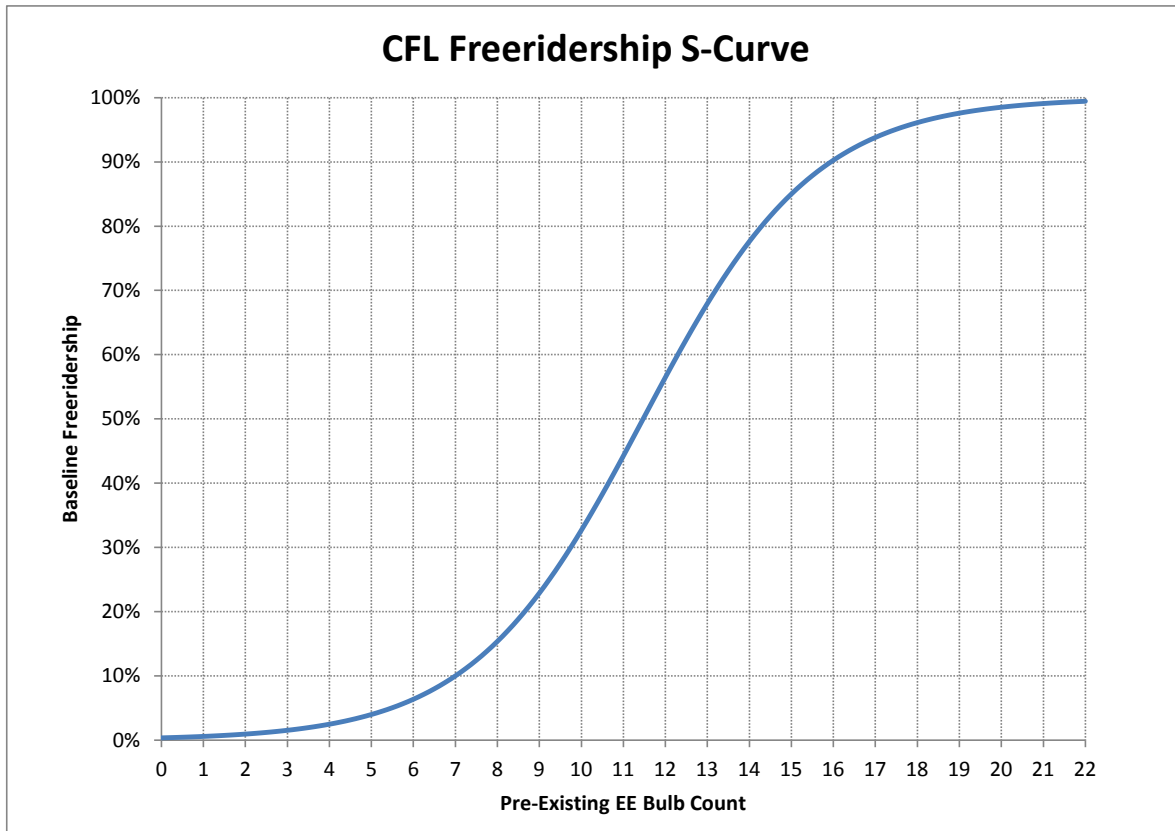
¹⁵ Using participant surveys to assess freeridership is a current and accepted practice in the industry. Please see the Basic Approach method in the section titled "Participant Net Impact Protocol" in the California Energy Efficiency Evaluation Protocols, April 2006. TecMarket Works, et al.

¹⁶ Table 31 presents the same data as in Appendix F. Participant Survey Frequency Tables, except that the table in this section only includes participants who installed CFLs from the kit and missing data has been replaced with median values.

Table 31. Efficient Light Bulbs Installed Before the Program and Baseline Freeridership Score (n=432)

Count of CFLs and LEDS Installed Before the Program	Baseline Freerider Percentage	Number of Respondents
0	0%	77
1	1%	4
2	1%	10
3	2%	8
4	2%	28
5	4%	23
6	6%	13
7	10%	11
8	15%	14
9	23%	7
10	33%	96
11	44%	10
12	56%	22
13	68%	6
14	78%	33
15	85%	15
16	90%	3
17	94%	2
18	96%	5
19	98%	3
20	99%	10
21	99%	4
22 or more	100%	28
TOTAL		432

Figure 16. Diffusion of Adoption Curve for Determining Freeridership



Step Two: Purchasing Intentions Prior to Participation

Because people's behavior changes over time, past purchase behavior needs to be informed by future purchase intent in order to assess freeridership. While self-reports of future behavior are not as reliable a predictor as past behavior and are impacted by several types of response bias, purchase intent is considered in the assessment of freeridership. To accomplish this, participants were asked about their purchasing intentions prior to their participation in the program. If survey respondents indicated they were intent on purchasing CFL and/or LED light bulbs, they were asked how many of their next 10 light bulb purchases will be CFLs, LEDs, standard incandescent, or halogen bulbs. Participants were not asked this follow-up question if they had no intention of purchasing energy-efficient bulbs or already had them installed in all available sockets. The decision to move to step three of the analysis follows the logic matrix in Table 32.

Table 32. Step Two Decision Matrix Based on Purchasing Intentions

LEDs → CFLs ↓	Yes	No	Maybe	No, already installed in all sockets	DK/NS
Yes	Use step 3 multiplier	Use step 3 multiplier	Use step 3 multiplier	Automatic 100%	Use step 3 multiplier
No	Use step 3 multiplier	Multiply by 0.25	Use step 3 multiplier	Automatic 100%	Multiply by 0.25
Maybe	Use step 3 multiplier	Use step 3 multiplier	Use step 3 multiplier	Automatic 100%	Use step 3 multiplier
No, already installed in all sockets	Automatic 100%	Automatic 100%	Automatic 100%	Automatic 100%	Automatic 100%
DK/NS	Use step 3 multiplier	Multiply by 0.25	Use step 3 multiplier	Automatic 100%	Use step 3 multiplier

Step Three: Future Purchasing Intentions

To score future purchase intent, each of the three bulb categories (incandescent/halogen, CFL, and LED) is assigned a freeridership adjustment factor, or multiplier. These multipliers are shown in the example scenario in Table 33. With this configuration, purchasing intent for incandescent or halogen bulb results in a 75% decrease in freeridership, while purchasing intent for CFLs increases the respondent's freeridership by the same percentage. Purchasing intent for LEDs increases freeridership 75% over CFLs, as these respondents are considered to be ahead of the curve.

Once a survey respondent's purchasing intentions have been collected for the next 10 bulbs, we calculate a weighted average freeridership multiplier. Table 33 represents a scenario in which a respondent has indicated that he or she will likely purchase equal amounts of incandescent and CFL bulbs for their next 10 bulbs. The number in bold is the weighted average freeridership multiplier for this participant. This participant's freeridership score is then the product of the baseline freeridership and the weighted average freeridership multiplier. Since the multipliers of CFL and incandescent bulbs mirror each other, they are offset and freeridership is ultimately unaffected. That is, it is equal to the value from the diffusion of adoption curve in Table 31.

Table 33. Bulb Purchase Intention Multipliers and Example Scenario

Type	Count	Multiplier
Incandescent or Halogen	5	0.25
CFL	5	1.75
LED	0	2.5
Weighted Multiplier		1.0

Every participant who installed at least one program-provided CFL was assigned a freeridership score using the approach outlined above.¹⁷ The average of these scores represents the estimate for CFL freeridership, which calculated as 47.3%.

Non-Lighting Freeridership

For energy-efficient showerheads, faucet aerators, and outlet gasket insulators, we determined the level of freeridership using the responses to three questions in the survey. Table 34 lists the three questions and the level of freeridership we applied to the energy savings. All other possible combinations of answers to the series of questions resulted in 0% freeridership (not shown in table).

¹⁷ In order to calculate a freerider score for every participant, missing data has to be replaced with values derived from the survey results. If a participant could not recall whether they had CFLs or LEDs before the program, we assigned the median valid response for pre-installed bulbs of that type (five for CFLs and zero for LEDs). If they recalled having a type of bulb but could not provide a bulb count, we assigned the median number of bulbs installed by surveyed participants with that type of bulb installed who did provide counts (10 for CFLs and four for LEDs). For participants who did not answer the questions about future bulb purchase intentions, we assigned the average step-three multiplier value from all valid responses (1.54).

Table 34. Freeridership Factors for Non-Lighting Energy Efficiency Home Kit Items

Did you have any [ITEMS] installed before you got the kit?	Were you planning on buying additional [ITEMS] before you got the kit?	Have you purchased any [ITEMS] since you got the kit?	Freeridership Score
yes	Yes	yes	1.00
yes	Yes	no	1.00
no	Yes	no	0.50
no	Yes	yes	0.50
don't know	Yes	yes	0.75
don't know	Yes	no	0.50
yes	already installed in all available sockets	yes	1.00
yes	already installed in all available sockets	no	1.00
yes	already installed in all available sockets	don't know	1.00
don't know	maybe	yes	0.25
yes	maybe	no	0.25
yes	Yes	don't know	1.00
don't know	Yes	don't know	0.50
no	Yes	don't know	0.50

We applied the scores to participants' responses to questions about energy-efficient showerheads, faucet aerators (combined), and outlet gasket insulators (combined) to estimate the overall freeridership scores for each item, shown in Table 35.

Table 35. Freeridership for Showerheads, Aerators, and Outlet Gasket Insulators

Measure (n=participants installing)	Number of participants with freeridership	Freeridership %
Energy-efficient showerhead (n=175)	34	14.7%
Faucet aerators (n=194)	31	0.0%*
Outlet gasket insulators (n=69 on outside walls)	19	16.3%

*The Illinois TRM uses a common practice approach to defining the baseline condition. Average measured flow rates used as the baseline reflect the penetration or previously installed low flow fixtures, use of the faucet at less than rated flow, debris buildup, and lower than rated fixture water system pressure. The freerider rate for this measure is therefore deemed to be zero.

Validity and Reliability of the Freerider Estimation Approach

The basic freeridership assessment approach, as specified in the California Evaluation Protocols, requires the construction of questions that allow the evaluation contractor to estimate the level of freeridership. We based the approach used in this evaluation on the results of a set of freerider questions

incorporated into participant survey instruments and examined the various ways in which the program impacted the participants' acquisition and use of energy-efficient items in their home. We allocated a freeridership factor for each of the types of responses contained in the survey questions. Using this approach, we assigned high freeridership values to participants who would have acquired energy-efficient items on their own—that factor was influenced by their past purchase behavior and their stated future intentions.

Spillover Estimation

The evaluation measured spillover for the Energy Efficiency Home Kit portion of the program by asking participants if, due to their program participation, they installed additional energy-efficient measure that were like ones they received through the Energy Efficiency Home Kit. If respondents indicated they made energy-efficient improvements and/or purchased and installed products similar to the items received in the Energy Efficiency Home Kit, the survey asked how influential they deemed the program on their purchasing decisions; participants could choose from a 0 to 10 rating scale where 0 means *not at all influential* and 10 means *extremely influential*. Participants who answered a rating of 9 or 10 had 100% of estimated spillover measure savings attributed to the program. Participants who answered with a rating of 6, 7, or 8 had 50% of estimated spillover measure savings attributed to the program, while any measures mentioned with a rating less than 5 did not receive any attribution towards the program.

Table 29 shows the quantities, per-unit kWh savings estimates and total calculated spillover savings attributed to the program. We calculate the estimate of spillover by dividing the survey sample spillover kWh savings by the survey sample gross program kWh savings. The Cadmus team estimated spillover for the Energy Efficiency Home Kit portion of the program overall as 15.3% of the survey sample gross program savings.

Table 36. Spillover for Energy Efficiency Home Kit Items

Spillover Measure	Quantity	Per Units kWh Savings	Total Spillover kWh Savings	Total Survey Sample Program kWh Savings	Spillover %
CFLs	370.78	27.92	10,351	72,286*	14.32%
Energy-efficient showerhead	13.0	50.97	663		0.92%
Faucet aerators	2.0	13.90	27.81		0.04%
Outlet gasket insulators	9.0	1.24	11.12		0.02%
Overall	N/A	N/A	11,052	72,286*	15.3%

*Survey sample program kWh savings does not include behavior savings, it only includes Energy Efficiency Home Kit measure savings. The behavior savings estimate portion of the program includes any “non-like” program measure spillover activity.

Appendix F. Energy Education for Schools Program Participant Survey

Energy Efficiency for School's Program 4.28.15

Intro We are conducting this survey to obtain your opinions about the Duke Energy / Energy Efficiency for School's Program that provides an energy-related performance by the National Theatre for Children to local schools. Program records indicate that your child attended the performance at his or her school, and that your household subsequently received a kit containing items that can help you reduce your home's energy usage. The survey will take about 10 minutes and your answers will be confidential, and will help us make improvements to the program to better serve others.

1 Do you recall your child talking about the Duke Energy / National Theater for Children performance they saw at school?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Do you recall your child talking about the Duke Energy / National Theater for Children performance they saw at school_ Yes Is Selected

2 Did your child say they heard about...

	Yes (1)	No (2)	Don't know (3)
Saving energy (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turning lights and appliances off when not in use (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turning off the water faucets when not in use (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Renewable (solar, wind, hydro) energy (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CFL light bulbs (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Saving water (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fixing leaky faucets (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3 Students were encouraged to complete a home energy survey with their family (found in their activity book) in order to receive an Energy Efficiency Starter Kit from Duke Energy that contains items for reducing home energy usage. Did you receive an Energy Efficiency Starter Kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If State_Cd Is Equal to OH

4 Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the program?

- ☐ 0 - Extremely dissatisfied (1)
- ☐ 1 (2)
- ☐ 2 (3)
- ☐ 3 (4)
- ☐ 4 (5)
- ☐ 5 (6)
- ☐ 6 (7)
- ☐ 7 (8)
- ☐ 8 (9)
- ☐ 9 (10)
- ☐ 10 - Extremely satisfied (11)
- ☐ Don't know (12)

5a The energy efficiency kit you received contained various energy-saving items for your home, including a 13-watt CFL bulb and a 18-watt CFL bulb. Is the 13-watt bulb currently installed in your home? (If not, do you plan to install it?)

- ☐ Yes (1)
- ☐ No, installed but subsequently removed it (2)
- ☐ No, but I plan to install it (3)
- ☐ No, and I don't plan to install it (4)
- ☐ Don't know (5)

5b Is the 18-watt bulb currently installed in your home? (If not, do you plan to install it?)

- ☐ Yes (1)
- ☐ No, installed but subsequently removed it (2)
- ☐ No, but I plan to install it (3)
- ☐ No, and I don't plan to install it (4)
- ☐ Don't know (5)

Answer If The energy efficiency kit you received contained various energy-saving items for your home, including a 13-watt CFL bulb and a 18-watt CFL bulb. _Is the 13-watt bulb currently installed in you... No, installed but subsequently removed it Is Selected Or Is the 18-watt bulb currently installed in your home? (If not, do you plan to install it?) No, installed but subsequently removed it Is Selected

6 Why did you remove the CFL(s)?

- ☐ Not bright enough (1)
- ☐ Too bright (2)
- ☐ Did not like how the light looked (3)
- ☐ The CFL burned out (4)
- ☐ Too slow to start (5)
- ☐ CFL not dimmable (6)
- ☐ Other, please describe in the text box below: (7) _____

Answer If The energy efficiency kit you received contained various energy-saving items for your home, including a 13-watt CFL bulb and a 18-watt CFL bulb. _Is the 13 watt bulb currently installed in you... Yes Is Selected

7a Thinking about the 13-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it?

- ☐ Living/family room (1)
- ☐ Dining room (2)
- ☐ Kitchen (3)
- ☐ Master bedroom (4)
- ☐ Other bedroom (5)
- ☐ Hall (6)
- ☐ Closet (7)
- ☐ Basement (8)
- ☐ Garage (9)
- ☐ Outdoors/Exterior (10)
- ☐ Other specify: (11) _____

Answer If Is the 18-watt bulb _currently installed in your home? (If not, do you plan to install it?) Yes Is Selected

7b Thinking about the 18-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it?

- ☐ Living/family room (1)
- ☐ Dining room (2)
- ☐ Kitchen (3)
- ☐ Master bedroom (4)
- ☐ Other bedroom (5)
- ☐ Hall (6)
- ☐ Closet (7)
- ☐ Basement (8)
- ☐ Garage (9)
- ☐ Outdoors/Exterior (10)
- ☐ Other specify: (11) _____

Answer If Thinking about the 13-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it? Living/family room Is Displayed

7c On average, approximately how many hours per day is the 13-watt CFL in the _\${q://QID15/ChoiceTextEntryValue/11} location being used?

Answer If Thinking about the 18-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it? Living/family room Is Displayed

7d On average, approximately how many hours per day is the 18-watt CFL in the __ location being used?

Answer If The energy efficiency kit you received contained various energy-saving items for your home, incl... Yes Is Selected

8a You noted that you installed the 13-watt bulb in the _location. What type of bulb was installed prior to installing this new bulb?

- ☐ Standard incandescent (1)
- ☐ CFL (2)
- ☐ LED (3)
- ☐ Other, please describe in the text box below: (4) _____
- ☐ No bulb in socket / burned out bulb (5)
- ☐ Don't know (6)

Answer If You noted that you installed the_13-watt bulb in the_ location._What type of bulb was installed prior to i... Standard incandescent Is Selected Or You noted that you installed the_13-watt bulb in the_ location._What type of bulb was installed prior to i... CFL Is Selected Or You noted that you installed the_13-watt bulb in the_ location._What type of bulb was installed prior to i... LED Is Selected

8b The 13-watt CFL replaced a \${q://QID121/ChoiceGroup/SelectedChoices} bulb in the \${q://QID15/ChoiceGroup/SelectedChoices}\${q://QID15/ChoiceTextEntryValue/11} location. What was the wattage of the \${q://QID121/ChoiceGroup/SelectedChoices} bulb?

Answer If You noted that you installed the_13-watt bulb in the__location._What type of bulb was installed prior to installing this new bulb? Other, please describe in the text box below: Is Selected

8bother The _was replaced by the 13-watt CFL bulb. What was the wattage of the _?

Answer If Is the 18-watt bulb currently installed in your home? (If not, do you plan to install it?) Yes Is Selected

8c You noted that you installed the 18-watt bulb in the __ location. What type of bulb was installed prior to installing this new bulb?

- ☐ Standard incandescent (1)
- ☐ CFL (2)
- ☐ LED (3)
- ☐ Other, please describe in the text box below: (4) _____
- ☐ No bulb in socket / burned out bulb (5)
- ☐ Don't know (6)

Answer If You noted that you installed the_18-watt_bulb in the _of bulb was installed prior to i... Standard incandescent Is Selected Or You noted that you installed the_18-watt_bulb in the _of bulb was installed prior to i... CFL Is Selected Or You noted that you installed the_18-watt_bulb in the _of bulb was installed prior to i... LED Is Selected

8d The 18-watt CFL replaced a \${q://QID122/ChoiceGroup/SelectedChoices} bulb in the __ location. What was the wattage of the \${q://QID122/ChoiceGroup/SelectedChoices} bulb?

Answer If You noted that you installed the_18-watt_bulb in the _of bulb was installed prior to i... Other, please describe in the text box below: Is Selected

8dother The \${q://QID122/ChoiceTextEntryValue/4} was replaced by the 18-watt CFL bulb. What was the wattage of the \${q://QID122/ChoiceTextEntryValue/4}?

9 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the 13-watt CFL you received?

- ☐ 0 - Extremely dissatisfied (27)
- ☐ 1 (28)
- ☐ 2 (29)
- ☐ 3 (30)
- ☐ 4 (31)
- ☐ 5 (32)
- ☐ 6 (33)
- ☐ 7 (34)
- ☐ 8 (35)
- ☐ 9 (36)
- ☐ 10 - Extremely satisfied (37)
- ☐ Don't know (38)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

10 Why are you less than satisfied with the 13-watt CFL?

11 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the 18-watt CFL you received?

- ☐ 0 - Extremely dissatisfied (27)
- ☐ 1 (28)
- ☐ 2 (29)
- ☐ 3 (30)
- ☐ 4 (31)
- ☐ 5 (32)
- ☐ 6 (33)
- ☐ 7 (34)
- ☐ 8 (35)
- ☐ 9 (36)
- ☐ 10 - Extremely satisfied (37)
- ☐ Don't know (38)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is

"extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

12 Why are you less than satisfied with the 18-watt CFL?

Lighting

Currently, there are a number of types of light bulbs available for purchase in the market. Incandescent bulbs are the most common type of light bulb. It features a screw-base and is known for providing bright, warm light instantly. Incandescent bulbs have been steadily phased out of the lighting market. Halogen light bulbs are similar to incandescent bulbs, but are known to be more energy efficient than standard incandescent bulbs and tend to be used in indoor and outdoor flood lighting, indoor recessed or track lighting, and in floor and desk lamps. CFLs, also known as compact fluorescent bulbs, are energy saving light bulbs that have a "twisty" shape like a soft-serve ice cream cone. LEDs, also known as light-emitting diodes, are a type of lighting that uses multiple tiny bulbs, or diodes, that are wired together on one lamp.

13 Thinking about the next 10 light bulbs you will purchase, how many will be of each of the following types? (Must total 10 bulbs. If you are unsure, place a 10 in the "Don't know" option).

- _____ Incandescent light bulbs (1)
- _____ Halogen light bulbs (2)
- _____ CFL light bulbs (3)
- _____ LED light bulbs (4)
- _____ Other light bulbs (please specify) (5)
- _____ Don't know (6)

14 Did you have any CFLs installed in your home before you received the Energy Efficiency kit from Duke Energy?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Did you have any CFLs installed in your home before you received the Energy Efficiency kit from Duke Energy? Yes Is Selected

15 Do you know how many CFLs were installed in your home before you received the kit from Duke Energy?

- ☐ Yes. (Please note how many bulbs in the text box below, numeric only) (1) _____
- ☐ No, I do not know how many CFLs were installed. (2)

16 Were you planning on buying CFLs for your home before you received the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ No, already have them installed in all available light sockets (3)
- ☐ Maybe (4)
- ☐ Don't know (5)

17 Have you purchased this o CFLs since receiving the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Have you purchased any additional CFLs since receiving the kit? Yes Is Selected

18 Do you recall how many additional CFLs have you purchased?

- ☐ Yes, please list how you have purchased below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Have you purchased any additional CFLs since receiving the kit? Yes Is Selected

19 Do you recall how many of these additional CFLs that you purchased are currently installed in your home?

- ☐ Yes, please list how many are installed below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Do you recall how many of these additional CFLs that you purchased are currently installed in you... Yes, please list how many are installed below (numeric only): Is Greater Than 0

20 Using a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase and install these additional CFLs?

- ☐ 0 - Not at all influential (1)
- ☐ 1 (2)
- ☐ 2 (3)
- ☐ 3 (4)
- ☐ 4 (5)
- ☐ 5 (6)
- ☐ 6 (7)
- ☐ 7 (8)
- ☐ 8 (9)
- ☐ 9 (10)
- ☐ 10 - Extremely influential (11)
- ☐ Don't know (12)

21 Did you have any LEDs installed in your home before you received the Energy Efficiency kit from Duke Energy?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Did you have any LEDs installed in your home before you received the Energy Efficiency kit from Duke Energy? Yes Is Selected

22 Do you recall how many LEDs were installed in your home before you received the kit from Duke Energy?

- ☐ Yes. (Please note how many bulbs in the text box below, numeric only) (1) _____
- ☐ No, I do not know how many LEDs were installed. (2)

23 Were you planning on buying LEDs for your home before you received the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ No, already have them installed in all available light sockets (3)
- ☐ Maybe (4)
- ☐ Don't know (5)

24 Have you purchased any additional LEDs since receiving the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Have you purchased any additional LEDs since receiving the kit?_ Yes Is Selected

25 Do you recall how many additional LEDs you have purchased?

- ☐ Yes, please list the number you have purchased below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Have you purchased any additional LEDs since receiving the kit?_ Yes Is Selected

26 Do you recall how many of these additional LEDs that you purchased are currently installed in your home?

- ☐ Yes, please list the number of installed bulbs below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Do you recall how many of these additional LEDs that you purchased are currently installed in you... Yes, please list the number of installed bulbs below (numeric only): Is Greater Than 0

27 Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase and install these additional LEDs?

- ☐ 0 - Not at all influential (1)
- ☐ 1 (2)
- ☐ 2 (3)
- ☐ 3 (4)
- ☐ 4 (5)
- ☐ 5 (6)
- ☐ 6 (7)
- ☐ 7 (8)
- ☐ 8 (9)
- ☐ 9 (10)
- ☐ 10 - Extremely influential (11)
- ☐ Don't know (12)

28 The kit also included a low-flow showerhead. Did you install the low-flow showerhead that was provided in the kit?

- ☐ Yes (1)
- ☐ No, but plan to (2)
- ☐ No, and don't plan to (3)
- ☐ Don't know (4)

Answer If The kit also included a low-flow showerhead. _ Did you install the low-flow showerhead that was provided in the kit? Yes Is Selected

29 Is the showerhead you installed through the kit still installed in your home?

- ☐ Yes (1)
- ☐ No, I removed it (2)
- ☐ Don't know (3)

Answer If Is the showerhead you installed through the kit still installed in your home? No, I removed it Is Selected

30 Why did you remove the showerhead?

Answer If Is the showerhead you installed through the kit still installed in your home? Yes Is Selected

31 Typically, how many showers per week are taken using the showerhead from the kit?

Number of showers per week (1)

Answer If The kit also included a low-flow showerhead. Did you install the low-flow showerhead that was provided in the kit? Yes Is Selected

32 When you installed the low-flow showerhead from the kit, did you:

- ☐ Replace another low-flow showerhead (1)
- ☐ Replace a standard-flow showerhead (2)
- ☐ Don't know (3)

33 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the energy efficient showerhead you received?

- ☐ 0 - Extremely dissatisfied (277)
- ☐ 1 (278)
- ☐ 2 (279)
- ☐ 3 (280)
- ☐ 4 (281)
- ☐ 5 (282)
- ☐ 6 (283)
- ☐ 7 (284)

- ☐ 8 (285)
- ☐ 9 (286)
- ☐ 10 - Extremely satisfied (287)
- ☐ Don't know (288)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

34 Why are you less than satisfied with the showerhead?

35 Did you have any energy efficient showerheads installed in your home before you received the Energy Efficiency kit from Duke Energy?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

36 Were you planning on buying energy efficient showerheads for your home before you received the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ No, already have them installed in all available showers (3)
- ☐ Maybe (4)
- ☐ Don't know (5)

37 Have you purchased any additional energy efficient showerheads since receiving the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

If Yes Is Not Selected, Then Skip To The energy efficiency kit you receive...

38 Do you recall how many additional low-flow showerheads have you purchased?

- ☐ Yes, please note how many you have purchased below (numeric only): (1) _____
- ☐ I don't know (2)

39 Do you recall how many of these additional low-flow showerheads are currently installed in your home?

- ☐ Yes, please note how many you have installed below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Do you recall how many of these additional low-flow showerheads are currently installed in your h... Yes, please note how many you have installed below (numeric only): Is Greater Than 0

40 Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase these additional energy efficient showerheads?

- ☐ 0 - Not at all influential (1)
- ☐ 1 (2)
- ☐ 2 (3)
- ☐ 3 (4)
- ☐ 4 (5)
- ☐ 5 (6)
- ☐ 6 (7)
- ☐ 7 (8)
- ☐ 8 (9)
- ☐ 9 (10)
- ☐ 10 - Extremely influential (11)
- ☐ Don't know (12)

Aerators The kit also included a low-flow kitchen aerator and a flow-flow bathroom aerator.

41a Is the low-flow kitchen aerator currently installed in your home?

- ☐ Yes (1)
- ☐ No, installed but subsequently removed it (2)
- ☐ No, but I plan to install it (3)
- ☐ No, and I don't plan to install it (4)
- ☐ Don't know (5)

41b Is the low-flow bathroom aerator currently installed in your home?

- ☐ Yes (1)
- ☐ No, installed but subsequently removed it (2)
- ☐ No, but I plan to install it (3)
- ☐ No, and I don't plan to install it (4)
- ☐ Don't know (5)

Answer If Is the low-flow kitchen aerator currently installed in your home? No, installed but subsequently removed it Is Selected Or Is the low-flow bathroom aerator currently installed in your home? No, installed but subsequently removed it Is Selected

42 Why did you remove the aerator(s)?

Answer If Is the low-flow kitchen aerator currently installed in your home? Yes Is Selected

43 Did the low-flow kitchen aerator that you installed in your kitchen replace another aerator?

- ☐ Yes, replaced another low-flow aerator (1)
- ☐ Yes, replaced a standard-flow aerator (2)
- ☐ Yes, replaced another aerator but not sure if it was low-flow or standard (3)
- ☐ No, there was previously no aerator on the faucet (4)
- ☐ Not sure / don't remember (5)

44 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the low-flow kitchen faucet aerator you received?

- ☐ 0 - Extremely dissatisfied (15)
- ☐ 1 (16)
- ☐ 2 (17)
- ☐ 3 (18)
- ☐ 4 (19)
- ☐ 5 (20)
- ☐ 6 (21)
- ☐ 7 (22)
- ☐ 8 (23)
- ☐ 9 (24)
- ☐ 10 - Extremely satisfied (25)
- ☐ Don't know (26)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

45 Why are you less than satisfied with the kitchen faucet aerator?

Answer If Is the low-flow bathroom aerator currently installed in your home? Yes Is Selected

46 Did the low-flow bathroom aerator that you installed in your bathroom replace another aerator?

- ☐ Yes, replaced another low-flow aerator (1)
- ☐ Yes, replaced a standard-flow aerator (2)
- ☐ Yes, replaced another aerator but not sure if it was low-flow or standard (3)
- ☐ No, there was previously no aerator on the faucet (4)
- ☐ Not sure / don't remember (5)

47 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the low-flow bathroom faucet aerator you received?

- ☐ 0 - Extremely dissatisfied (15)
- ☐ 1 (16)
- ☐ 2 (17)
- ☐ 3 (18)
- ☐ 4 (19)
- ☐ 5 (20)
- ☐ 6 (21)
- ☐ 7 (22)
- ☐ 8 (23)
- ☐ 9 (24)
- ☐ 10 - Extremely satisfied (25)
- ☐ Don't know (26)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

48 Why are you less than satisfied with the bathroom faucet aerator?

49 Did you have any low-flow faucet aerators installed in your home before you received the Energy Efficiency kit from Duke Energy?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

50 Were you planning on buying low-flow faucet aerators for your home before you received the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ No, already have them installed in all available faucets (3)
- ☐ Maybe (4)
- ☐ Don't know (5)

51 Have you purchased any additional low-flow faucet aerators since receiving the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Have you purchased any additional low-flow faucet aerators since receiving the kit?_ Yes Is Selected

52 Do you recall how many additional low-flow faucet aerators have you purchased?

- ☐ Yes, please note how many you purchased below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Have you purchased any additional low-flow faucet aerators since receiving the kit?_ Yes Is Selected

53 Do you recall how many of these low-flow faucet aerators are currently installed in your home?

- ☐ Yes, please note how many you installed below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Do you recall how many of these low-flow faucet aerators are currently installed in your home? Yes, please note how many you installed below (numeric only): Is Greater Than 0

54 Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase these additional low-flow faucet aerators?

- ☐ 0 - Not at all influential (1)
- ☐ 1 (2)
- ☐ 2 (3)
- ☐ 3 (4)
- ☐ 4 (5)
- ☐ 5 (6)
- ☐ 6 (7)
- ☐ 7 (8)
- ☐ 8 (9)

- ☐ 9 (10)
- ☐ 10 - Extremely influential (11)
- ☐ Don't know (12)

55 The kit also included outlet and switch gasket insulators. Are some or all of the insulators that were provided in the kit currently installed in your home?

- ☐ Yes (1)
- ☐ No, but I do plan to install some or all of them (2)
- ☐ No, and I don't plan to install any of them (3)
- ☐ Don't know (4)

Answer If The kit also included outlet and switch gasket insulators. _Are some or all of the insulators that were provided in the kit currently installed in your home? Yes Is Selected

56 Please select the locations where you have installed an outlet and switch gasket insulator, then indicate in the number installed below (select all that apply):

- ☐ Interior walls (1) _____
- ☐ Exterior walls (2) _____
- ☐ Not installed yet on any walls (3) _____
- ☐ Don't know (4)

57 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the outlet and switch gasket insulators you received?

- ☐ 0 - Extremely dissatisfied (27)
- ☐ 1 (28)
- ☐ 2 (29)
- ☐ 3 (30)
- ☐ 4 (31)
- ☐ 5 (32)
- ☐ 6 (33)
- ☐ 7 (34)
- ☐ 8 (35)
- ☐ 9 (36)
- ☐ 10 - Extremely satisfied (37)
- ☐ Don't know (38)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

58 Why are you less than satisfied with the gasket insulators?

59 Did you have any outlet and switch gasket insulators installed in your home before you received the Energy Efficiency kit from Duke Energy?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

60 Were you planning on buying outlet and switch gaskets for your home before you received the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ No, already have them installed in all available outlets/switches (3)
- ☐ Maybe (4)
- ☐ Don't know (5)

61 Have you purchased any additional outlet and switch gaskets since receiving the kit?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

If Yes Is Not Selected, Then Skip To The energy efficiency kit you receive...

62 Do you recall how many additional outlet and switch gaskets have you purchased?

- ☐ Yes, please note how many you purchased below (numeric only): (1) _____
- ☐ I don't know (2)

64 Do you recall how many of these additional outlet and switch gaskets are currently installed on EXTERIOR WALLS of your home?

- ☐ Yes, please note how many you installed below (numeric only): (1) _____
- ☐ I don't know (2)

Answer If Do you recall how many of these additional outlet and switch gaskets are currently installed on E... Yes, please note how many you installed below (numeric only): Is Greater Than 0

65 Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase these additional outlet and switch gasket insulators?

- ☐ 0 - Not at all influential (1)
- ☐ 1 (2)
- ☐ 2 (3)
- ☐ 3 (4)

- ☐ 4 (5)
- ☐ 5 (6)
- ☐ 6 (7)
- ☐ 7 (8)
- ☐ 8 (9)
- ☐ 9 (10)
- ☐ 10 - Extremely influential (11)
- ☐ Don't know (12)

66 The kit also included a water flow meter bag. Did you use the water flow meter bag that was provided in the kit?

- ☐ Yes (1)
- ☐ No, but plan to (2)
- ☐ No, and don't plan to (3)
- ☐ Don't know (4)

If Yes Is Not Selected, Then Skip To On a scale from 0 to 10, where 0 is “...

67a On which faucet(s) did you check how many gallons of water you were using per minute? (select all that apply)

- ☐ Showerhead (1)
- ☐ Kitchen sink faucet (2)
- ☐ Bathroom sink faucet (3)
- ☐ Other sink faucet (4)

Answer If On which faucet(s) did you check how many gallons of water you were using per minute? (select all that apply) q://QID81/SelectedChoicesCount Is Greater Than 0

67b On which faucets did you then adjust the water flow based on the readings? (select all that apply)

68 On a scale from 0 to 10, where 0 is “extremely dissatisfied” and 10 is “extremely satisfied”, how would you rate your overall satisfaction with the water flow meter bag you received in the Energy Efficiency kit?

- ☐ Please select your rating here (2)
- ☐ 0 - Extremely dissatisfied (3)
- ☐ 1 (4)
- ☐ 2 (5)
- ☐ 3 (6)
- ☐ 4 (7)
- ☐ 5 (8)
- ☐ 6 (9)
- ☐ 7 (10)

- ☐ 8 (11)
- ☐ 9 (12)
- ☐ 10 - Extremely satisfied (13)
- ☐ Don't know (14)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

69 Why are you less than satisfied with the water flow meter bag?

70 The kit also included a water heater temperature card. Did you use the water heater temperature card to test the temperature of the hot water in your home?

- ☐ Yes (1)
- ☐ No, but plan to (2)
- ☐ No, and don't plan to (3)
- ☐ Don't know (4)

If Yes Is Not Selected, Then Skip To On a scale from 0 to 10, where 0 is "...

71 What was the temperature reading of the hot water in your home?

- ☐ Less than 120° (1)
- ☐ 120° (2)
- ☐ 130° (3)
- ☐ 140° (4)
- ☐ 150° (5)
- ☐ Above 150° (6)
- ☐ Don't Know (7)

72 Did you adjust your water heater temperature as a result?

- ☐ Yes (1)
- ☐ No (2)

Answer If Did you adjust your water heater temperature as a result? Yes Is Selected

73 What was the temperature reading of your hot water after you adjusted the water heater temperature?

- ☐ Less than 120° (1)
- ☐ 120° (2)
- ☐ 130° (3)

- ☐ 140° (4)
- ☐ 150° (5)
- ☐ Above 150° (6)
- ☐ Don't know (7)

74 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the water heater temperature card you received in the Energy Efficiency kit?

- ☐ Please select your rating here (2)
- ☐ 0 - Extremely dissatisfied (3)
- ☐ 1 (4)
- ☐ 2 (5)
- ☐ 3 (6)
- ☐ 4 (7)
- ☐ 5 (8)
- ☐ 6 (9)
- ☐ 7 (10)
- ☐ 8 (11)
- ☐ 9 (12)
- ☐ 10 - Extremely satisfied (13)
- ☐ Don't know (14)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

75 Why are you less than satisfied with the water heater temperature card?

76 The kit also included a night light. Is the night light that was provided in the kit currently installed in your home?

- ☐ Yes (1)
- ☐ No, installed but subsequently removed it (2)
- ☐ No, but plan to (3)
- ☐ No, and don't plan to (4)
- ☐ Don't know (5)

Answer If The kit also included a _night light. _Is the night light that was provided in the kit currently installed in your home? No, installed but subsequently removed it Is Selected

77 Why did you remove the night light?

78 On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with night light you received in the Energy Efficiency kit?

- ☐ 0 - Extremely dissatisfied (27)
- ☐ 1 (28)
- ☐ 2 (29)
- ☐ 3 (30)
- ☐ 4 (31)
- ☐ 5 (32)
- ☐ 6 (33)
- ☐ 7 (34)
- ☐ 8 (35)
- ☐ 9 (36)
- ☐ 10 - Extremely satisfied (37)
- ☐ Don't know (38)

Answer If On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 0 - Extremely dissatisfied Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 1 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 2 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 3 Is Selected Or On a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how... 4 Is Selected

79 Why are you less than satisfied with the night light?

80 How much would you say you read of the Energy Savers booklet from the Department of Energy?

- ☐ Read most or all of it (1)
- ☐ Read some of it, but not all of it (2)
- ☐ Glanced at it, but did not read it (3)
- ☐ Did not look at it at all (4)

If Did not look at it at all Is Selected, Then Skip To What other actions, if any, have you ...If Glanced at it, but did not ... Is Selected, Then Skip To What other actions, if any, have you ...

Answer If How much would you say you read of the Energy Savers booklet from the Department of Energy? Read most or all of it Is Selected Or How much would you say you read of the Energy Savers booklet from the Department of Energy? Read some of it, but not all of it Is Selected

81 Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means "strongly disagree" and 10 means "strongly agree."

It was helpful (1)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)
It was informative (2)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)
It offered tips for saving energy that I had not previously thought about (3)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)
It provided ideas that are feasible to implement (4)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)
It provided ideas that are affordable to implement (5)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)
It was easy to understand (6)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)
It was relevant to my household and the way I live (7)	<input type="radio"/> 0 - Strongly disagree (1)	<input type="radio"/> 1 (2)	<input type="radio"/> 2 (3)	<input type="radio"/> 3 (4)	<input type="radio"/> 4 (5)	<input type="radio"/> 5 (6)	<input type="radio"/> 6 (7)	<input type="radio"/> 7 (8)	<input type="radio"/> 8 (9)	<input type="radio"/> 9 (10)	<input type="radio"/> 10 - Strongly agree (11)	<input type="radio"/> Don't know (12)

Answer If How much would you say you read of the Energy Savers booklet from the Department of Energy? Read most or all of it Is Selected Or How much would you say you read of the Energy Savers booklet from the Department of Energy? Read some of it, but not all of it Is Selected

82 Based on the advice in the booklet, have you taken any of the following actions?

	Yes (1)	No, but plan to (2)	No, and don't plan to (3)	Don't know (4)
Sealed air leaks; properly insulated home (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintained and/or upgraded HVAC equipment (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lowered hot water temperature (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Installed energy efficient windows (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chose energy-efficient lighting, such as CFLs and LEDs (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Purchased more energy efficient appliances throughout home (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turned off home electronics when not in use (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chose more efficient transportation options (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Used renewable energy at home such as solar and wind (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

83 What other actions, if any, have you taken in your home to save energy and reduce utility bills at least in part as a result of what you learned in the Duke Energy / National Theater for Children program?

84 Since receiving the kit, has your knowledge of how to save energy and reduce your utility bill increased, stayed the same, or decreased?

- ☐ Increased a lot (1)
- ☐ Increased somewhat (2)
- ☐ Stayed about the same (3)
- ☐ Decreased somewhat (4)
- ☐ Decreased a lot (5)
- ☐ Don't know (6)

Answer If State_Cd Is Equal to NC Or State_Cd Is Equal to KY Or State_Cd Is Equal to IN Or State_Cd Is Equal to SC

85 Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied", how would you rate your overall satisfaction with the program?

- ☐ 0 - Extremely dissatisfied (27)
- ☐ 1 (28)
- ☐ 2 (29)
- ☐ 3 (30)
- ☐ 4 (31)
- ☐ 5 (32)
- ☐ 6 (33)
- ☐ 7 (34)
- ☐ 8 (35)
- ☐ 9 (36)
- ☐ 10 - Extremely satisfied (37)
- ☐ Don't know (38)

Answer If Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0... 0 - Extremely dissatisfied Is Selected Or Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0... 1 Is Selected Or Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0... 2 Is Selected Or Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0... 3 Is Selected Or Thinking about the Duke Energy / National Theater for Children program overall, on a scale from 0... 4 Is Selected

86 What, specifically, caused you to rate your satisfaction with Duke Energy's / National Theater for Children program a \${q://QID100/ChoiceGroup/SelectedChoices}?

Answer If State_Cd Is Equal to OH

87 Finally, if you were rating your overall satisfaction with the Duke Energy / National Theater for Children program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, or Very Dissatisfied?

- ☐ Very satisfied (1)
- ☐ Somewhat satisfied (2)
- ☐ Neither satisfied nor dissatisfied (3)
- ☐ Somewhat dissatisfied (4)
- ☐ Very dissatisfied (5)
- ☐ Don't know (6)

If Don't know Is Selected, Then Skip To Do you have any suggestions to improv...

Answer If State_Cd Is Equal to OH

88 Why do you give it that rating?

89 Do you have any suggestions to improve this program?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Answer If Do you have any suggestions to improve this program? Yes Is Selected

90 How might the program be improved?

91 As a result of participating in this National Theater for Children program, would you say your attitude toward Duke Energy is more positive, more negative, or about the same?

- ☐ Much more positive (1)
- ☐ Somewhat more positive (2)
- ☐ About the same (3)
- ☐ Somewhat more negative (4)
- ☐ Much more negative (5)
- ☐ Don't know (6)

D intro Finally, we have some general demographic questions.

d1 In what type of building do you live?

- ☐ Single-family home, detached construction (1)
- ☐ Single family home, factory manufactured/modular (2)
- ☐ Single family, mobile home (3)
- ☐ Row House (4)
- ☐ Two or Three family attached residence-traditional structure (5)
- ☐ Apartment (4 + families)---traditional structure (6)
- ☐ Condominium---traditional structure (7)

- ☐ Other (8)
- ☐ Don't know (9)

d2 Approximately what year was this home first built?

- ☐ 1959 and before (1)
- ☐ 1960-1979 (2)
- ☐ 1980-1989 (3)
- ☐ 1990-1997 (4)
- ☐ 1998-2000 (5)
- ☐ 2001-2007 (6)
- ☐ 2008-present (7)
- ☐ Don't know (8)

d3 About how large is your home in square feet, excluding your garage and/or patio? Note: A 10-foot by 12 foot room is 120 square feet

- ☐ Less than 500 (1)
- ☐ 500 – 999 (2)
- ☐ 1000 – 1499 (3)
- ☐ 1500 – 1999 (4)
- ☐ 2000 – 2499 (5)
- ☐ 2500 – 2999 (6)
- ☐ 3000 – 3499 (7)
- ☐ 3500 – 3999 (8)
- ☐ 4000 or more (9)
- ☐ Don't know (10)

d4 Which of the following best describes your home's heating system?

- ☐ Central forced air furnace (1)
- ☐ Electric baseboard (2)
- ☐ Heat pump (3)
- ☐ Geothermal heat pump (4)
- ☐ Other, please describe in the text box below: (5) _____

d5 What type of fuel do you use to primarily heat your home?

- ☐ Natural gas (1)
- ☐ Bottled, tank, or LP (2)
- ☐ Electric (3)
- ☐ Oil, kerosene (4)
- ☐ Coal (5)
- ☐ Wood (6)
- ☐ Other, please describe in the text box below: (7) _____

d6 Which of the following best describes your home's cooling system?

- ☐ None, do not cool the home (1)
- ☐ Heat pump for cooling (2)
- ☐ Central air conditioning (3)
- ☐ Wall or window air conditioning unit (4)
- ☐ Geothermal heat pump (5)
- ☐ Other, please describe in the text box below: (6) _____

d7 What type of fuel do you use to heat water in your home?

- ☐ Natural gas (1)
- ☐ Bottled, tank, or LP gas (2)
- ☐ Electric (3)
- ☐ Oil, kerosene (4)
- ☐ Coal (5)
- ☐ Wood (6)
- ☐ Other, please describe in the text box below: (7) _____

d8 Do you own or rent your home?

- ☐ Rent (1)
- ☐ Own (2)

d9 How many people live in your home year-round? (numeric only)

d10 How many of the people who live in your home are under age 18? (numeric only)

11 What is your age group?

- ☐ 18-24 (1)
- ☐ 25-34 (2)
- ☐ 35-44 (3)
- ☐ 45-54 (4)
- ☐ 55-64 (5)
- ☐ 65-74 (6)
- ☐ 75+ (7)

d12 Which of the following categories best describes your total annual household income before taxes?

- ☐ Under \$15,000 (1)
- ☐ \$15,000 - \$29,999 (2)
- ☐ \$30,000 - \$49,999 (3)
- ☐ \$50,000 - \$74,999 (4)
- ☐ \$75,000 - \$100,000 (5)
- ☐ Over \$100,000 (6)
- ☐ Prefer not to answer (7)

Appendix G. Participant Survey Frequency Tables

CFL Installations

The energy efficiency kit you received contained various energy-saving items for your home, including a 13-watt CFL. Is this currently installed in your home?

		NC	SC	Total
Yes	Count	297	105	402
	% within State	79.2%	78.9%	79.1%
No, installed but subsequently removed it	Count	6	4	10
	% within State	1.6%	3.0%	2.0%
No, but I plan to install it	Count	50	22	72
	% within State	13.3%	16.5%	14.2%
No, and I don't plan to install it	Count	8	1	9
	% within State	2.1%	.8%	1.8%
Don't know	Count	14	1	15
	% within State	3.7%	.8%	3.0%
Total	Count	375	133	508
	% within State	100.0%	100.0%	100.0%

Is the 18-watt bulb currently installed in your home? (If not, do you plan to install it?)

		NC	SC	Total
Yes	Count	274	99	373
	% within State	73.1%	73.9%	73.3%
No, installed but subsequently removed it	Count	3	4	7
	% within State	.8%	3.0%	1.4%
No, but I plan to install it	Count	73	25	98
	% within State	19.5%	18.7%	19.3%
No, and I don't plan to install it	Count	8	0	8
	% within State	2.1%	0.0%	1.6%
Don't know	Count	17	6	23
	% within State	4.5%	4.5%	4.5%
Total	Count	375	134	509
	% within State	100.0%	100.0%	100.0%

Why did you remove the CFL(s)?

		NC	SC	Total
Not bright enough	Count	2	1	3
	% within State	33.3%	25.0%	30.0%
Did not like how the light looked	Count	1	0	1
	% within State	16.7%	0.0%	10.0%
The CFL burned out	Count	1	1	2
	% within State	16.7%	25.0%	20.0%
Other, please describe in the text box	Count	2	2	4

below:				
Total	% within State	33.3%	50.0%	40.0%
	Count	6	4	10
	% within State	100.0%	100.0%	100.0%

Why did you remove the CFL(s)? TEXT

		NC	SC	Total
	Count	374	132	506
	% within State	99.5%	98.5%	99.2%
It caught fire in my standing lamp	Count	0	1	1
	% within State	0.0%	.7%	.2%
Not a warm light in terms of color	Count	1	0	1
	% within State	.3%	0.0%	.2%
Ordered LED lights from Duke Energy Website and replaced all bulbs with LED	Count	0	1	1
	% within State	0.0%	.7%	.2%
Too slow and replaced with LED	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Thinking about the 13-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it?

		NC	SC	Total
Living/family room	Count	105	31	136
	% within State	35.4%	29.5%	33.8%
Dining room	Count	17	6	23
	% within State	5.7%	5.7%	5.7%
Kitchen	Count	29	9	38
	% within State	9.8%	8.6%	9.5%
Master bedroom	Count	43	15	58
	% within State	14.5%	14.3%	14.4%
Other bedroom	Count	50	27	77
	% within State	16.8%	25.7%	19.2%
Hall	Count	18	7	25
	% within State	6.1%	6.7%	6.2%
Closet	Count	6	0	6
	% within State	2.0%	0.0%	1.5%
Basement	Count	1	0	1
	% within State	.3%	0.0%	.2%
Garage	Count	3	1	4
	% within State	1.0%	1.0%	1.0%
Outdoors/Exterior	Count	9	1	10
	% within State	3.0%	1.0%	2.5%

Total	Other specify:	Count	16	8	24
		% within State	5.4%	7.6%	6.0%
		Count	297	105	402
		% within State	100.0%	100.0%	100.0%

Thinking about the 13-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it? TEXT

		NC	SC	Total
	Count	360	126	486
	% within State	95.7%	94.0%	95.3%
bath rooms and in entries	Count	1	0	1
	% within State	.3%	0.0%	.2%
bathroom	Count	4	2	6
	% within State	1.1%	1.5%	1.2%
Bathroom	Count	3	3	6
	% within State	.8%	2.2%	1.2%
bathroom vanity fixture	Count	1	0	1
	% within State	.3%	0.0%	.2%
Don't remember	Count	0	1	1
	% within State	0.0%	.7%	.2%
entire house	Count	1	0	1
	% within State	.3%	0.0%	.2%
Kids play room	Count	0	1	1
	% within State	0.0%	.7%	.2%
lamp	Count	0	1	1
	% within State	0.0%	.7%	.2%
laundry room	Count	1	0	1
	% within State	.3%	0.0%	.2%
office	Count	1	0	1
	% within State	.3%	0.0%	.2%
Office	Count	1	0	1
	% within State	.3%	0.0%	.2%
porch	Count	1	0	1
	% within State	.3%	0.0%	.2%
Stairwell	Count	1	0	1
	% within State	.3%	0.0%	.2%
Sun Room	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Thinking about the 18-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it?

		NC	SC	Total
Living/family room	Count	100	42	142
	% within State	37.0%	42.4%	38.5%
Dining room	Count	25	7	32
	% within State	9.3%	7.1%	8.7%
Kitchen	Count	45	13	58
	% within State	16.7%	13.1%	15.7%
Master bedroom	Count	35	20	55
	% within State	13.0%	20.2%	14.9%
Other bedroom	Count	22	7	29
	% within State	8.1%	7.1%	7.9%
Hall	Count	15	1	16
	% within State	5.6%	1.0%	4.3%
Closet	Count	2	0	2
	% within State	.7%	0.0%	.5%
Basement	Count	4	0	4
	% within State	1.5%	0.0%	1.1%
Garage	Count	5	2	7
	% within State	1.9%	2.0%	1.9%
Outdoors/Exterior	Count	11	2	13
	% within State	4.1%	2.0%	3.5%
Other specify:	Count	6	5	11
	% within State	2.2%	5.1%	3.0%
Total	Count	270	99	369
	% within State	100.0%	100.0%	100.0%

Thinking about the 18-watt CFL bulb you received in the Energy Efficiency Kit, where in your home did you install it? TEXT

		NC	SC	Total
	Count	370	129	499
	% within State	98.4%	96.3%	97.8%
Bathroom	Count	1	2	3
	% within State	.3%	1.5%	.6%
bed dining & living rooms	Count	1	0	1
	% within State	.3%	0.0%	.2%
can't remember	Count	1	0	1
	% within State	.3%	0.0%	.2%
den	Count	0	1	1
	% within State	0.0%	.7%	.2%
Don't remember	Count	0	1	1
	% within State	0.0%	.7%	.2%
Home Office	Count	1	0	1

	% within State	.3%	0.0%	.2%
laundry room	Count	0	1	1
	% within State	0.0%	.7%	.2%
Office	Count	1	0	1
	% within State	.3%	0.0%	.2%
playroom	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

On average, approximately how many hours per day is the 13-watt CFL in the [location] being used?

		NC	SC	Total
	Count	84	33	117
	% within State	22.3%	24.6%	22.9%
3	Count	1	0	1
	% within State	.3%	0.0%	.2%
5 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
.25	Count	2	0	2
	% within State	.5%	0.0%	.4%
.3	Count	1	0	1
	% within State	.3%	0.0%	.2%
.5	Count	4	0	4
	% within State	1.1%	0.0%	.8%
0	Count	2	0	2
	% within State	.5%	0.0%	.4%
1	Count	26	12	38
	% within State	6.9%	9.0%	7.5%
1 and a half	Count	1	0	1
	% within State	.3%	0.0%	.2%
1 hour	Count	0	1	1
	% within State	0.0%	.7%	.2%
1 to 2 hr	Count	1	0	1
	% within State	.3%	0.0%	.2%
1-2	Count	4	2	6
	% within State	1.1%	1.5%	1.2%
1.5 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
10	Count	1	2	3
	% within State	.3%	1.5%	.6%
10 hours	Count	0	1	1
	% within State	0.0%	.7%	.2%
10 hrs	Count	1	0	1

	% within State	.3%	0.0%	.2%
10hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
12	Count	0	1	1
	% within State	0.0%	.7%	.2%
12 hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
15	Count	1	0	1
	% within State	.3%	0.0%	.2%
17 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
1hour	Count	1	0	1
	% within State	.3%	0.0%	.2%
2	Count	52	16	68
	% within State	13.8%	11.9%	13.3%
2 hours	Count	5	1	6
	% within State	1.3%	.7%	1.2%
2 hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
2-3	Count	2	0	2
	% within State	.5%	0.0%	.4%
2-3 hours	Count	1	1	2
	% within State	.3%	.7%	.4%
2-4	Count	2	1	3
	% within State	.5%	.7%	.6%
2,3 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
20	Count	2	0	2
	% within State	.5%	0.0%	.4%
24	Count	3	2	5
	% within State	.8%	1.5%	1.0%
24hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
3	Count	48	19	67
	% within State	12.8%	14.2%	13.1%
3 - 4 hrs.	Count	1	0	1
	% within State	.3%	0.0%	.2%
3 hours	Count	4	0	4
	% within State	1.1%	0.0%	.8%
3 to 4	Count	1	0	1
	% within State	.3%	0.0%	.2%
3 to 4 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%

3-4 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
30 minutes	Count	0	1	1
	% within State	0.0%	.7%	.2%
3hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
4	Count	39	15	54
	% within State	10.4%	11.2%	10.6%
4 hours	Count	2	1	3
	% within State	.5%	.7%	.6%
4 hrs a day.	Count	1	0	1
	% within State	.3%	0.0%	.2%
4-5hrs	Count	1	0	1
	% within State	.3%	0.0%	.2%
4-6	Count	2	0	2
	% within State	.5%	0.0%	.4%
4hour	Count	1	0	1
	% within State	.3%	0.0%	.2%
5	Count	20	5	25
	% within State	5.3%	3.7%	4.9%
5 hours	Count	2	1	3
	% within State	.5%	.7%	.6%
5 HOURS	Count	1	0	1
	% within State	.3%	0.0%	.2%
6	Count	15	4	19
	% within State	4.0%	3.0%	3.7%
6 hrs	Count	1	0	1
	% within State	.3%	0.0%	.2%
6-8	Count	0	1	1
	% within State	0.0%	.7%	.2%
6hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
7	Count	6	2	8
	% within State	1.6%	1.5%	1.6%
7-8	Count	1	0	1
	% within State	.3%	0.0%	.2%
8	Count	10	3	13
	% within State	2.7%	2.2%	2.5%
8 hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
8-10 hours.	Count	0	1	1
	% within State	0.0%	.7%	.2%
8-9	Count	1	0	1

	% within State	.3%	0.0%	.2%
8hrs.	Count	1	0	1
	% within State	.3%	0.0%	.2%
a couple of hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
around 5	Count	1	0	1
	% within State	.3%	0.0%	.2%
five hours a day	Count	1	0	1
	% within State	.3%	0.0%	.2%
less than 1	Count	1	0	1
	% within State	.3%	0.0%	.2%
less than 1 hour	Count	1	0	1
	% within State	.3%	0.0%	.2%
Less than 1 hour	Count	0	1	1
	% within State	0.0%	.7%	.2%
less than 1hr	Count	1	0	1
	% within State	.3%	0.0%	.2%
less than an hour	Count	1	0	1
	% within State	.3%	0.0%	.2%
Less then 1 hr.	Count	1	0	1
	% within State	.3%	0.0%	.2%
living room	Count	0	1	1
	% within State	0.0%	.7%	.2%
Maybe 5	Count	1	0	1
	% within State	.3%	0.0%	.2%
Not sure	Count	1	0	1
	% within State	.3%	0.0%	.2%
one	Count	1	0	1
	% within State	.3%	0.0%	.2%
seven	Count	0	1	1
	% within State	0.0%	.7%	.2%
three to four hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
we use it when its dark...	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

On average, approximately how many hours per day is the 18-watt CFL in the [location] being used?

		NC	SC	Total
	Count	108	39	147
	% within State	28.7%	29.1%	28.8%
4	Count	1	0	1
	% within State	.3%	0.0%	.2%
.5	Count	2	1	3
	% within State	.5%	.7%	.6%
.5 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
<1	Count	1	0	1
	% within State	.3%	0.0%	.2%
0	Count	1	0	1
	% within State	.3%	0.0%	.2%
1	Count	33	9	42
	% within State	8.8%	6.7%	8.2%
1 hour	Count	1	1	2
	% within State	.3%	.7%	.4%
1-2	Count	2	2	4
	% within State	.5%	1.5%	.8%
1.5	Count	1	0	1
	% within State	.3%	0.0%	.2%
10	Count	5	5	10
	% within State	1.3%	3.7%	2.0%
10 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
10 minutes	Count	0	1	1
	% within State	0.0%	.7%	.2%
12	Count	3	0	3
	% within State	.8%	0.0%	.6%
16	Count	1	0	1
	% within State	.3%	0.0%	.2%
18	Count	2	0	2
	% within State	.5%	0.0%	.4%
2	Count	33	15	48
	% within State	8.8%	11.2%	9.4%
2 hours	Count	0	1	1
	% within State	0.0%	.7%	.2%
2 to 3 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
2-3	Count	2	0	2

	% within State	.5%	0.0%	.4%
2-3 hours	Count	2	0	2
	% within State	.5%	0.0%	.4%
2-3hrs	Count	1	0	1
	% within State	.3%	0.0%	.2%
2-4	Count	0	1	1
	% within State	0.0%	.7%	.2%
2.5	Count	2	0	2
	% within State	.5%	0.0%	.4%
2=4	Count	1	0	1
	% within State	.3%	0.0%	.2%
20	Count	0	1	1
	% within State	0.0%	.7%	.2%
24	Count	2	0	2
	% within State	.5%	0.0%	.4%
24 hours	Count	0	1	1
	% within State	0.0%	.7%	.2%
28	Count	1	0	1
	% within State	.3%	0.0%	.2%
2hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
2hrs	Count	1	0	1
	% within State	.3%	0.0%	.2%
3	Count	34	8	42
	% within State	9.0%	6.0%	8.2%
3 hours	Count	7	2	9
	% within State	1.9%	1.5%	1.8%
3 HOURS	Count	1	0	1
	% within State	.3%	0.0%	.2%
3 hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
3 to 4	Count	2	0	2
	% within State	.5%	0.0%	.4%
3-4	Count	2	0	2
	% within State	.5%	0.0%	.4%
30	Count	0	1	1
	% within State	0.0%	.7%	.2%
30 minutes	Count	0	1	1
	% within State	0.0%	.7%	.2%
3hours	Count	1	0	1
	% within State	.3%	0.0%	.2%

3hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
4	Count	35	17	52
	% within State	9.3%	12.7%	10.2%
4 hours	Count	1	1	2
	% within State	.3%	.7%	.4%
4-5	Count	1	0	1
	% within State	.3%	0.0%	.2%
4hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
5	Count	25	6	31
	% within State	6.6%	4.5%	6.1%
5-6	Count	1	0	1
	% within State	.3%	0.0%	.2%
5.	Count	1	0	1
	% within State	.3%	0.0%	.2%
5hours	Count	0	1	1
	% within State	0.0%	.7%	.2%
6	Count	15	5	20
	% within State	4.0%	3.7%	3.9%
6 hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
6 hours	Count	2	1	3
	% within State	.5%	.7%	.6%
6 hrs. a day.	Count	1	0	1
	% within State	.3%	0.0%	.2%
6-8	Count	1	0	1
	% within State	.3%	0.0%	.2%
6hrs.	Count	1	0	1
	% within State	.3%	0.0%	.2%
7	Count	2	0	2
	% within State	.5%	0.0%	.4%
7 hours	Count	0	1	1
	% within State	0.0%	.7%	.2%
8	Count	15	6	21
	% within State	4.0%	4.5%	4.1%
8 hrs	Count	0	1	1
	% within State	0.0%	.7%	.2%
8-9	Count	1	0	1
	% within State	.3%	0.0%	.2%
9	Count	1	1	2

	% within State	.3%	.7%	.4%
all night	Count	1	0	1
	% within State	.3%	0.0%	.2%
around 8	Count	1	0	1
	% within State	.3%	0.0%	.2%
five hours	Count	1	0	1
	% within State	.3%	0.0%	.2%
four	Count	1	0	1
	% within State	.3%	0.0%	.2%
i don't know	Count	1	0	1
	% within State	.3%	0.0%	.2%
less than 1	Count	1	0	1
	% within State	.3%	0.0%	.2%
less than 1 hour	Count	1	0	1
	% within State	.3%	0.0%	.2%
Less than 1 hour	Count	0	1	1
	% within State	0.0%	.7%	.2%
less than 2hrs	Count	1	0	1
	% within State	.3%	0.0%	.2%
less than an hour	Count	1	0	1
	% within State	.3%	0.0%	.2%
Less then 1 hr.	Count	1	0	1
	% within State	.3%	0.0%	.2%
maybe 2	Count	1	0	1
	% within State	.3%	0.0%	.2%
maybe 3 1/2 to 4 hours a day	Count	1	0	1
	% within State	.3%	0.0%	.2%
seven	Count	0	1	1
	% within State	0.0%	.7%	.2%
two hours a day	Count	1	0	1
	% within State	.3%	0.0%	.2%
unsure	Count	1	0	1
	% within State	.3%	0.0%	.2%
we use it when its dark...	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

You noted that you installed the 13-watt bulb in the [location]. What type of bulb was installed prior to installing this new bulb?

		NC	SC	Total
Standard incandescent	Count	174	66	240
	% within State	58.6%	62.9%	59.7%
CFL	Count	80	29	109
	% within State	26.9%	27.6%	27.1%
LED	Count	15	2	17
	% within State	5.1%	1.9%	4.2%
Other, please describe in the text box below:	Count	2	0	2
	% within State	.7%	0.0%	.5%
No bulb in socket / burned out bulb	Count	6	1	7
	% within State	2.0%	1.0%	1.7%
Don't know	Count	20	7	27
	% within State	6.7%	6.7%	6.7%
Total	Count	297	105	402
	% within State	100.0%	100.0%	100.0%

You noted that you installed the 13-watt bulb in the [location]. What type of bulb was installed prior to installing this new bulb? TEXT

		NC	SC	Total
	Count	374	133	507
	% within State	99.5%	99.3%	99.4%
Halogen	Count	1	0	1
	% within State	.3%	0.0%	.2%
just a regular bulb	Count	0	1	1
	% within State	0.0%	.7%	.2%
regular bulb were installed, when I moved I installed all 13-watt and 18 watt which you sent to me	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

The 13-watt CFL replaced a [type] bulb in the [location]. What type of bulb was installed prior to installing this new bulb?

		NC	SC	Total
	Count	165	59	224
	% within State	43.9%	44.0%	43.9%
13 I think	Count	1	0	1
	% within State	.3%	0.0%	.2%
?	Count	4	0	4
	% within State	1.1%	0.0%	.8%

100	Count	6	0	6
	% within State	1.6%	0.0%	1.2%
100 watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
13	Count	16	3	19
	% within State	4.3%	2.2%	3.7%
13 watt	Count	3	1	4
	% within State	.8%	.7%	.8%
13-Watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
18	Count	7	3	10
	% within State	1.9%	2.2%	2.0%
18-watt	Count	0	1	1
	% within State	0.0%	.7%	.2%
20	Count	3	0	3
	% within State	.8%	0.0%	.6%
20 watt	Count	0	1	1
	% within State	0.0%	.7%	.2%
25	Count	1	0	1
	% within State	.3%	0.0%	.2%
30	Count	4	0	4
	% within State	1.1%	0.0%	.8%
30 watt	Count	0	1	1
	% within State	0.0%	.7%	.2%
4	Count	1	0	1
	% within State	.3%	0.0%	.2%
40	Count	21	8	29
	% within State	5.6%	6.0%	5.7%
40 equivalent	Count	1	1	2
	% within State	.3%	.7%	.4%
40 watts	Count	1	0	1
	% within State	.3%	0.0%	.2%
40-watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
40watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
45	Count	3	0	3
	% within State	.8%	0.0%	.6%
45watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
50	Count	1	0	1

	% within State	.3%	0.0%	.2%
50watt? don't really remember	Count	0	1	1
	% within State	0.0%	.7%	.2%
60	Count	67	27	94
	% within State	17.8%	20.1%	18.4%
60 equivalent	Count	13	3	16
	% within State	3.5%	2.2%	3.1%
60 w	Count	0	1	1
	% within State	0.0%	.7%	.2%
60 W	Count	0	1	1
	% within State	0.0%	.7%	.2%
60 watt	Count	6	0	6
	% within State	1.6%	0.0%	1.2%
60 watts	Count	1	0	1
	% within State	.3%	0.0%	.2%
60-100	Count	0	1	1
	% within State	0.0%	.7%	.2%
60watts	Count	1	0	1
	% within State	.3%	0.0%	.2%
64	Count	1	0	1
	% within State	.3%	0.0%	.2%
65	Count	2	0	2
	% within State	.5%	0.0%	.4%
65 equivalent	Count	1	0	1
	% within State	.3%	0.0%	.2%
7	Count	2	0	2
	% within State	.5%	0.0%	.4%
70	Count	0	1	1
	% within State	0.0%	.7%	.2%
75	Count	2	5	7
	% within State	.5%	3.7%	1.4%
75 equivalent	Count	1	1	2
	% within State	.3%	.7%	.4%
75 watt	Count	2	0	2
	% within State	.5%	0.0%	.4%
75 watts	Count	1	0	1
	% within State	.3%	0.0%	.2%
75 watts.	Count	1	0	1
	% within State	.3%	0.0%	.2%
80 watt	Count	1	0	1
	% within State	.3%	0.0%	.2%

90	Count	0	1	1
	% within State	0.0%	.7%	.2%
can't remember	Count	1	0	1
	% within State	.3%	0.0%	.2%
do not know	Count	1	0	1
	% within State	.3%	0.0%	.2%
do not remember	Count	1	0	1
	% within State	.3%	0.0%	.2%
don't know	Count	3	0	3
	% within State	.8%	0.0%	.6%
Don't know	Count	0	1	1
	% within State	0.0%	.7%	.2%
don't remember	Count	3	2	5
	% within State	.8%	1.5%	1.0%
Don't remember	Count	2	1	3
	% within State	.5%	.7%	.6%
dont know	Count	1	0	1
	% within State	.3%	0.0%	.2%
dont remember	Count	1	0	1
	% within State	.3%	0.0%	.2%
forgot	Count	1	0	1
	% within State	.3%	0.0%	.2%
i don't know	Count	1	0	1
	% within State	.3%	0.0%	.2%
I don't know	Count	0	1	1
	% within State	0.0%	.7%	.2%
I don't remember	Count	2	1	3
	% within State	.5%	.7%	.6%
I don't remember now	Count	1	0	1
	% within State	.3%	0.0%	.2%
I don't remember.	Count	1	0	1
	% within State	.3%	0.0%	.2%
I think 13 watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
n/a	Count	1	1	2
	% within State	.3%	.7%	.4%
Na	Count	1	0	1
	% within State	.3%	0.0%	.2%
no	Count	0	1	1
	% within State	0.0%	.7%	.2%
not bright	Count	1	0	1

	% within State	.3%	0.0%	.2%
not sure	Count	3	0	3
	% within State	.8%	0.0%	.6%
Not sure	Count	2	2	4
	% within State	.5%	1.5%	.8%
NOT SURE	Count	1	0	1
	% within State	.3%	0.0%	.2%
Not sure.	Count	1	1	2
	% within State	.3%	.7%	.4%
Unknown	Count	0	1	1
	% within State	0.0%	.7%	.2%
unsure	Count	0	2	2
	% within State	0.0%	1.5%	.4%
Unsure	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

You noted that you installed the 18-watt bulb in the [location]. What type of bulb was installed prior to installing this new bulb?

		NC	SC	Total
Standard incandescent	Count	175	56	231
	% within State	64.6%	57.1%	62.6%
CFL	Count	52	23	75
	% within State	19.2%	23.5%	20.3%
LED	Count	9	2	11
	% within State	3.3%	2.0%	3.0%
No bulb in socket / burned out bulb	Count	13	3	16
	% within State	4.8%	3.1%	4.3%
Don't know	Count	22	14	36
	% within State	8.1%	14.3%	9.8%
Total	Count	271	98	369
	% within State	100.0%	100.0%	100.0%

You noted that you installed the 18-watt bulb in the [location]. TEXT

		NC	SC	Total
	Count	374	131	505
	% within State	99.5%	97.8%	99.0%
13	Count	0	1	1
	% within State	0.0%	.7%	.2%
75	Count	1	0	1

	% within State	.3%	0.0%	.2%
ceiling fan bulbs	Count	1	0	1
	% within State	.3%	0.0%	.2%
GE standard light bulb 60 watt	Count	0	1	1
	% within State	0.0%	.7%	.2%
just a regular bulb	Count	0	1	1
	% within State	0.0%	.7%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

The 18-watt CFL replaced a [type of] bulb in the [location].

		NC	SC	Total
	Count	172	62	234
	% within State	45.7%	46.3%	45.9%
?	Count	4	0	4
	% within State	1.1%	0.0%	.8%
100	Count	13	5	18
	% within State	3.5%	3.7%	3.5%
100 watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
120	Count	1	0	1
	% within State	.3%	0.0%	.2%
13	Count	4	2	6
	% within State	1.1%	1.5%	1.2%
13 watt	Count	1	1	2
	% within State	.3%	.7%	.4%
15	Count	1	0	1
	% within State	.3%	0.0%	.2%
18	Count	10	7	17
	% within State	2.7%	5.2%	3.3%
18 watts	Count	0	1	1
	% within State	0.0%	.7%	.2%
18-watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
20	Count	2	0	2
	% within State	.5%	0.0%	.4%
20 watt	Count	0	1	1
	% within State	0.0%	.7%	.2%
22	Count	0	1	1
	% within State	0.0%	.7%	.2%
25	Count	2	0	2

	% within State	.5%	0.0%	.4%
30	Count	3	0	3
	% within State	.8%	0.0%	.6%
30 equivalent	Count	1	0	1
	% within State	.3%	0.0%	.2%
30 watt	Count	0	1	1
	% within State	0.0%	.7%	.2%
35w	Count	1	0	1
	% within State	.3%	0.0%	.2%
4	Count	0	1	1
	% within State	0.0%	.7%	.2%
40	Count	10	4	14
	% within State	2.7%	3.0%	2.7%
40-watt equivalent	Count	1	0	1
	% within State	.3%	0.0%	.2%
45	Count	1	0	1
	% within State	.3%	0.0%	.2%
50	Count	1	0	1
	% within State	.3%	0.0%	.2%
60	Count	71	16	87
	% within State	18.9%	11.9%	17.1%
60 equivalent	Count	4	2	6
	% within State	1.1%	1.5%	1.2%
60 W	Count	0	1	1
	% within State	0.0%	.7%	.2%
60 watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
60-100	Count	0	1	1
	% within State	0.0%	.7%	.2%
60-watt	Count	1	1	2
	% within State	.3%	.7%	.4%
60watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
65	Count	2	0	2
	% within State	.5%	0.0%	.4%
7	Count	1	0	1
	% within State	.3%	0.0%	.2%
70	Count	0	1	1
	% within State	0.0%	.7%	.2%
75	Count	24	14	38
	% within State	6.4%	10.4%	7.5%

75 equivalent	Count	4	0	4
	% within State	1.1%	0.0%	.8%
75 watt	Count	4	1	5
	% within State	1.1%	.7%	1.0%
75 watts	Count	2	0	2
	% within State	.5%	0.0%	.4%
75-watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
75watt	Count	1	0	1
	% within State	.3%	0.0%	.2%
75watt? don't really remember	Count	0	1	1
	% within State	0.0%	.7%	.2%
75watts	Count	1	0	1
	% within State	.3%	0.0%	.2%
80	Count	1	0	1
	% within State	.3%	0.0%	.2%
90	Count	1	1	2
	% within State	.3%	.7%	.4%
can't remember	Count	1	0	1
	% within State	.3%	0.0%	.2%
do not know	Count	1	0	1
	% within State	.3%	0.0%	.2%
Do not know	Count	1	0	1
	% within State	.3%	0.0%	.2%
don't know	Count	1	0	1
	% within State	.3%	0.0%	.2%
don't remember	Count	4	1	5
	% within State	1.1%	.7%	1.0%
Don't remember	Count	2	1	3
	% within State	.5%	.7%	.6%
dont know	Count	0	1	1
	% within State	0.0%	.7%	.2%
dont remember	Count	3	0	3
	% within State	.8%	0.0%	.6%
i do not remember	Count	1	0	1
	% within State	.3%	0.0%	.2%
i don't know	Count	1	0	1
	% within State	.3%	0.0%	.2%
I don't know	Count	2	1	3
	% within State	.5%	.7%	.6%
I don't remember	Count	0	1	1

	% within State	0.0%	.7%	.2%
idk	Count	1	0	1
	% within State	.3%	0.0%	.2%
n/a	Count	1	0	1
	% within State	.3%	0.0%	.2%
Na	Count	1	0	1
	% within State	.3%	0.0%	.2%
no	Count	0	1	1
	% within State	0.0%	.7%	.2%
not sure	Count	3	0	3
	% within State	.8%	0.0%	.6%
Not sure	Count	0	1	1
	% within State	0.0%	.7%	.2%
Not sure.	Count	0	1	1
	% within State	0.0%	.7%	.2%
sixty	Count	1	0	1
	% within State	.3%	0.0%	.2%
unk	Count	1	0	1
	% within State	.3%	0.0%	.2%
unsure	Count	0	1	1
	% within State	0.0%	.7%	.2%
Unsure	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

The [bulb] was replaced by the 18-watt CFL bulb. What was the wattage of the [bulb]?

		NC	SC	Total
	Count	374	132	506
	% within State	99.5%	98.5%	99.2%
?	Count	1	0	1
	% within State	.3%	0.0%	.2%
60	Count	0	1	1
	% within State	0.0%	.7%	.2%
I don't remember	Count	0	1	1
	% within State	0.0%	.7%	.2%
i think 30 im not sure	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Have you purchased any additional CFLs since receiving the kit?

		NC	SC	Total
Yes	Count	112	50	162
	% within State	29.9%	37.3%	31.8%
No	Count	260	83	343
	% within State	69.3%	61.9%	67.4%
Don't know	Count	3	1	4
	% within State	.8%	.7%	.8%
Total	Count	375	134	509
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional CFLs have you purchased?

		NC	SC	Total
Yes, please list how you have purchased below (numeric only):	Count	83	25	108
	% within State	74.1%	50.0%	66.7%
I don't know	Count	29	25	54
	% within State	25.9%	50.0%	33.3%
Total	Count	112	50	162
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional CFLs that you purchased are currently installed in your home?

		NC	SC	Total
Yes, please list how many are installed below (numeric only):	Count	82	23	105
	% within State	73.9%	46.9%	65.6%
I don't know	Count	29	26	55
	% within State	26.1%	53.1%	34.4%
Total	Count	111	49	160
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional CFLs that you purchased are currently installed in your home?
TEXT

		NC	SC	Total
	Count	294	112	406
	% within State	78.2%	83.6%	79.6%
0	Count	3	1	4
	% within State	.8%	.7%	.8%
04	Count	1	0	1
	% within State	.3%	0.0%	.2%
1	Count	9	0	9
	% within State	2.4%	0.0%	1.8%

10	Count	6	1	7
	% within State	1.6%	.7%	1.4%
12	Count	2	0	2
	% within State	.5%	0.0%	.4%
14	Count	2	1	3
	% within State	.5%	.7%	.6%
15	Count	1	1	2
	% within State	.3%	.7%	.4%
18	Count	1	0	1
	% within State	.3%	0.0%	.2%
2	Count	18	6	24
	% within State	4.8%	4.5%	4.7%
25	Count	0	1	1
	% within State	0.0%	.7%	.2%
3	Count	9	1	10
	% within State	2.4%	.7%	2.0%
37	Count	1	0	1
	% within State	.3%	0.0%	.2%
4	Count	13	5	18
	% within State	3.5%	3.7%	3.5%
5	Count	6	1	7
	% within State	1.6%	.7%	1.4%
6	Count	7	2	9
	% within State	1.9%	1.5%	1.8%
7	Count	1	1	2
	% within State	.3%	.7%	.4%
8	Count	2	1	3
	% within State	.5%	.7%	.6%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Using a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase and install these additional CFLs?

		NC	SC	Total
0 - Not at all influential	Count	2	0	2
	% within State	2.5%	0.0%	2.0%
1	Count	1	0	1
	% within State	1.3%	0.0%	1.0%
2	Count	2	1	3
	% within State	2.5%	4.8%	3.0%
3	Count	1	2	3

	% within State	1.3%	9.5%	3.0%
4	Count	4	0	4
	% within State	5.1%	0.0%	4.0%
5	Count	11	2	13
	% within State	13.9%	9.5%	13.0%
6	Count	6	2	8
	% within State	7.6%	9.5%	8.0%
7	Count	6	1	7
	% within State	7.6%	4.8%	7.0%
8	Count	11	3	14
	% within State	13.9%	14.3%	14.0%
9	Count	8	0	8
	% within State	10.1%	0.0%	8.0%
10 - Extremely influential	Count	27	10	37
	% within State	34.2%	47.6%	37.0%
Total	Count	79	21	100
	% within State	100.0%	100.0%	100.0%

Have you purchased any additional LEDs since receiving the kit?

		NC	SC	Total
Yes	Count	59	24	83
	% within State	15.9%	17.9%	16.4%
No	Count	305	105	410
	% within State	82.0%	78.4%	81.0%
Don't know	Count	8	5	13
	% within State	2.2%	3.7%	2.6%
Total	Count	372	134	506
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional LEDs you have purchased?

		NC	SC	Total
Yes, please list the number you have purchased below (numeric only):	Count	45	18	63
	% within State	77.6%	75.0%	76.8%
I don't know	Count	13	6	19
	% within State	22.4%	25.0%	23.2%
Total	Count	58	24	82
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional LEDs you have purchased? TEXT

		NC	SC	Total
	Count	331	116	447
	% within State	88.0%	86.6%	87.6%
1	Count	6	2	8
	% within State	1.6%	1.5%	1.6%
10	Count	3	2	5
	% within State	.8%	1.5%	1.0%
12	Count	1	1	2
	% within State	.3%	.7%	.4%
15	Count	1	0	1
	% within State	.3%	0.0%	.2%
17	Count	2	0	2
	% within State	.5%	0.0%	.4%
2	Count	13	5	18
	% within State	3.5%	3.7%	3.5%
20	Count	2	1	3
	% within State	.5%	.7%	.6%
3	Count	7	0	7
	% within State	1.9%	0.0%	1.4%
4	Count	2	4	6
	% within State	.5%	3.0%	1.2%
5	Count	1	0	1
	% within State	.3%	0.0%	.2%
50	Count	1	0	1
	% within State	.3%	0.0%	.2%
6	Count	4	2	6
	% within State	1.1%	1.5%	1.2%
7	Count	0	1	1
	% within State	0.0%	.7%	.2%
8	Count	2	0	2
	% within State	.5%	0.0%	.4%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional LEDs that you purchased are currently installed in your home?

		NC	SC	Total
Yes, please list the number of installed bulbs below (numeric only):	Count	43	17	60
	% within State	74.1%	70.8%	73.2%
I don't know	Count	15	7	22
	% within State	25.9%	29.2%	26.8%
Total	Count	58	24	82
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional LEDs that you purchased are currently installed in your home?
TEXT

		NC	SC	Total
	Count	333	117	450
	% within State	88.6%	87.3%	88.2%
0	Count	2	0	2
	% within State	.5%	0.0%	.4%
1	Count	10	2	12
	% within State	2.7%	1.5%	2.4%
10	Count	2	2	4
	% within State	.5%	1.5%	.8%
15	Count	2	0	2
	% within State	.5%	0.0%	.4%
17	Count	2	0	2
	% within State	.5%	0.0%	.4%
2	Count	10	5	15
	% within State	2.7%	3.7%	2.9%
20	Count	1	1	2
	% within State	.3%	.7%	.4%
3	Count	6	1	7
	% within State	1.6%	.7%	1.4%
4	Count	2	3	5
	% within State	.5%	2.2%	1.0%
5	Count	1	0	1
	% within State	.3%	0.0%	.2%
6	Count	4	3	7
	% within State	1.1%	2.2%	1.4%
8	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Using a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase and install these additional LEDs?

		NC	SC	Total
0 - Not at all influential	Count	7	0	7
	% within State	17.1%	0.0%	12.1%
2	Count	1	0	1
	% within State	2.4%	0.0%	1.7%
3	Count	2	1	3
	% within State	4.9%	5.9%	5.2%
4	Count	1	0	1
	% within State	2.4%	0.0%	1.7%
5	Count	4	0	4
	% within State	9.8%	0.0%	6.9%
6	Count	3	2	5
	% within State	7.3%	11.8%	8.6%
7	Count	4	0	4
	% within State	9.8%	0.0%	6.9%
8	Count	4	5	9
	% within State	9.8%	29.4%	15.5%
9	Count	2	2	4
	% within State	4.9%	11.8%	6.9%
10 - Extremely influential	Count	13	7	20
	% within State	31.7%	41.2%	34.5%
Total	Count	41	17	58
	% within State	100.0%	100.0%	100.0%

Efficient Light Bulbs Installed Before the Program

Did you have any CFLs installed in your home before you received the Energy Efficiency kit from Duke Energy?

		NC	SC	Total
Yes	Count	281	100	381
	% within State	75.1%	75.2%	75.1%
No	Count	73	28	101
	% within State	19.5%	21.1%	19.9%
Don't know	Count	20	5	25
	% within State	5.3%	3.8%	4.9%
Total	Count	374	133	507
	% within State	100.0%	100.0%	100.0%

Do you know how many CFLs were installed in your home before you received the kit from Duke Energy?

		NC	SC	Total
Yes. (Please note how many bulbs in the text box below, numeric only)	Count	187	58	245
	% within State	66.8%	58.0%	64.5%
No, I do not know how many CFLs were installed.	Count	93	42	135
	% within State	33.2%	42.0%	35.5%
Total	Count	280	100	380
	% within State	100.0%	100.0%	100.0%

Do you know how many CFLs were installed in your home before you received the kit from Duke Energy?
TEXT

		NC	SC	Total
	Count	189	76	265
	% within State	50.3%	56.7%	52.0%
0	Count	3	0	3
	% within State	.8%	0.0%	.6%
05	Count	1	0	1
	% within State	.3%	0.0%	.2%
1	Count	5	1	6
	% within State	1.3%	.7%	1.2%
10	Count	20	9	29
	% within State	5.3%	6.7%	5.7%
11	Count	3	2	5
	% within State	.8%	1.5%	1.0%
12	Count	11	5	16
	% within State	2.9%	3.7%	3.1%
13	Count	3	1	4
	% within State	.8%	.7%	.8%
14	Count	4	2	6
	% within State	1.1%	1.5%	1.2%
15	Count	19	2	21
	% within State	5.1%	1.5%	4.1%
16	Count	3	0	3
	% within State	.8%	0.0%	.6%
17	Count	2	1	3
	% within State	.5%	.7%	.6%
18	Count	4	0	4
	% within State	1.1%	0.0%	.8%
19	Count	2	2	4
	% within State	.5%	1.5%	.8%
2	Count	12	2	14

	% within State	3.2%	1.5%	2.7%
20	Count	7	2	9
	% within State	1.9%	1.5%	1.8%
21	Count	2	0	2
	% within State	.5%	0.0%	.4%
22	Count	1	1	2
	% within State	.3%	.7%	.4%
24	Count	2	0	2
	% within State	.5%	0.0%	.4%
25	Count	2	1	3
	% within State	.5%	.7%	.6%
29	Count	1	0	1
	% within State	.3%	0.0%	.2%
3	Count	10	3	13
	% within State	2.7%	2.2%	2.5%
30	Count	6	0	6
	% within State	1.6%	0.0%	1.2%
32	Count	1	1	2
	% within State	.3%	.7%	.4%
35	Count	3	1	4
	% within State	.8%	.7%	.8%
37	Count	0	1	1
	% within State	0.0%	.7%	.2%
4	Count	16	9	25
	% within State	4.3%	6.7%	4.9%
40	Count	1	0	1
	% within State	.3%	0.0%	.2%
5	Count	10	3	13
	% within State	2.7%	2.2%	2.5%
6	Count	15	3	18
	% within State	4.0%	2.2%	3.5%
7	Count	3	1	4
	% within State	.8%	.7%	.8%
8	Count	11	4	15
	% within State	2.9%	3.0%	2.9%
80	Count	1	0	1
	% within State	.3%	0.0%	.2%
9	Count	3	1	4
	% within State	.8%	.7%	.8%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Did you have any LEDs installed in your home before you received the Energy Efficiency kit from Duke Energy?

		NC	SC	Total
Yes	Count	101	32	133
	% within State	26.9%	23.9%	26.1%
No	Count	246	93	339
	% within State	65.4%	69.4%	66.5%
Don't know	Count	29	9	38
	% within State	7.7%	6.7%	7.5%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Do you recall how many LEDs were installed in your home before you received the kit from Duke Energy?

		NC	SC	Total
Yes. (Please note how many bulbs in the text box below, numeric only)	Count	68	21	89
	% within State	68.0%	65.6%	67.4%
No, I do not know how many LEDs were installed.	Count	32	11	43
	% within State	32.0%	34.4%	32.6%
Total	Count	100	32	132
	% within State	100.0%	100.0%	100.0%

Do you recall how many LEDs were installed in your home before you received the kit from Duke Energy?
TEXT

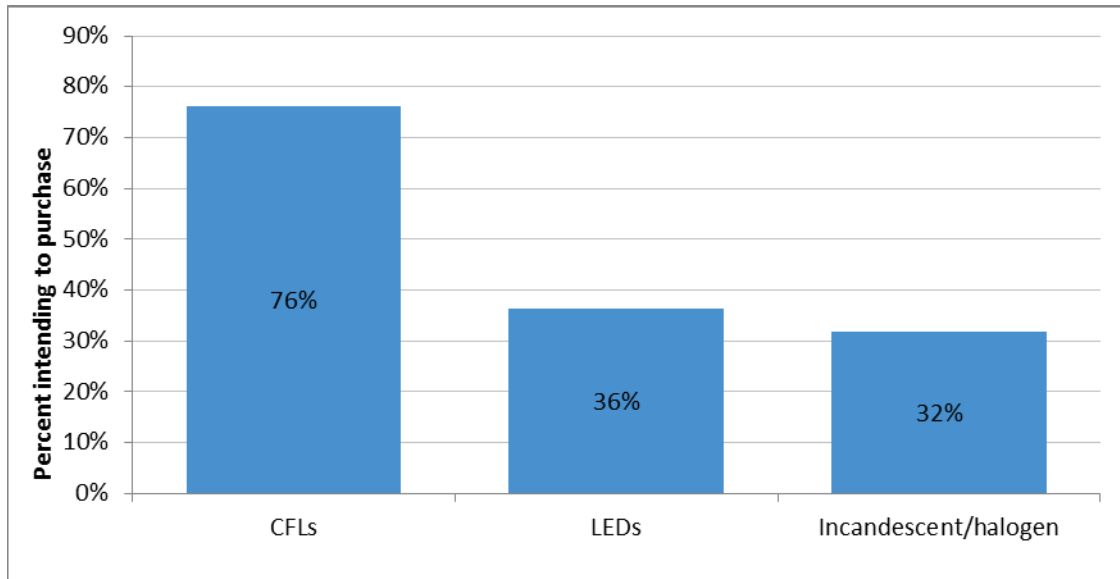
		NC	SC	Total
	Count	308	113	421
	% within State	81.9%	84.3%	82.5%
0	Count	1	0	1
	% within State	.3%	0.0%	.2%
04	Count	1	0	1
	% within State	.3%	0.0%	.2%
1	Count	8	5	13
	% within State	2.1%	3.7%	2.5%
10	Count	3	1	4
	% within State	.8%	.7%	.8%
14	Count	1	0	1
	% within State	.3%	0.0%	.2%
15	Count	3	2	5
	% within State	.8%	1.5%	1.0%
17	Count	1	0	1
	% within State	.3%	0.0%	.2%

2	Count	15	6	21
	% within State	4.0%	4.5%	4.1%
20	Count	1	0	1
	% within State	.3%	0.0%	.2%
3	Count	6	2	8
	% within State	1.6%	1.5%	1.6%
30	Count	1	0	1
	% within State	.3%	0.0%	.2%
4	Count	10	3	13
	% within State	2.7%	2.2%	2.5%
5	Count	5	1	6
	% within State	1.3%	.7%	1.2%
50	Count	2	0	2
	% within State	.5%	0.0%	.4%
6	Count	8	0	8
	% within State	2.1%	0.0%	1.6%
8	Count	2	1	3
	% within State	.5%	.7%	.6%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Future Light Bulb Purchase Intentions

Participants were asked what type of light bulbs they intend to purchase for their next ten bulbs purchased. As seen in Figure 1, a large majority intend to purchase CFLs, while about a third intend to purchase LEDs and another third intend to buy incandescent or halogen bulbs.

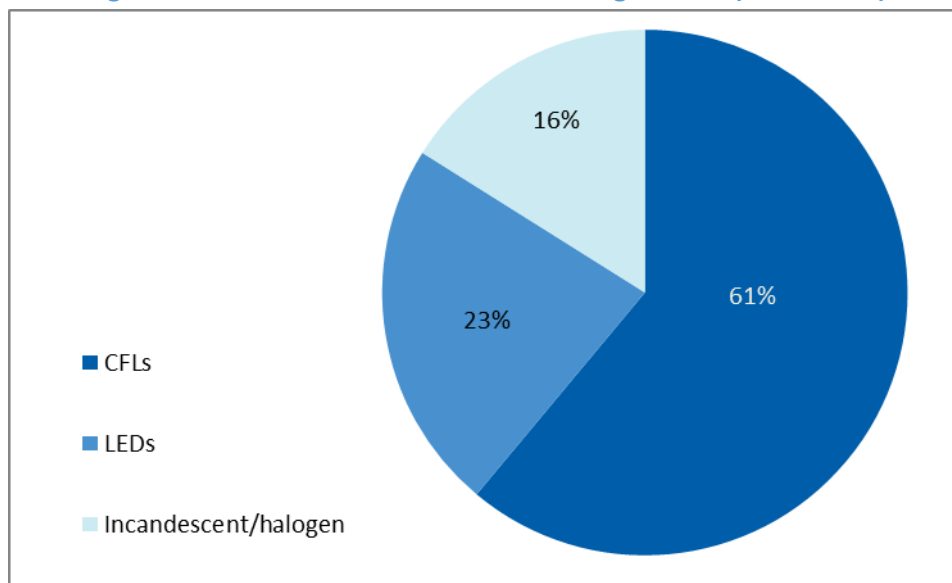
Figure 1. Purchase Intention for Next Ten Light Bulbs (Percent Purchasing)



Source: Participant Survey Questions A13.1-6. 12.13. Thinking about the next ten light bulbs you will purchase, how many will be of each of the following types? (valid n=421; multiple responses permitted. Percentages are of total number of respondents, and exceed 100%.)

Figure 2 shows the overall distribution of intended future bulb purchases; in total, 84% of light bulbs intended to be purchased by program participants will be CFLs or LEDs and only 16% will be incandescent or halogen bulbs.

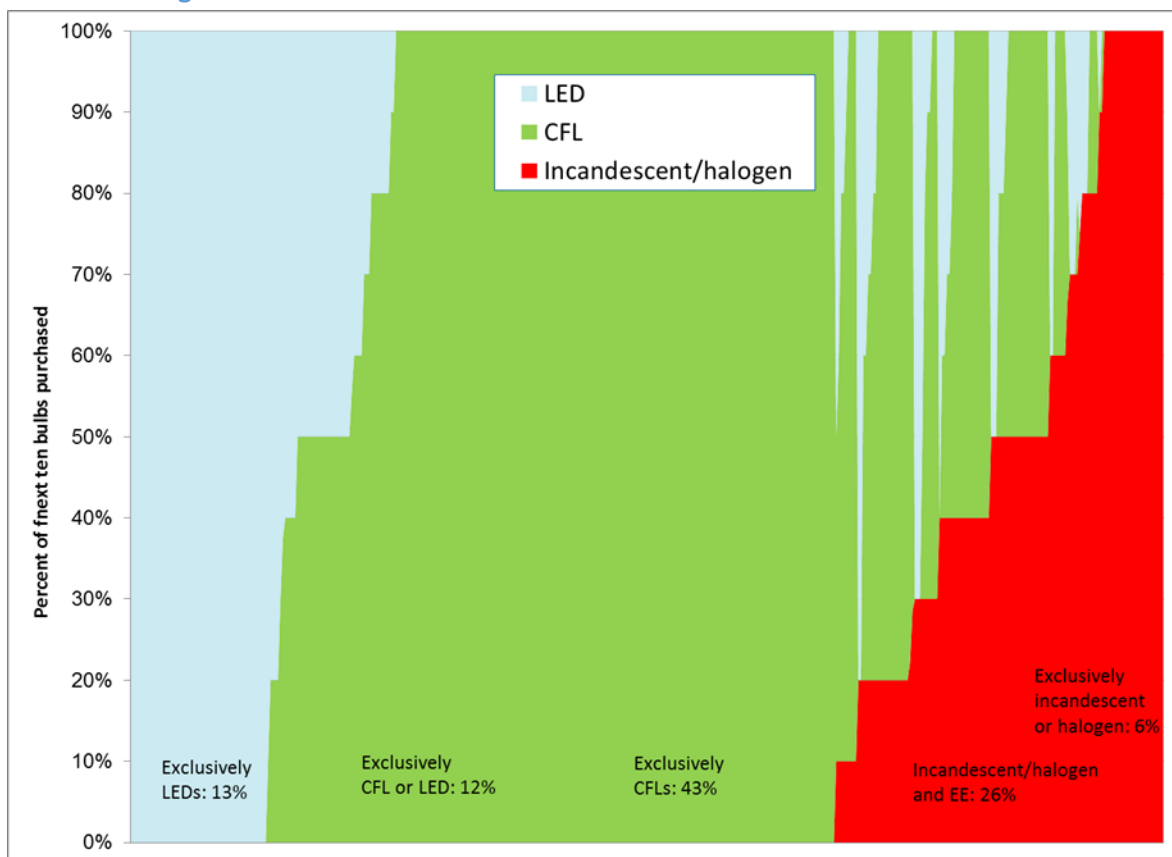
Figure 2. Purchase Intention for Next Ten Light Bulbs (Total Bulbs)



Source: Participant Survey Questions A13.1-6. 12.13. Thinking about the next ten light bulbs you will purchase, how many will be of each of the following types? (valid n=421)

Figure 3 presents the distribution of future bulb purchases in the form of an area chart as a visual aid: the Y-axis shows the distribution of bulbs intended to be purchased, and the X-axis shows all 421 valid responses sorted by the distribution of bulb types. The chart shows that a majority of customers surveyed say they intend to purchase exclusively efficient lighting for their next ten bulbs (the left and center area of the chart that is green and blue from top to bottom which accounts for 68% of respondents), while only 6% of participants intend to purchase all incandescent and halogen bulbs for their next ten bulbs (the far right of the chart which is red from top to bottom). About one participant in four intends to purchase a mix of standard and efficient bulbs (the area of the chart that is a combination of red and blue or green).

Figure 3. Area Chart of Purchase Intention for Next Ten Bulbs Purchased



Source: Participant Survey Questions A13.1-6. 12.13. Thinking about the next ten light bulbs you will purchase, how many will be of each of the following types? (valid n=421)

Low-Flow Showerhead Installations

The kit also included a low-flow showerhead. Did you install the low-flow showerhead that was provided in the kit?

		NC	SC	Total
Yes	Count	140	46	186
	% within State	37.2%	34.3%	36.5%
No, but plan to	Count	121	39	160
	% within State	32.2%	29.1%	31.4%
No, and don't plan to	Count	101	44	145
	% within State	26.9%	32.8%	28.4%
Don't know	Count	14	5	19
	% within State	3.7%	3.7%	3.7%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Is the showerhead you installed through the kit still installed in your home?

		NC	SC	Total
Yes	Count	131	44	175
	% within State	93.6%	95.7%	94.1%
No, I removed it	Count	9	2	11
	% within State	6.4%	4.3%	5.9%
Total	Count	140	46	186
	% within State	100.0%	100.0%	100.0%

Why did you remove the showerhead?

		NC	SC	Total
	Count	368	132	500
	% within State	97.9%	98.5%	98.0%
cuz I have 1 shower....	Count	1	0	1
	% within State	.3%	0.0%	.2%
Got a double flow one	Count	1	0	1
	% within State	.3%	0.0%	.2%
moved to a new residence	Count	1	0	1
	% within State	.3%	0.0%	.2%
no water pressure	Count	1	0	1
	% within State	.3%	0.0%	.2%
not big enough	Count	0	1	1
	% within State	0.0%	.7%	.2%
not enough pressure	Count	0	1	1
	% within State	0.0%	.7%	.2%
Not enough water comes out	Count	1	0	1
	% within State	.3%	0.0%	.2%
not enough water pressure	Count	1	0	1
	% within State	.3%	0.0%	.2%

	% within State	.3%	0.0%	.2%
Took to long to shower	Count	1	0	1
	% within State	.3%	0.0%	.2%
water pressure was TOO low!	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Typically, how many showers per week are taken using the showerhead from the kit?

		NC	SC	Total
	Count	246	90	336
	% within State	65.4%	67.2%	65.9%
0	Count	1	2	3
	% within State	.3%	1.5%	.6%
1	Count	3	1	4
	% within State	.8%	.7%	.8%
10	Count	17	5	22
	% within State	4.5%	3.7%	4.3%
11	Count	0	1	1
	% within State	0.0%	.7%	.2%
12	Count	5	4	9
	% within State	1.3%	3.0%	1.8%
13	Count	1	0	1
	% within State	.3%	0.0%	.2%
14	Count	18	3	21
	% within State	4.8%	2.2%	4.1%
15	Count	10	0	10
	% within State	2.7%	0.0%	2.0%
15-20	Count	1	0	1
	% within State	.3%	0.0%	.2%
16	Count	2	0	2
	% within State	.5%	0.0%	.4%
2	Count	2	0	2
	% within State	.5%	0.0%	.4%
20	Count	10	4	14
	% within State	2.7%	3.0%	2.7%
20-30	Count	1	0	1
	% within State	.3%	0.0%	.2%
21	Count	6	4	10
	% within State	1.6%	3.0%	2.0%
22	Count	1	0	1
	% within State	.3%	0.0%	.2%
24	Count	1	0	1

	% within State	.3%	0.0%	.2%
25	Count	3	4	7
	% within State	.8%	3.0%	1.4%
28	Count	3	1	4
	% within State	.8%	.7%	.8%
3	Count	3	1	4
	% within State	.8%	.7%	.8%
30	Count	3	1	4
	% within State	.8%	.7%	.8%
35	Count	2	0	2
	% within State	.5%	0.0%	.4%
4	Count	2	1	3
	% within State	.5%	.7%	.6%
40	Count	2	1	3
	% within State	.5%	.7%	.6%
42	Count	2	0	2
	% within State	.5%	0.0%	.4%
49	Count	1	0	1
	% within State	.3%	0.0%	.2%
5	Count	8	1	9
	% within State	2.1%	.7%	1.8%
6	Count	3	3	6
	% within State	.8%	2.2%	1.2%
7	Count	12	6	18
	% within State	3.2%	4.5%	3.5%
8	Count	5	0	5
	% within State	1.3%	0.0%	1.0%
9	Count	2	1	3
	% within State	.5%	.7%	.6%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

When you installed the low-flow showerhead from the kit, did you:

		NC	SC	Total
Replace another low-flow showerhead	Count	14	2	16
	% within State	10.1%	4.5%	8.7%
Replace a standard-flow showerhead	Count	119	40	159
	% within State	85.6%	90.9%	86.9%
Don't know	Count	6	2	8
	% within State	4.3%	4.5%	4.4%
Total	Count	139	44	183
	% within State	100.0%	100.0%	100.0%

Have you purchased any additional energy efficient showerheads since receiving the kit?

		NC	SC	Total
Yes	Count	20	7	27
	% within State	5.3%	5.2%	5.3%
No	Count	351	123	474
	% within State	93.6%	91.8%	93.1%
Don't know	Count	4	4	8
	% within State	1.1%	3.0%	1.6%
Total	Count	375	134	509
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional low-flow showerheads have you purchased?

		NC	SC	Total
Yes, please note how many you have purchased below (numeric only):	Count	16	6	22
	% within State	80.0%	85.7%	81.5%
I don't know	Count	4	1	5
	% within State	20.0%	14.3%	18.5%
Total	Count	20	7	27
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional low-flow showerheads have you purchased? TEXT

		NC	SC	Total
	Count	360	128	488
	% within State	95.7%	95.5%	95.7%
0	Count	1	0	1
	% within State	.3%	0.0%	.2%
1	Count	11	5	16
	% within State	2.9%	3.7%	3.1%
2	Count	2	1	3
	% within State	.5%	.7%	.6%
3	Count	1	0	1
	% within State	.3%	0.0%	.2%
4	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional low-flow showerheads are currently installed in your home?

		NC	SC	Total
Yes, please note how many you have installed below (numeric only):	Count	14	6	20
	% within State	73.7%	85.7%	76.9%
I don't know	Count	5	1	6
	% within State	26.3%	14.3%	23.1%
Total	Count	19	7	26
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional low-flow showerheads are currently installed in your home. TEXT

		NC	SC	Total
0	Count	362	128	490
	% within State	96.3%	95.5%	96.1%
1	Count	1	1	2
	% within State	.3%	.7%	.4%
2	Count	6	1	7
	% within State	1.6%	.7%	1.4%
3	Count	5	3	8
	% within State	1.3%	2.2%	1.6%
4	Count	1	1	2
	% within State	.3%	.7%	.4%
5	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase these additional energy efficient showerheads?

		NC	SC	Total
0 - Not at all influential	Count	3	0	3
	% within State	23.1%	0.0%	16.7%
3	Count	1	0	1
	% within State	7.7%	0.0%	5.6%
5	Count	0	1	1
	% within State	0.0%	20.0%	5.6%
6	Count	1	0	1
	% within State	7.7%	0.0%	5.6%
7	Count	0	1	1
	% within State	0.0%	20.0%	5.6%
8	Count	2	0	2
	% within State	15.4%	0.0%	11.1%
9	Count	1	0	1

	% within State	7.7%	0.0%	5.6%
10 - Extremely influential	Count	4	3	7
	% within State	30.8%	60.0%	38.9%
Don't know	Count	1	0	1
	% within State	7.7%	0.0%	5.6%
Total	Count	13	5	18
	% within State	100.0%	100.0%	100.0%

Faucet Aerator Installations

Is the low-flow kitchen aerator currently installed in your home?

		NC	SC	Total
Yes	Count	108	50	158
	% within State	28.8%	37.3%	31.0%
No, installed but subsequently removed it	Count	16	7	23
	% within State	4.3%	5.2%	4.5%
No, but I plan to install it	Count	113	34	147
	% within State	30.1%	25.4%	28.9%
No, and I don't plan to install it	Count	113	36	149
	% within State	30.1%	26.9%	29.3%
Don't know	Count	25	7	32
	% within State	6.7%	5.2%	6.3%
Total	Count	375	134	509
	% within State	100.0%	100.0%	100.0%

Is the low-flow bathroom aerator currently installed in your home?

		NC	SC	Total
Yes	Count	99	40	139
	% within State	26.3%	30.1%	27.3%
No, installed but subsequently removed it	Count	7	5	12
	% within State	1.9%	3.8%	2.4%
No, but I plan to install it	Count	128	42	170
	% within State	34.0%	31.6%	33.4%
No, and I don't plan to install it	Count	108	32	140
	% within State	28.7%	24.1%	27.5%
Don't know	Count	34	14	48
	% within State	9.0%	10.5%	9.4%
Total	Count	376	133	509
	% within State	100.0%	100.0%	100.0%

Why did you remove the aerator(s)?

	NC	SC	Total
--	----	----	-------

	Count	357	126	483
	% within State	94.9%	94.0%	94.7%
Because of it my garbage disposal wasn't getting enough water to flush out a small bowl of cereal and I had to call a plumber to fix it.	Count	1	0	1
	% within State	.3%	0.0%	.2%
brought a new	Count	0	1	1
	% within State	0.0%	.7%	.2%
changed faucets	Count	0	1	1
	% within State	0.0%	.7%	.2%
did not fit correctly leaked	Count	1	0	1
	% within State	.3%	0.0%	.2%
did not like	Count	1	0	1
	% within State	.3%	0.0%	.2%
Did not like the low flow of water	Count	1	0	1
	% within State	.3%	0.0%	.2%
did not work with our water filter	Count	1	0	1
	% within State	.3%	0.0%	.2%
Didn't fit	Count	0	1	1
	% within State	0.0%	.7%	.2%
didn't like	Count	1	0	1
	% within State	.3%	0.0%	.2%
Didn't work well	Count	1	0	1
	% within State	.3%	0.0%	.2%
didn't work well with the old faucent in our rental home. Waiting to use in our next house we purchase.	Count	1	0	1
	% within State	.3%	0.0%	.2%
I did not like how the water flowed from them.	Count	0	1	1
	% within State	0.0%	.7%	.2%
I installed a filter	Count	1	0	1
	% within State	.3%	0.0%	.2%
It did not fit good	Count	0	1	1
	% within State	0.0%	.7%	.2%
It didn't fit	Count	1	0	1
	% within State	.3%	0.0%	.2%
It was defective	Count	1	0	1
	% within State	.3%	0.0%	.2%
It wasn't working with my filter.	Count	1	0	1
	% within State	.3%	0.0%	.2%
Never installed	Count	1	0	1
	% within State	.3%	0.0%	.2%
Not enough pressure	Count	0	1	1
	% within State	0.0%	.7%	.2%

not enough water flow	Count	0	1	1
	% within State	0.0%	.7%	.2%
Quality	Count	1	0	1
	% within State	.3%	0.0%	.2%
The old faucet had a lower flow. The one in the energy kit was too powerful and sprayed all over the bathroom when we tried to wash our hands. We weren't able to take apart of kitchen faucet enough to change the aerator.	Count	1	0	1
	% within State	.3%	0.0%	.2%
The water flow was to slow.	Count	1	0	1
	% within State	.3%	0.0%	.2%
water pressure got low	Count	0	1	1
	% within State	0.0%	.7%	.2%
Wife didn't like	Count	1	0	1
	% within State	.3%	0.0%	.2%
Would not stay attached to an older sink faucet/	Count	1	0	1
	% within State	.3%	0.0%	.2%
Yes	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Did the low-flow kitchen aerator that you installed in your kitchen replace another aerator?

		NC	SC	Total
Yes, replaced another low-flow aerator	Count	16	5	21
	% within State	15.0%	10.0%	13.4%
Yes, replaced a standard-flow aerator	Count	47	27	74
	% within State	43.9%	54.0%	47.1%
Yes, replaced another aerator but not sure if it was low-flow or standard	Count	9	5	14
	% within State	8.4%	10.0%	8.9%
No, there was previously no aerator on the faucet	Count	28	10	38
	% within State	26.2%	20.0%	24.2%
Not sure / don't remember	Count	7	3	10
	% within State	6.5%	6.0%	6.4%
Total	Count	107	50	157
	% within State	100.0%	100.0%	100.0%

Did the low-flow bathroom aerator that you installed in your bathroom replace another aerator?

		NC	SC	Total
Yes, replaced another low-flow aerator	Count	10	4	14

	% within State	10.4%	10.0%	10.3%
Yes, replaced a standard-flow aerator	Count	45	21	66
	% within State	46.9%	52.5%	48.5%
Yes, replaced another aerator but not sure if it was low-flow or standard	Count	6	4	10
	% within State	6.3%	10.0%	7.4%
No, there was previously no aerator on the faucet	Count	31	8	39
	% within State	32.3%	20.0%	28.7%
Not sure / don't remember	Count	4	3	7
	% within State	4.2%	7.5%	5.1%
Total	Count	96	40	136
	% within State	100.0%	100.0%	100.0%

Have you purchased any additional low-flow faucet aerators since receiving the kit?

		NC	SC	Total
Yes	Count	5	2	7
	% within State	1.3%	1.5%	1.4%
No	Count	360	130	490
	% within State	96.5%	97.0%	96.6%
Don't know	Count	8	2	10
	% within State	2.1%	1.5%	2.0%
Total	Count	373	134	507
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional low-flow faucet aerators have you purchased?

		NC	SC	Total
Yes, please note how many you purchased below (numeric only):	Count	3	2	5
	% within State	60.0%	100.0%	71.4%
I don't know	Count	2	0	2
	% within State	40.0%	0.0%	28.6%
Total	Count	5	2	7
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional low-flow faucet aerators have you purchased? TEXT

		NC	SC	Total
	Count	373	132	505
	% within State	99.2%	98.5%	99.0%
2	Count	1	2	3
	% within State	.3%	1.5%	.6%
3	Count	1	0	1
	% within State	.3%	0.0%	.2%
5	Count	1	0	1

	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these low-flow faucet aerators are currently installed in your home?

		NC	SC	Total
Yes, please note how many you installed below (numeric only):	Count	3	2	5
	% within State	60.0%	100.0%	71.4%
I don't know	Count	2	0	2
	% within State	40.0%	0.0%	28.6%
Total	Count	5	2	7
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these low-flow faucet aerators are currently installed in your home? TEXT

		NC	SC	Total
	Count	373	132	505
	% within State	99.2%	98.5%	99.0%
2	Count	0	2	2
	% within State	0.0%	1.5%	.4%
3	Count	2	0	2
	% within State	.5%	0.0%	.4%
5	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase these additional low-flow faucet aerators?

		NC	SC	Total
2	Count	1	0	1
	% within State	50.0%	0.0%	25.0%
8	Count	0	1	1
	% within State	0.0%	50.0%	25.0%
10 - Extremely influential	Count	1	1	2
	% within State	50.0%	50.0%	50.0%
Total	Count	2	2	4
	% within State	100.0%	100.0%	100.0%

Water Flow Meter Bag

The kit also included a water flow meter bag. Did you use the water flow meter bag that was provided in the kit?

		NC	SC	Total
Yes	Count	61	26	87
	% within State	16.3%	19.4%	17.1%
No, but plan to	Count	127	38	165
	% within State	34.0%	28.4%	32.5%
No, and don't plan to	Count	125	50	175
	% within State	33.4%	37.3%	34.4%
Don't know	Count	61	20	81
	% within State	16.3%	14.9%	15.9%
Total	Count	374	134	508
	% within State	100.0%	100.0%	100.0%

On which faucet(s) did you check how many gallons of water you were using per minute? Showerhead

		NC	SC	Total
1	Count	18	11	29
	% within State	100.0%	100.0%	100.0%
Total	Count	18	11	29
	% within State	100.0%	100.0%	100.0%

On which faucet(s) did you check how many gallons of water you were using per minute? Kitchen sink faucet

		NC	SC	Total
1	Count	51	21	72
	% within State	100.0%	100.0%	100.0%
Total	Count	51	21	72
	% within State	100.0%	100.0%	100.0%

On which faucet(s) did you check how many gallons of water you were using per minute? Bathroom sink faucet

		NC	SC	Total
1	Count	25	9	34
	% within State	100.0%	100.0%	100.0%
Total	Count	25	9	34
	% within State	100.0%	100.0%	100.0%

On which faucet(s) did you check how many gallons of water you were using per minute? Other sink faucet

		NC	SC	Total
1	Count	2	2	4
	% within State	100.0%	100.0%	100.0%
Total	Count	2	2	4
	% within State	100.0%	100.0%	100.0%

On which faucets did you then adjust the water flow based on the readings? Showerhead

		NC	SC	Total
1	Count	8	4	12
	% within State	100.0%	100.0%	100.0%
Total	Count	8	4	12
	% within State	100.0%	100.0%	100.0%

On which faucets did you then adjust the water flow based on the readings? Kitchen sink faucet

		NC	SC	Total
1	Count	15	5	20
	% within State	100.0%	100.0%	100.0%
Total	Count	15	5	20
	% within State	100.0%	100.0%	100.0%

On which faucets did you then adjust the water flow based on the readings? Bathroom sink faucet

		NC	SC	Total
1	Count	7	4	11
	% within State	100.0%	100.0%	100.0%
Total	Count	7	4	11
	% within State	100.0%	100.0%	100.0%

On which faucets did you then adjust the water flow based on the readings? Other sink faucet

		NC	Total
1	Count	2	2
	% within State	100.0%	100.0%
Total	Count	2	2
	% within State	100.0%	100.0%

Outlet Gasket Insulator Installations

The kit also included outlet and switch gasket insulators. Are some or all of the insulators that were provided in the kit currently installed in your home?

		NC	SC	Total
Yes	Count	103	35	138
	% within State	27.4%	26.1%	27.1%
No, but I do plan to install some or all of them	Count	156	57	213
	% within State	41.5%	42.5%	41.8%
No, and I don't plan to install any of them	Count	82	27	109
	% within State	21.8%	20.1%	21.4%
Don't know	Count	35	15	50
	% within State	9.3%	11.2%	9.8%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Please select the locations where you have installed an outlet and switch gasket insulator, then indicate the number installed. Interior walls

		NC	SC	Total
.00	Count	4	0	4
	% within State	6.7%	0.0%	5.3%
1.00	Count	12	3	15
	% within State	20.0%	18.8%	19.7%
2.00	Count	15	3	18
	% within State	25.0%	18.8%	23.7%
3.00	Count	7	0	7
	% within State	11.7%	0.0%	9.2%
4.00	Count	2	2	4
	% within State	3.3%	12.5%	5.3%
5.00	Count	6	1	7
	% within State	10.0%	6.3%	9.2%
6.00	Count	3	4	7
	% within State	5.0%	25.0%	9.2%
8.00	Count	4	1	5
	% within State	6.7%	6.3%	6.6%
10.00	Count	5	2	7
	% within State	8.3%	12.5%	9.2%
12.00	Count	1	0	1
	% within State	1.7%	0.0%	1.3%
20.00	Count	1	0	1
	% within State	1.7%	0.0%	1.3%
Total	Count	60	16	76
	% within State	100.0%	100.0%	100.0%

Please select the locations where you have installed an outlet and switch gasket insulator, then indicate the number installed. Exterior walls

		NC	SC	Total
.00	Count	4	1	5
	% within State	6.9%	6.3%	6.8%
1.00	Count	6	1	7
	% within State	10.3%	6.3%	9.5%
2.00	Count	11	5	16
	% within State	19.0%	31.3%	21.6%
3.00	Count	6	2	8
	% within State	10.3%	12.5%	10.8%
4.00	Count	11	2	13
	% within State	19.0%	12.5%	17.6%
5.00	Count	4	0	4
	% within State	6.9%	0.0%	5.4%
6.00	Count	1	1	2
	% within State	1.7%	6.3%	2.7%
7.00	Count	1	0	1
	% within State	1.7%	0.0%	1.4%
8.00	Count	3	1	4
	% within State	5.2%	6.3%	5.4%
9.00	Count	1	0	1
	% within State	1.7%	0.0%	1.4%
10.00	Count	8	2	10
	% within State	13.8%	12.5%	13.5%
12.00	Count	1	0	1
	% within State	1.7%	0.0%	1.4%
15.00	Count	1	1	2
	% within State	1.7%	6.3%	2.7%
Total	Count	58	16	74
	% within State	100.0%	100.0%	100.0%

Please select the locations where you have installed an outlet and switch gasket insulator, then indicate the number installed. Not installed yet on any walls.

		NC	SC	Total
1	Count	4	1	5
	% within State	100.0%	100.0%	100.0%
Total	Count	4	1	5
	% within State	100.0%	100.0%	100.0%

Please select the locations where you have installed an outlet and switch gasket insulator, then indicate the number installed. Don't know.

		NC	SC	Total
.00	Count	3	1	4
	% within State	75.0%	100.0%	80.0%
2.00	Count	1	0	1
	% within State	25.0%	0.0%	20.0%
Total	Count	4	1	5
	% within State	100.0%	100.0%	100.0%

Have you purchased any additional outlet and switch gaskets since receiving the kit?

		NC	SC	Total
1	Count	6	6	12
	% within State	100.0%	100.0%	100.0%
Total	Count	6	6	12
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional outlet and switch gaskets have you purchased?

		NC	SC	Total
Yes, please note how many you purchased below (numeric only):	Count	4	4	8
	% within State	44.4%	66.7%	53.3%
I don't know	Count	5	2	7
	% within State	55.6%	33.3%	46.7%
Total	Count	9	6	15
	% within State	100.0%	100.0%	100.0%

Do you recall how many additional outlet and switch gaskets have you purchased? TEXT

		NC	SC	Total
	Count	372	130	502
	% within State	98.9%	97.0%	98.4%
10	Count	1	2	3
	% within State	.3%	1.5%	.6%
2	Count	2	0	2
	% within State	.5%	0.0%	.4%
20	Count	0	1	1
	% within State	0.0%	.7%	.2%
3	Count	0	1	1
	% within State	0.0%	.7%	.2%
4	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional outlet and switch gaskets are currently installed on EXTERIOR WALLS of your home?

		NC	SC	Total
Yes, please note how many you installed below (numeric only):	Count	3	3	6
	% within State	33.3%	60.0%	42.9%
I don't know	Count	6	2	8
	% within State	66.7%	40.0%	57.1%
Total	Count	9	5	14
	% within State	100.0%	100.0%	100.0%

Do you recall how many of these additional outlet and switch gaskets are currently installed on EXTERIOR WALLS of your home? TEXT

		NC	SC	Total
	Count	373	131	504
	% within State	99.2%	97.8%	98.8%
0	Count	0	1	1
	% within State	0.0%	.7%	.2%
2	Count	3	1	4
	% within State	.8%	.7%	.8%
3	Count	0	1	1
	% within State	0.0%	.7%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Using a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential was the kit you received from Duke Energy and the National Theater for Children/ Energy Efficiency for Schools program on your decision to purchase these additional outlet and switch gasket insulators?

		NC	SC	Total
6	Count	1	0	1
	% within State	33.3%	0.0%	20.0%
8	Count	0	1	1
	% within State	0.0%	50.0%	20.0%
10 - Extremely influential	Count	2	1	3
	% within State	66.7%	50.0%	60.0%
Total	Count	3	2	5
	% within State	100.0%	100.0%	100.0%

Water Heater Temperature Card

The kit also included a water heater temperature card. Did you use the water heater temperature card to test the temperature of the hot water in your home?

		NC	SC	Total
Yes	Count	130	51	181
	% within State	34.7%	38.1%	35.6%
No, but plan to	Count	122	45	167
	% within State	32.5%	33.6%	32.8%
No, and don't plan to	Count	79	26	105
	% within State	21.1%	19.4%	20.6%
Don't know	Count	44	12	56
	% within State	11.7%	9.0%	11.0%
Total	Count	375	134	509
	% within State	100.0%	100.0%	100.0%

What was the temperature reading of the hot water in your home?

		NC	SC	Total
Less than 120°	Count	31	8	39
	% within State	23.8%	15.7%	21.5%
120°	Count	49	19	68
	% within State	37.7%	37.3%	37.6%
130°	Count	15	9	24
	% within State	11.5%	17.6%	13.3%
140°	Count	4	2	6
	% within State	3.1%	3.9%	3.3%
150°	Count	3	1	4
	% within State	2.3%	2.0%	2.2%
Above 150°	Count	3	2	5
	% within State	2.3%	3.9%	2.8%
Don't Know	Count	25	10	35
	% within State	19.2%	19.6%	19.3%
Total	Count	130	51	181
	% within State	100.0%	100.0%	100.0%

Did you adjust your water heater temperature as a result?

		NC	SC	Total
Yes	Count	21	12	33
	% within State	16.3%	24.0%	18.4%
No	Count	108	38	146
	% within State	83.7%	76.0%	81.6%
Total	Count	129	50	179
	% within State	100.0%	100.0%	100.0%

What was the temperature reading of your hot water after you adjusted the water heater temperature?

		NC	SC	Total
Less than 120°	Count	6	3	9
	% within State	28.6%	25.0%	27.3%
120°	Count	9	6	15
	% within State	42.9%	50.0%	45.5%
Above 150°	Count	0	1	1
	% within State	0.0%	8.3%	3.0%
Don't know	Count	6	2	8
	% within State	28.6%	16.7%	24.2%
Total	Count	21	12	33
	% within State	100.0%	100.0%	100.0%

Limelight Night Light

The kit also included a night light. Is the night light that was provided in the kit currently installed in your home?

		NC	SC	Total
Yes	Count	308	115	423
	% within State	81.9%	85.8%	82.9%
No, installed but subsequently removed it	Count	12	5	17
	% within State	3.2%	3.7%	3.3%
No, but plan to	Count	26	8	34
	% within State	6.9%	6.0%	6.7%
No, and don't plan to	Count	20	5	25
	% within State	5.3%	3.7%	4.9%
Don't know	Count	10	1	11
	% within State	2.7%	.7%	2.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Why did you remove the night light?

		NC	SC	Total
	Count	364	129	493
	% within State	96.8%	96.3%	96.7%
because my son didn't think it was bright enough	Count	1	0	1
	% within State	.3%	0.0%	.2%
Children fighting over it	Count	1	0	1
	% within State	.3%	0.0%	.2%
did not need	Count	0	1	1
	% within State	0.0%	.7%	.2%
Didn't work very well.	Count	1	0	1
	% within State	.3%	0.0%	.2%
I couldn't sleep with it on.	Count	0	1	1
	% within State	0.0%	.7%	.2%
i think it broke	Count	1	0	1
	% within State	.3%	0.0%	.2%
it quit working	Count	0	1	1
	% within State	0.0%	.7%	.2%
It quit working	Count	1	0	1
	% within State	.3%	0.0%	.2%
It was too bright	Count	0	1	1
	% within State	0.0%	.7%	.2%
just didnt need a night light	Count	1	0	1
	% within State	.3%	0.0%	.2%
my son pulled it out and broke it	Count	1	0	1
	% within State	.3%	0.0%	.2%
My toddler took it out of the socket and lost it.	Count	1	0	1
	% within State	.3%	0.0%	.2%
The cable box light would make the night light shut off. Making the nightlight useless.	Count	1	0	1
	% within State	.3%	0.0%	.2%
too bright	Count	1	0	1
	% within State	.3%	0.0%	.2%
Too bright for kid's room, not bright enough for hallway.	Count	1	0	1
	% within State	.3%	0.0%	.2%
TOO DIM	Count	0	1	1
	% within State	0.0%	.7%	.2%
Use flashlight for better light	Count	1	0	1
	% within State	.3%	0.0%	.2%
Total	Count	376	134	510
	% within State	100.0%	100.0%	100.0%

Feedback on Energy Savers Booklet

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means “strongly disagree” and 10 means “strongly agree.” It was helpful.

		NC	SC	Total
3	Count	1	0	1
	% within State	.4%	0.0%	.3%
4	Count	2	0	2
	% within State	.7%	0.0%	.5%
5	Count	18	9	27
	% within State	6.6%	8.4%	7.1%
6	Count	16	6	22
	% within State	5.8%	5.6%	5.8%
7	Count	37	14	51
	% within State	13.5%	13.1%	13.4%
8	Count	39	16	55
	% within State	14.2%	15.0%	14.4%
9	Count	41	11	52
	% within State	15.0%	10.3%	13.6%
10 strongly agree	Count	117	50	167
	% within State	42.7%	46.7%	43.8%
don't know	Count	3	1	4
	% within State	1.1%	.9%	1.0%
Total	Count	274	107	381
	% within State	100.0%	100.0%	100.0%

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means “strongly disagree” and 10 means “strongly agree.” It was informative.

		NC	SC	Total
0 disagree	Count	1	0	1
	% within State	.4%	0.0%	.3%
3	Count	1	0	1
	% within State	.4%	0.0%	.3%
4	Count	3	0	3
	% within State	1.1%	0.0%	.8%
5	Count	11	7	18
	% within State	4.0%	6.5%	4.7%
6	Count	15	4	19
	% within State	5.5%	3.7%	5.0%
7	Count	25	9	34
	% within State	9.1%	8.4%	8.9%
8	Count	44	20	64
	% within State	16.1%	18.7%	16.8%

9	Count	43	11	54
	% within State	15.7%	10.3%	14.2%
10 strongly agree	Count	129	56	185
	% within State	47.1%	52.3%	48.6%
don't know	Count	2	0	2
	% within State	.7%	0.0%	.5%
Total	Count	274	107	381
	% within State	100.0%	100.0%	100.0%

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means “strongly disagree” and 10 means “strongly agree.” It offered tips for saving energy that I had not previously thought about.

		NC	SC	Total
0 disagree	Count	5	0	5
	% within State	1.8%	0.0%	1.3%
1	Count	3	0	3
	% within State	1.1%	0.0%	.8%
2	Count	2	1	3
	% within State	.7%	.9%	.8%
3	Count	8	2	10
	% within State	2.9%	1.9%	2.6%
4	Count	7	0	7
	% within State	2.6%	0.0%	1.8%
5	Count	18	12	30
	% within State	6.6%	11.2%	7.9%
6	Count	15	12	27
	% within State	5.5%	11.2%	7.1%
7	Count	36	11	47
	% within State	13.1%	10.3%	12.3%
8	Count	43	20	63
	% within State	15.7%	18.7%	16.5%
9	Count	38	8	46
	% within State	13.9%	7.5%	12.1%
10 strongly agree	Count	96	41	137
	% within State	35.0%	38.3%	36.0%
don't know	Count	3	0	3
	% within State	1.1%	0.0%	.8%
Total	Count	274	107	381
	% within State	100.0%	100.0%	100.0%

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means “strongly disagree” and 10 means “strongly agree.” It provided ideas that are feasible to implement.

		NC	SC	Total
0 disagree	Count	1	0	1
	% within State	.4%	0.0%	.3%
1	Count	1	0	1
	% within State	.4%	0.0%	.3%
2	Count	1	0	1
	% within State	.4%	0.0%	.3%
3	Count	1	0	1
	% within State	.4%	0.0%	.3%
4	Count	2	0	2
	% within State	.7%	0.0%	.5%
5	Count	13	10	23
	% within State	4.8%	9.3%	6.1%
6	Count	19	7	26
	% within State	7.0%	6.5%	6.9%
7	Count	40	18	58
	% within State	14.7%	16.8%	15.3%
8	Count	55	20	75
	% within State	20.2%	18.7%	19.8%
9	Count	40	10	50
	% within State	14.7%	9.3%	13.2%
10 strongly agree	Count	93	42	135
	% within State	34.2%	39.3%	35.6%
don't know	Count	6	0	6
	% within State	2.2%	0.0%	1.6%
Total	Count	272	107	379
	% within State	100.0%	100.0%	100.0%

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means “strongly disagree” and 10 means “strongly agree.” It provided ideas that are affordable to implement.

		NC	SC	Total
0 disagree	Count	1	0	1
	% within State	.4%	0.0%	.3%
2	Count	2	0	2
	% within State	.7%	0.0%	.5%
3	Count	4	2	6
	% within State	1.5%	1.9%	1.6%
4	Count	4	2	6
	% within State	1.5%	1.9%	1.6%
5	Count	17	15	32

	% within State	6.3%	14.0%	8.4%
6	Count	26	10	36
	% within State	9.6%	9.3%	9.5%
7	Count	47	15	62
	% within State	17.3%	14.0%	16.4%
8	Count	46	18	64
	% within State	16.9%	16.8%	16.9%
9	Count	34	8	42
	% within State	12.5%	7.5%	11.1%
10 strongly agree	Count	85	37	122
	% within State	31.3%	34.6%	32.2%
don't know	Count	6	0	6
	% within State	2.2%	0.0%	1.6%
Total	Count	272	107	379
	% within State	100.0%	100.0%	100.0%

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means "strongly disagree" and 10 means "strongly agree." It was easy to understand.

		NC	SC	Total
4	Count	0	1	1
	% within State	0.0%	.9%	.3%
5	Count	10	7	17
	% within State	3.7%	6.6%	4.5%
6	Count	14	1	15
	% within State	5.1%	.9%	4.0%
7	Count	19	12	31
	% within State	7.0%	11.3%	8.2%
8	Count	47	11	58
	% within State	17.3%	10.4%	15.3%
9	Count	53	13	66
	% within State	19.5%	12.3%	17.5%
10 strongly agree	Count	127	60	187
	% within State	46.7%	56.6%	49.5%
don't know	Count	2	1	3
	% within State	.7%	.9%	.8%
Total	Count	272	106	378
	% within State	100.0%	100.0%	100.0%

Please rate the Energy Savers booklet in the following areas using a scale of 0 to 10, where 0 means “strongly disagree” and 10 means “strongly agree.” It was relevant to my household and the way I live.

		NC	SC	Total
0 disagree	Count	3	0	3
	% within State	1.1%	0.0%	.8%
1	Count	1	0	1
	% within State	.4%	0.0%	.3%
2	Count	1	0	1
	% within State	.4%	0.0%	.3%
3	Count	2	1	3
	% within State	.7%	.9%	.8%
4	Count	2	0	2
	% within State	.7%	0.0%	.5%
5	Count	13	9	22
	% within State	4.8%	8.4%	5.8%
6	Count	21	9	30
	% within State	7.7%	8.4%	7.9%
7	Count	45	11	56
	% within State	16.5%	10.3%	14.8%
8	Count	43	19	62
	% within State	15.8%	17.8%	16.4%
9	Count	38	12	50
	% within State	14.0%	11.2%	13.2%
10 strongly agree	Count	97	46	143
	% within State	35.7%	43.0%	37.7%
don't know	Count	6	0	6
	% within State	2.2%	0.0%	1.6%
Total	Count	272	107	379
	% within State	100.0%	100.0%	100.0%

Additional Actions Based on What Participants Learned from the Program

What other actions, if any, have you taken in your home to save energy and reduce utility bills at least in part as a result of what you learned in the Duke Energy / National Theater for Children program?

Category of Action	Count of Participants Mentioning
Turn off lights when not in use	40
Turn items off when not in use / unplug electronics	32
Thermostat adjustments / heating and cooling decisions	32
Conserving water (other than clothes washing)	18
Use efficient lighting (CFL and LED)	10
Use curtains, shades, blinds to control heat and light	6
Weather-stripping doors and windows / sealing leaks	5
Use fans to circulate air better	4
Keep doors and windows closed	4
Add insulation to walls, ceilings, floors, etc.	3
Wash clothes less often, run bigger loads / use lower water temperature	3
Upgrade windows, doors	2
Upgrade HVAC system	2
Upgrade to efficient appliances / Energy Star	2
Lights on timers, motion detectors, occupancy sensors	2
Professional home energy audit (including Home Energy House Call)	2
Planting, landscaping to increase shade	2
Unplugged spare water heater	1
Use dryer less often, run larger loads	1
Use stove, oven less	1
Regular HVAC maintenance	1
Install timer on pool pump	1
Install timer on water heater	1
Adjusted temperature of refrigerator	1
Use space heaters / zone heating	1
Installed a home energy monitor	1
Joined the Power Manager program	1
Recycling	1
Solar outdoor lighting	1



Multifamily Energy Efficiency Program

Evaluation, Measurement, and Verification
for Duke Energy Carolinas

Prepared for:
Duke Energy



Navigant Consulting, Inc.
1375 Walnut St.
Suite 200
Boulder, CO 80202

303.728.2500
navigant.com



November 3, 2015



Table of Contents

1. Evaluation Summary	3
1.1 Program Summary.....	3
1.2 Evaluation Objectives and Program-Level Findings	3
1.3 Evaluation Parameters and Sample Period	4
1.4 Evaluation Recommendations	5
2. Program Description	6
2.1 Design.....	6
2.2 Implementation	6
3. Key Research Objectives	8
4. Impact Evaluation	9
4.1 Impact Results	9
4.1.1 Other Key Findings.....	11
4.2 Impact Evaluation Methodology	11
4.2.1 Detailed Review of Ex Ante Deemed Savings.....	11
4.2.2 Onsite Field Verification.....	12
4.2.3 Tenant Surveys	13
4.3 Impact Evaluation Findings	13
4.3.1 Water Flow Regulation Measures.....	13
4.3.2 Water Heater Pipe Wrap	16
4.3.3 Measure Life	16
5. Net-to-Gross Analysis	17
5.1 Overview of Net-to-Gross Methodology.....	17
5.1.1 Definitions of Free Ridership, Spillover, and NTG Ratio	17
5.1.2 Estimating Free Ridership.....	18
5.1.3 Estimating Spillover.....	20
5.1.4 Combining Results Across Respondents	20
5.2 Results for Free Ridership, Spillover, and Net-to-Gross	21
5.2.1 Review of Data Collection Efforts for Attribution Analysis.....	21
5.2.2 Free Ridership Results.....	21
5.2.3 Spillover Results.....	22
5.2.4 NTG Results	22
6. Process Evaluation	23
6.1 Key Findings.....	23



6.2 Documentation Review	24
6.3 Interviews with Key Program Management Staff	24
6.4 Property Manager Interviews	24
6.5 Overall Marketing and Outreach.....	25
6.6 Tenant Surveys.....	26
7. Conclusions and Recommendations	31
8. Measure-Level Inputs for Duke Energy Analytics.....	32
Appendix A. Detailed Survey Results	33
A.1 Property Manager Interviews	33
A.2 Tenant Satisfaction Surveys.....	35



1. Evaluation Summary

1.1 Program Summary

Duke Energy's Multifamily Energy Efficiency Program provides energy efficient equipment to multifamily housing properties at no cost to the property managers or tenant end-users. It has evolved from the Property Manager Program. The program is delivered through coordination with property managers and owners. Tenants are provided with notice and informational materials to inform them of the program and potential for reduction in their energy bills. The program consists of lighting and water measures. This evaluation report covers only the water measures.

- **Water measures:** Bathroom and kitchen faucet aerators, water-saving showerheads, hot water pipe wrap

Franklin Energy is the implementation contractor. Customers (i.e., property managers) have the option to choose self-installation or direct installation through Franklin Energy. Duke Energy informed Navigant that most customers choose the direct install route by Franklin Energy. Duke Energy also informed Navigant that third-party quality control inspections are completed on 20 percent of properties in any given month. Within a selected property, the quantity of units to inspect is based on property size.

1.2 Evaluation Objectives and Program-Level Findings

Navigant was selected by Duke Energy to provide independent Evaluation, Measurement, and Verification (EM&V) for the water measures of the Multifamily Energy Efficiency Program in the Duke Energy Carolinas jurisdiction. EM&V is a term used to describe the process of evaluating a program to assess the impacts as well as the program structure and delivery. For this EM&V effort, the evaluation approach and objectives can be described as follows:

- **Impact evaluation:** To quantify the net and gross energy and coincident demand savings associated with program activity
- **Process evaluation:** To assess program delivery and customer satisfaction

By performing both components of the EM&V effort, Navigant is able to provide Duke Energy with verified energy and demand impacts, as well as a set of recommendations that are intended to aid Duke Energy with improving or maintaining the satisfaction with program delivery while meeting energy and demand reduction targets in a cost-effective manner.

Overall, Navigant found that the Multifamily Energy Efficiency Program is being delivered effectively, customer satisfaction is generally favorable, and the reported measure installations are accurate.

For the evaluation period covered by this report, there were a total of 22,081 housing units at 144 participating properties managed by at least 55 different property managers or property management companies. The program-level evaluation findings are presented in Table 1 through Table 4. Navigant found the realization rate for gross energy savings to be 81 percent, meaning that total verified gross energy savings were found to be about twenty percent lower than claimed in the tracking database.



provided by Duke Energy. The realization rate for gross summer peak demand savings was 96 percent, and for gross winter peak demand was 153%. Navigant found the net-to-gross (NTG) ratio to be 0.96, meaning that for every 100 kWh of reported energy savings, 96 kWh can be attributed directly to the program. These findings will be discussed in greater detail throughout this report.

Table 1. Program Claimed and Evaluated Gross Energy Impacts

	Claimed	Evaluated	Realization Rate
Gross Energy Impacts (MWh)	10,107	8,212	81%

Source: Navigant analysis, totals subject to rounding.

Table 2. Program Claimed and Evaluated Gross Peak Demand Impacts

	Claimed	Evaluated	Realization Rate
Gross Summer Peak Demand Impacts (MW)	0.81	0.77	96%
Gross Winter Peak Demand Impacts (MW)	1.16	1.77	153%

Source: Navigant analysis, totals subject to rounding.

Table 3. Program Net Energy Impacts

	MWh
Net Energy Impacts	7,898

Source: Navigant analysis, totals subject to rounding.

Table 4. Program Net Peak Demand Impacts

	MW
Net Summer Peak Demand Impacts	0.74
Net Winter Peak Demand Impacts	1.70

Source: Navigant analysis, totals subject to rounding.

1.3 Evaluation Parameters and Sample Period

To accomplish the evaluation objectives, Navigant performed an engineering review of measure savings algorithms, field verification to assess installed quantities and characteristics, as well as surveys with tenants and property managers to assess satisfaction and decision-making processes. The evaluated parameters are summarized in Table 5. The expected sampling confidence and precision for tenant phone surveys was 90 percent \pm 10 percent, and the achieved was 90 percent \pm 6 percent. For field verification, the expected sampling confidence and precision was 90 percent \pm 10 percent, and the achieved was 90 percent \pm 4 percent.

Table 5. Evaluated Parameters

Evaluated Parameter	Description	Details
---------------------	-------------	---------



Efficiency Characteristics	Inputs and assumptions used to estimate energy and demand savings	1. Aerator flow rates (gpm) 2. Showerhead flow rates (gpm) 3. Water temperature (F) 4. Pipe wrap length (ft) 5. Baseline characteristics
In-Service Rates	The percentage of program measures in use as compared to reported	1. Aerator and showerhead quantities 2. Pipe wrap length
Satisfaction	Customer satisfaction	1. Satisfaction with program 2. Satisfaction with contractor 3. Satisfaction with program measures
Free Ridership	Fraction of reported savings that would have occurred anyway, even in the absence of the program	
Spillover	Additional, non-reported savings that occurred as a result of participation in the program	

This evaluation covers program participation from April of 2014 through February of 2015. Table 6 shows the start and end dates of Navigant's sample period for evaluation activities.

Table 6. Sample Period Start and End Dates

Activity	Start Date	End Date
Field Verification	July 20, 2015	July 24, 2015
Tenant Phone Surveys	July 17, 2015	July 24, 2015
Property Manager Interviews	July 13, 2015	August 21, 2015

1.4 Evaluation Recommendations

Navigant developed a series of recommendations during the EM&V effort. These recommendations are intended to assist Duke Energy with enhancing the program delivery and customer experience, as well as to support future EM&V activities and possibly increase program impacts. Further explanation for each recommendation can be found later in this report.

1. Navigant recommends that Duke Energy should adopt the ex post per unit energy and demand impacts from this evaluation and use them going forward.
2. Navigant recommends that Duke Energy maintain an updated and complete list of contact information for property managers at participating properties.
3. Navigant recommends that no more than the first three feet of cold water inlet pipes be insulated for the water heater pipe wrap measure.



2. Program Description

2.1 Design

The Multifamily Energy Efficiency Program is designed to provide energy efficiency to a sector that is often underserved or difficult to reach via traditional, incentive-based energy efficiency programs. This market can be difficult to penetrate because multifamily housing units are often tenant-occupied rather than owner-occupied, meaning that the benefits of participation may be realized by the tenant whereas the incremental costs of participating in the program are absorbed by the owner.

Duke Energy's Multifamily Energy Efficiency Program provides energy efficient equipment to multifamily housing properties at no cost to the property managers or tenant end-users. The program is delivered through coordination with property managers and owners. Tenants are provided with notice and informational materials to inform them of the program and potential for reduction in their energy bills. The program consists of lighting and water measures. This evaluation report covers only the water measures.

- **Water measures:** Bathroom and kitchen faucet aerators, water-saving showerheads, hot water pipe wrap

2.2 Implementation

Franklin Energy is the implementation contractor for the program. To recruit participants, Franklin Energy conducts onsite visits, in combination with internet searches, and SalesGenie¹ lists, to identify properties, property managers, or property management companies that it believes are likely to participate. Franklin Energy then sends an outreach team of energy advisors to coordinate with property managers and explain the program delivery and benefits. This is considered an Energy Assessment. This is also an opportunity for energy advisors to determine the type of measures along with associated quantities that can be installed. Franklin Energy indicated that property managers can be hesitant at first because they may not comprehend that the equipment will be installed at no cost to them. Another potential delay in committing to the program is the need for the property manager to get approval to participate from their corporate office.

Once a property has been fully assessed and a service agreement has been signed, the project is handed over to a different group at Franklin Energy to schedule the installations. The installation crew performs the work as scheduled, while displaying Duke Energy branded clothing, badges, and vehicle decals as directed. The installation crews record the quantities and locations of installed measures for each housing unit via a tablet device, which are eventually entered into a tracking database.

¹ SalesGenie is a business and consumer lead generation tool that sales and marketing professionals can use to search for targeted leads, get contact names and phone numbers, and view detailed information. The tool also provides marketing and data solutions designed to help businesses reach their intended audiences more effectively.



When energy efficient program measures are installed, Franklin Energy removes the existing or baseline equipment and generally disposes of it onsite. If the property management previously requested to keep the existing equipment, Franklin Energy will package it up and leave it behind with property management or maintenance personnel. In general, Franklin Energy does not record specific information about the efficiency characteristics of the equipment being removed, although Franklin Energy indicated they are experimenting with the idea of doing so.²

There can be logistical complications associated with performing these types of retrofits at multifamily housing properties. Franklin Energy indicated that some units may be skipped at a property due to safety issues, lack of access to equipment, pet barriers, or refusal from tenants.

Franklin Energy indicated that they have internal and external forms of quality control (QC) to ensure consistent measure installation. On the internal side, a Franklin Energy supervisor may accompany installation crews to ensure quality work. On the external side, a third-party inspector, High Performance Building Solutions, conducts inspections on a least five percent of participating housing units each year. The QC inspections are required to happen within 22 business days of installation. If a property is selected for a QC inspection, at least 20 percent of the units at the property are targeted for inspection.

During each month of QC inspections, Franklin Energy is provided with a discrepancy report that indicates when measures were missing, installed incorrectly, or if there were missed opportunities. Franklin Energy attempts to address the discrepancies, and subsequently updates the tracking data to reflect the QC findings. The tracking data is ultimately provided to Duke Energy, and subsequently to Navigant for EM&V.

² During the property assessment phase, Franklin Energy determines that housing units selected for participation contain standard aerators and showerheads served by electric water heating.



3. Key Research Objectives

As outlined in the Statement of Work, the key research objectives were to conduct impact and process evaluations, as well as a net-to-gross (NTG) analysis. The evaluation covers only water measures.

The primary purpose of the evaluation, measurement, and verification (EM&V) assessment is to estimate net annual energy and demand impacts associated with participation from April of 2014 through February of 2015. Secondary objectives include the following:

- Estimate impacts by measure
- Perform detailed review of deemed savings estimates for each measure, and provide updates if necessary
- Assess the installed quantities and efficiency characteristics of program measures
- Evaluate the strengths and weaknesses of current program processes and customer perceptions of the program offering and delivery
- Recommend improvements to program rules and processes that support greater savings, enhanced cost-effectiveness, and improved customer satisfaction
- Update measure life assumptions, if applicable

Key impact and process research questions to be explored include:

- Is the program achieving targeted energy and demand savings at the measure level?
- How do customers learn about the program, and can participation be increased?
- How is the persistence of savings impacted by participant removal of measures installed through the program?
- Are there opportunities for additional measure offerings through the program?



4. Impact Evaluation

4.1 Impact Results

The program-level results are shown in Table 7. These results were calculated by multiplying the measure quantities found in the tracking database by the verified energy and demand savings estimated by Navigant for each measure. The net impacts were found by multiplying the gross impacts by the NTG ratio of 0.96. The NTG methodology and results are discussed in detail in Section 5 of this report.

Table 7. Summary of Program Impacts

	Energy (MWh)	Summer Coincident Demand (MW)	Winter Coincident Demand (MW)
Verified Gross Impacts	8,212	0.77	1.77
Verified Net Impacts	7,898	0.74	1.70

Source: Navigant analysis

A summary of each measure's contribution to program savings and realization rate between reported savings and verified savings is shown in Table 8. By dividing the total verified savings by the total reported savings in the tracking data in Table 8, Navigant calculates a gross realization rate of 81 percent for energy savings at the program level. The realization rate for summer coincident demand is 96 percent at the program level, as shown in Table 9, and is 153% for winter coincident demand as shown in Table 10. These realization rates include adjustments to the estimated savings for each measure which will be discussed during the remainder of this report. On a measure level, the largest adjustments were made to the savings for bathroom faucet aerators due to differences between the estimated per-person hot water usage in the deemed savings assumptions and Navigant's updated research.³

³ The deemed savings for bathroom faucet aerators were based on water use assumptions from the 2012 version of the Illinois Technical Reference Manual. Navigant found that the 2015 version of that TRM had a significant adjustment downward for the water usage assumption. Furthermore, Navigant used estimates from the DOE's Building America Benchmark which were similar to the 2015 version of the Illinois TRM.



Table 8. Distribution of Program Energy Savings by Measure

Measure	Measure Count from Tracking Data	Total Ex Ante Savings from Tracking Data (MWh)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MWh)	Realization Rate
Bathroom Faucet Aerators	21,070	2,441	24%	909	37%
Kitchen Faucet Aerators	13,087	1,264	13%	1,190	94%
Showerheads	18,396	4,462	44%	4,268	96%
Pipe Wrap (ft)	49,747	1,940	19%	1,845	95%
Total	102,300	10,107	100%	8,212	81%

Source: Navigant analysis

Table 9. Distribution of Summer Coincident Demand Savings by Measure

Measure	Total Savings from Tracking Data (MW)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MW)	Realization Rate
Bathroom Faucet Aerators	0.195	24%	0.120	61%
Kitchen Faucet Aerators	0.101	13%	0.156	155%
Showerheads	0.357	44%	0.351	98%
Pipe Wrap (ft)	0.155	19%	0.147	95%
Total	0.81	100%	0.77	96%

Source: Navigant analysis

Table 10. Distribution of Winter Coincident Demand Savings by Measure

Measure	Total Savings from Tracking Data (MW)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MW)	Realization Rate
Bathroom Faucet Aerators	0.278	24%	0.105	38%
Kitchen Faucet Aerators	0.144	12%	0.137	95%
Showerheads	0.510	44%	1.380	271%
Pipe Wrap (ft)	0.224	19%	0.147	66%



Total	1.16	100%	1.77	153%
-------	------	------	------	------

4.1.1 Other Key Findings

In addition to the impact results summarized in Table 7 through Table 9, Navigant would like to point out some key findings discovered during the impact evaluation that ultimately affected the final results:

- Overall, program measures were installed and operating as reported. For all measures, the in-service rate (ISR) was higher than Duke Energy's estimate of 95 percent.
- Navigant used Duke Energy's estimates for baseline measure characteristics when calculating verified savings. It was challenging to evaluate the baseline measure characteristics in most cases, because participants generally could not provide much detail about the pre-retrofit characteristics of their measures.
- Nearly half of the water heater pipe wrap was installed on the cold water inlet pipes. This point is discussed in more detail later in this report.
- At most properties in the sample for onsite field verification, property managers indicated that some portion of housing units are vacant at any given time. This suggests that not all measures installed are generating savings. Navigant did not account for vacant units in this impact analysis, but future efforts could be developed to assess vacancy rates at participating properties.

4.2 Impact Evaluation Methodology

Navigant's methodology for evaluating the gross and net energy and demand impacts of the program included the following components:

1. Detailed review of deemed savings estimates including: engineering algorithms, key input parameters, and supporting assumptions.
2. Onsite field verification to assess measure characteristics and in-service rates (ISRs)
3. Net-to-gross (NTG) analysis
4. Incorporating supplemental impact findings from tenant surveys

4.2.1 Detailed Review of Ex Ante Deemed Savings

Navigant reviewed the ex ante savings and supporting documentation used to estimate ex ante program impacts. Duke Energy provided Navigant with the ex ante savings assumptions for water measures shown in Table 11. For each water measure, Duke Energy provided a description of the base case, which included the assumed flow rate of the existing showerhead and faucet aerators, and the assumption that water heater pipes were uninsulated. Duke Energy also provided a supplemental document that



summarized the algorithms and assumptions used to estimate the deemed savings. Navigant performed a detailed review of these assumptions, and ultimately made some adjustments based on field findings and other research.

Table 11. Ex Ante Savings for Water Measures in Provided by Duke Energy

Measure	Annual energy savings (kWh)	Annual Non-coincident demand savings (kW)	Annual coincident demand savings (kW)
Faucet Aerators MF Direct 0.5 GPM - bath	164	0.0187	0.0131
Faucet Aerators MF Direct 1.0 GPM - bath	116	0.0132	0.0093
Faucet Aerators MF Direct 1.0 GPM - kitchen	97	0.0110	0.0077
Faucet Aerators MF DIY 0.5 GPM - bath	130	0.0148	0.0104
Faucet Aerators MF DIY 1.0 GPM - bath	91	0.0104	0.0073
Faucet Aerators MF DIY 1.0 GPM - kitchen	76	0.0087	0.0061
LF Showerhead MF Direct 0.5 GPM	485	0.0554	0.0388
LF Showerhead MF Direct 1.0 GPM	364	0.0415	0.0291
LF Showerhead MF Direct 1.5 GPM	243	0.0277	0.0194
LF Showerhead MF DIY 0.5 GPM	383	0.0437	0.0306
LF Showerhead MF DIY 1.0 GPM	287	0.0328	0.0230
LF Showerhead MF DIY 1.5 GPM	191	0.0219	0.0153
Pipe Wrap MF Direct	39	0.0045	0.0031
Pipe Wrap MF DIY	31	0.0035	0.0025

4.2.2 Onsite Field Verification

Navigant performed onsite field verification at 68 housing units across seven properties. Field verification efforts were designed to assess the measure characteristics as reported in the tracking data and to assess measure parameters that can be used to verify inputs and assumptions used to estimate energy and demand savings for individual measures. Table 12 shows a summary of the parameters assessed by Navigant during field verification, and Table 13 shows the field verification sample.



Table 12. Parameters Evaluated During Field Verification

	Faucet Aerators	Water-saving Showerheads	Hot Water Pipe Wrap
Installed quantity	x	x	x
Flow rates (gpm)	x	x	
Water heating system characteristics	x	x	x
Water Temperatures	x	x	x
Pipe insulation R value			x
Pipe length			x
Measure location	x	x	x
Baseline information (where available)	x	x	x

Table 13. Field Verification Sample

Program Measure	Number of Housing Units in Sample	Number of Measures Reported in Sample
Bathroom Faucet Aerators	54	70
Kitchen Faucet Aerators	55	55
Showerheads	50	63
Pipe Wrap	43	209 ft

Source: Navigant analysis

A summary of findings from field verification is included in Section 4.3.

4.2.3 Tenant Surveys

Navigant incorporated supplemental findings from 80 tenant phone surveys to inform the impact analysis where applicable. The findings from the tenant surveys will be addressed later in this report.

4.3 Impact Evaluation Findings

The impact evaluation findings for water flow regulation and pipe wrap measures are discussed separately.

4.3.1 Water Flow Regulation Measures

For field verification of program water measures, Navigant collected information to validate the efficiency characteristics of the equipment. This included verifying the reported number of measures and measuring actual flow rates of the retrofit equipment.

4.3.1.1 In-Service Rate

The ISRs for water measures are shown in Table 14. These were calculated using a weighted average of results from the onsite field verification inspections and the tenant phone surveys.

Table 14. In-Service Rates for Water Measures

Measure	ISR
Kitchen aerators	96%
Bathroom aerators	96%
Showerheads	101%
Pipe wrap	95%

Source: Navigant analysis

4.3.1.2 Energy Savings

Navigant performed a detailed review of documentation for deemed savings assumptions and calculations as provided by Duke Energy. The evaluation team confirmed key assumptions from secondary literature, and supplemented inputs with data gathered during field verification. To calculate verified savings for aerators and showerheads, Navigant used a standard engineering equation shown in Equation 1, Equation 2, and Equation 3. Navigant subsequently applied inputs collected during field verification or assumptions as listed below in Table 15. The resulting estimates for impacts of aerators and showerheads are presented in Table 16.

Equation 1. Algorithm for Estimating Energy Savings for Faucet Aerators

kWh savings for faucet aerators

$$= \text{ISR} \times \left[\frac{(GPM_{\text{base}} - GPM_{\text{low}}) \times T_{\text{home/day}} \times 365 \frac{\text{days}}{\text{yr}} \times DF \times (T_{\text{out}} - T_{\text{in}}) \times 8.3 \frac{\text{Btu}}{\text{gal} \cdot ^\circ\text{F}}}{\#_{\text{faucets}} \times 3412 \frac{\text{Btu}}{\text{kWh}} \times RE} \right]$$

Equation 2. Algorithm for Estimating Energy Savings for Low Flow Showerheads

kWh savings for low flow showerheads

$$= \text{ISR} \times \left[\frac{(GPM_{\text{base}} - GPM_{\text{low}}) \times T_{\text{home/day}} \times N_{\text{showers/day}} \times 365 \frac{\text{days}}{\text{yr}} \times (T_{\text{out}} - T_{\text{in}}) \times 8.3 \frac{\text{Btu}}{\text{gal} \cdot ^\circ\text{F}}}{\#_{\text{showers}} \times 3412 \frac{\text{Btu}}{\text{kWh}} \times RE} \right]$$

Equation 3. Algorithm for Estimating Coincident Demand Savings for Aerators and Showerheads

$$\Delta kW_{\text{peak}} = \Delta kWh/\text{yr} \times CF/365$$

Table 15. Input Parameters and Assumptions for Aerator and Showerhead Savings Calculations

Input	Definition	Value	Source
ISR	In-service rate	Refer to Table 14	Navigant field verification and phone surveys



GPM _{base}	Baseline flow rate	Aerators 2.2 Shower 2.5	Deemed savings assumptions from Duke Energy
GPM _{low}	Retrofit flow rate	Aerators 1 Shower 1.5	Deemed savings assumptions from Duke Energy ^a
T _{home/day}	Avg hot water use per day per home (minutes)	Kitchen 4.7 Bath 2.4 Shower 8.4	Building America Benchmark
N _{showers/day}	Number of showers per person per day	1	Navigant assumption
DF	Percent of water going down drain	Kitchen 75% Bath 90%	Navigant assumption
T _{out}	Temp of water flowing from faucets (F) Temp of water flowing from showerheads (F)	92 ^b 105	Navigant field verification Duke Energy deemed savings documentation
T _{in}	Temp of water entering water heater (F)	67	Navigant field verification
#faucets/showers	Number of faucets in home (used to distribute minutes of use between different faucets)	Kitchen 1 Bathroom 1.30 Shower 1.30	Program data
RE	Recovery efficiency of water heater	0.98	Ohio TRM
CF (aerators)	Coincidence Factor	Summer 0.048 Winter 0.042	Building America Benchmark
CF (showerheads)	Coincidence Factor	Summer 0.03 Winter 0.118	Building America Benchmark

- a. Navigant measured flow rates during onsite field verification and they were lower than the reported flow rates for the measures installed. However, this was likely due to calcification or water pressure characteristics and suggests that baseline flow rates may also have been lower. Because we did not measure flow rates for baseline units, we chose to use the reported flow rates in both cases.
- b. The actual measured hot water temperature was 117F, and the cold water temp was 67F. For analysis purposes, Navigant assumed that customers use faucet water at a temperature of 92 degrees, or the average of 117F and 67F.

Table 16. Verified Estimates of per Unit Impacts for Aerators and Showerheads⁴

Measure	Annual Energy Savings per Unit (kWh)	Annual Summer Coincident Demand Savings per Unit (kW)	Annual Winter Coincident Demand Savings per Unit (kW)
---------	--------------------------------------	---	---

⁴ The program offers aerators and showerheads at other flow rates. However, the tracking data indicated that 100 percent of the water measures installed during the period covered by this evaluation cycle were the flow rates



	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante
Kitchen aerator (1.0 GPM)	91	97	0.0120	0.0077	0.0105	0.0110
Bathroom aerator (1.0 GPM)	43	116	0.0057	0.0093	0.0050	0.0132
Low flow showerhead (1.5 GPM)	232	243	0.0191	0.0194	0.0750	0.0277

Source: Navigant analysis

4.3.2 Water Heater Pipe Wrap

During field verification, Navigant found that nearly half of the water heater pipe wrap was installed on the cold water inlet pipe to the water heater. Industry standards are to install pipe wrap on all hot water pipes, and only the first three feet of the cold water pipe.⁵ Therefore, Navigant did not count savings from pipe wrap of greater than three feet installed on cold water pipes. Navigant applied the ISR from our field verification to the deemed savings provided by Duke Energy.

Table 17. Verified Impacts for Water Heater Pipe Wrap

Measure	Annual Energy Savings per Unit (kWh)	Annual Summer Coincident Demand Savings per Linear Foot (kW)	Annual Winter Coincident Demand Savings per Linear Foot (kW)
Ex Post	37	0.0030	0.0030
Ex Ante	39	0.0031	0.0045

Source: Navigant analysis

4.3.3 Measure Life

Navigant reviewed the measure life assumptions for all program measures and compared them to other sources from secondary literature research. The evaluation team believes all program measure lives are appropriate and not in need of an update.

shown in Table 16, so a verified savings are shown here for only those measures. A full list of savings is shown in Section 8.

⁵ <http://www.energy.gov/energysaver/projects/savings-project-insulate-hot-water-pipes-energy-savings>



5. Net-to-Gross Analysis

Navigant conducted an NTG analysis to estimate the share of program savings that can be attributed to participation in or influence from the program. Table 18 shows the results of Navigant's NTG analysis. Navigant anticipated low free ridership and spillover given that the program is structured to offer energy efficient equipment at no cost to multifamily housing units, which are typically not owner-occupied. The results shown here are in line with expectations. Navigant chose to present a program-level NTG ratio rather than measure level due to the limited sample size of property managers and the fact that it is difficult to estimate spillover by measure. Navigant believes it is more appropriate to present the NTG ratio in aggregate.

Table 18. NTG Results

Estimated Free Ridership	5.0%
Estimated Spillover	1.2%
Estimated NTG	0.96

Source: Navigant analysis

5.1 Overview of Net-to-Gross Methodology

As indicated in the evaluation plan, Navigant used a survey-based, self-report methodology to estimate free ridership and spillover for the Multifamily Energy Efficiency Program. A self-report approach is outlined in the Universal Methods Protocol (UMP), and Navigant has previously used this method to estimate a NTG ratio for the multifamily sector of the Home Energy Improvement Program offered in the DEP jurisdiction. Navigant primarily targeted property managers for the NTG surveys, because they are the decision makers for participation in the program.⁶ Navigant also incorporated supplemental data gathered during tenant phone surveys into the analysis.

5.1.1 Definitions of Free Ridership, Spillover, and NTG Ratio

The methodology for assessing the energy savings attributable to a program is based on a NTG ratio. The NTG ratio has two main components: free ridership and spillover.

Free ridership is the share of the gross savings that is due to actions participants would have taken anyway (i.e., actions that were not induced by the program). This is meant to account for naturally occurring adoption of energy efficiency measures. The Multifamily Energy Efficiency Program and most other Duke Energy programs cover a wide range of energy efficiency measures and are designed to advance the overall energy efficiency market. However, it is likely that, for various reasons, some

⁶ Navigant recognizes that some property managers may have been instructed to participate by higher-level decision makers at the corporate level. Although we do not think this was the case very often, we do think that the local property managers were still privy to the decision making process.



participants would have wanted to install some high-efficiency measures even if they had not participated in the program or been influenced by the program in any way.

Spillover captures program savings that go beyond the measures installed through the program. Also called market effects, the term spillover is often used because it reflects savings that extend beyond the bounds of the program records. Spillover adds to a program's measured savings by incorporating indirect (i.e., non-incentivized) savings and effects that the program has had on the market above and beyond the directly incentivized or directly induced program measures.

The overall NTG ratio accounts for both the net savings at participating projects and spillover savings that result from the program, but are not included in the program's accounting of energy savings. When the NTG ratio is multiplied by the estimated gross program savings, the result is an estimate of energy savings that are attributable to the program (i.e., savings that would not have occurred without the program). The NTG formula is shown in Equation 4:

Equation 4. Net-to-Gross Formula

$$NTG = 1 - \text{free ridership} + \text{spillover}$$

The underlying concept inherent in the application of the NTG formula is that only savings caused by the program should be included in the final net program savings estimate, but that this estimate should include all savings caused by the program.

5.1.2 Estimating Free Ridership

Data to assess free ridership was gathered through the self-report method using a series of survey questions asked to the property managers at participating properties. The survey assessed free ridership using both direct questions, which aimed to obtain respondent estimates of the appropriate free ridership rate that should be applied to them, and supporting or influencing questions, which could be used to verify whether the direct responses were consistent with participants' views of the program's influence.

Each respondent to the survey provided perspectives on the measures that they had installed through the program. The core set of questions addressed the following three categories:

- **Likelihood:** To estimate the likelihood that they would have incorporated measures "of the same high level of efficiency," if not for the assistance of the program. In cases where respondents indicated that they might have incorporated some but not all of the measures, they were asked to estimate the share of measures that would have been incorporated anyway at high efficiency. This flexibility in how respondents could conceptualize and convey their views on free ridership allowed respondents to give their most informed response, thus improving the accuracy of the free ridership estimates.
- **Prior planning:** To further estimate the probability that a participant would have implemented the measures without the program. Participants were asked the extent to which they had considered installing the energy efficient measure prior to participating in the program. The



general approach holds that if customers were not definitively planning to install all of the efficiency measures prior to participation then the program can reasonably be credited with at least a portion of the energy savings resulting from the high-efficiency measures. Strong free ridership is reflected by those participants who indicated they had already allocated funds for the purchase and selected the equipment and an installer.

- **Program importance:** To clarify the role that program components (e.g., information, incentives) played in decision-making and to provide supporting information on free ridership. Responses to these questions were analyzed for each respondent, not just in aggregate, and were used to identify whether the direct responses on free ridership were consistent with how each respondent rated the influence of the program.

Free ridership scores were calculated for each of the three categories.⁷ Navigant then calculated a weighted average from each respondent based on their share of sample energy savings, and divided by 10 to convert the scores into a free ridership percentage. Next, a timing multiplier was applied to the average of the three scores to reflect the fact that respondents indicating that their energy efficiency actions would not have occurred until far into the future may be overestimating their level of free ridership. Participants were asked when they would have installed the equipment without the program. Respondents who indicated that they would not have installed the equipment for at least two years were not considered free riders and received a timing multiplier of 0. If they would have installed at the same time as they did, they received a timing multiplier of 1; within one year, a multiplier of 0.67; and between one and two years, a multiplier of 0.33. Participants were also asked when they learned about the financial incentive; if they learned about it after the equipment was installed then they received a timing multiplier of 1.

⁷ Scores were calculated by the following formulas:

- **Likelihood:** The likelihood score is 0 for those that “definitely would NOT have installed the same energy efficient measure” and 1 for those that “definitely WOULD have installed the same energy efficient measure.” For those that “MAY HAVE installed the same energy efficient measure,” the likelihood score is their answer to the following question: “On a scale of 0 to 10, where 0 is DEFINITELY WOULD NOT have installed and 10 is DEFINITELY WOULD have installed the same energy efficient measure, can you tell me the likelihood that you would have installed the same energy efficient measure?” If more than one measure was installed in the project, then this score was also multiplied by the respondent’s answer to what share they would have done.
- **Prior Planning:** If participants stated they had considered installing the measure prior to program participation, then the prior planning score is the average of their answers to the following two questions: “On a scale of 0 to 10, where 0 means you ‘Had not yet planned for equipment and installation’ and 10 means you ‘Had identified and selected specific equipment and the contractor to install it,’ please tell me how far along your plans were” and “On a scale of 0 to 10, where 0 means ‘Had not yet budgeted or considered payment’ and 10 means ‘Already had sufficient funds budgeted and approved for purchase,’ please tell me how far along your budget had been planned and approved.”
- **Program Importance:** This score was calculated by taking the maximum importance on a 0 to 10 scale of the four program importance questions and subtracting from 10 (i.e., the higher the program importance, the lower the influence on free ridership).



5.1.3 Estimating Spillover

The basic method for assessing participant spillover was an approach that asked a set of questions to determine the following:

- **Whether spillover exists at all.** These were yes-or-no questions that asked, for example, whether the respondent incorporated energy efficiency measures or designs that were not recorded in program records and did not receive any rebates from DEC.
- **The savings that could be attributed to the influence of the program.** Participants were asked to list the extra measures they installed, and the evaluation team assigned a savings value. See below for the method of assigning savings.
- **Program attribution.** Estimates were derived from a question asking the program importance on a 0 to 10 scale. Participants were also asked how the program influenced their decisions to incorporate additional energy efficiency measures.

If respondents said no, they did not install additional measures, they were assigned a 0 score for spillover. If they said yes, then Navigant estimated the energy spillover savings on a case-by-case basis. It is important to note that although free ridership questions were only asked of property managers, Navigant surveyed both property managers and tenants for spillover.⁸

5.1.4 Combining Results Across Respondents

The evaluation team determined free ridership estimates for each of the following:

- Individual respondents, by evaluating the responses to the relevant questions and applying the rules-based approach discussed above.
- The program as a whole, by taking a weighted average of the individual results based on each respondent's share of reported energy savings.

⁸ The reason for not assessing free ridership at the tenant level is because tenants generally participated in the program via their property managers rather than personal choice. It is possible that tenants would have installed the same measures themselves, but Navigant does not believe they should be considered free riders to the program because the timing of those installations would have been difficult to evaluate. If a tenant already had equivalent measures in place, it is unlikely that the implementer would have replaced them with program measures.



5.2 Results for Free Ridership, Spillover, and Net-to-Gross

5.2.1 Review of Data Collection Efforts for Attribution Analysis

Surveys were conducted with decision makers to provide the information to estimate free ridership, and thus, NTG ratios. A total of nine property managers were surveyed. These nine property managers managed 11 of 144 total properties in the program. This sample represents 8 percent of the total properties, 12 percent of the total housing units, and 11 percent of the total reported energy savings, as shown in Table 19.

Table 19. Property Manager Sample Representation

	Program Total	Sample Total	% of Program
Properties	144	11	8%
Property managers	55	9	16%
Housing units	22,081	2,542	12%
Bathroom faucet aerators	21,070	2,320	11%
Kitchen faucet aerators	13,087	1,590	12%
Showerheads	18,396	2,025	11%
Pipe wrap	49,747	4,956	10%
Total Energy Savings			11%

Source: Navigant analysis

5.2.2 Free Ridership Results

As described above, surveyed participants responded to a series of questions intended to elicit explicit estimates of free ridership, as well as ratings of program influence. Estimates are based on questions regarding the likelihood, scope, and timing of the investments in energy efficiency if the respondent had not participated in the program. For the Multifamily Energy Efficiency Program, free ridership was estimated at 5 percent, which is a relatively low value as anticipated by Navigant.

Navigant developed the free ridership estimate presented above based on responses to a variety of questions that related to survey respondents' intentions prior to participating in the program and to the influence of the program itself. Below are summaries by scoring component.

Prior Planning: One of the respondents had prior plans to install low flow showerheads. The other respondents indicated no prior plans to install water measures. These findings indicate low free ridership.

Program Importance: All respondents stated that the program was important for influencing their decision to have the measures installed. The average rating was 8.4 on a scale of 0 to 10 where 0 indicated "not important at all" and 10 indicated "very important". This finding also indicates low free ridership.



Likelihood: Respondents were asked in the absence of the program, if they would have had at least some of the work done. Seven of the respondents stated they would not have had any of the measures installed without the program. Two of the respondents said they would have had at least some of the measures installed.

Timing: Two respondents stated they would have done the installation within a year of the time they participated in the program, while three respondents stated they would have done the installations within one or two years.

In summary, respondents indicated that the program was very important in their decisions to have the energy efficient measures installed. Some indicated that they did have some prior plans to install the measures, but their plans were not very far along. Only one participant had high likelihood of installing the measures without the program, and on average, respondents would have done the installation between one and two years after the program installation. These results indicate low free ridership overall. The evaluation team estimated free ridership for the program at 5 percent of program reported savings.

5.2.3 Spillover Results

One of the nine property managers interviewed indicated that participation in the program influenced him/her to install CFLs and low flow water devices at other properties managed by the property management company. However, Navigant found several other properties managed by the same property management company that had received CFLs and water measures through the program so Navigant did not credit any spillover to this response in order to avoid double counting of measures already incentivized through the program.

In addition, during the tenant phone surveys a small number of tenants reported installing some energy efficiency lights after participating in the program. These respondents reported that the program influenced their decision to install additional energy efficiency lights by an average of 8 on a scale of 0 to 10. Navigant estimated the total spillover from these measures to be 1.2 percent by using the program deemed savings value for CFLs and adjusting by the 8 out of 10 influence factor

5.2.4 NTG Results

The NTG ratio was calculated as written in Equation 5:

Equation 5. Net-to-Gross Ratio

$$NTG = 1 - \text{free ridership} + \text{spillover} = 1 - 0.050 + 0.012 = 0.96$$

This suggests that for every one kWh reduced from program measures, about 0.96 kWh of savings can be directly attributed to the program.



6. Process Evaluation

Navigant conducted a process evaluation of the Multifamily Energy Efficiency Program to assess program delivery and customer satisfaction. The process findings summarized in this section are based on the results of customer surveys with 80 program participants, detailed surveys with 9 property managers representing 11 properties, an interview with the Duke Energy Program Manager, an interview with the Franklin Energy Program Manager, and a high level review of the program documents and functionality. The property manager interviews and tenant surveys were also used to inform the NTG analysis.

6.1 Key Findings

- The program appears to be effectively addressing many key challenges that are inherent to delivering energy efficiency programs to non-owner-occupied multifamily housing facilities.
- About half of property managers learned about this program through outreach by a program representative, and the other half learned through their corporate managers. Most tenants learned of this program through their property managers.
- Property managers listed saving money via no cost measures and installation by outside contractors as the primary reason for participating in the program. Two property managers said they were mandated to participate by corporate management.
- 29 percent of tenants indicated they noticed savings on their electric bill since the installation of the measures, whereas 61 percent said they had not noticed a change and 10 percent didn't know.
- A majority of program participants were satisfied with the program. On a scale of 0 to 10, where 0 indicates "not satisfied at all" and 10 indicates "extremely satisfied":
 - About 58 percent of participants indicated 8-10 for satisfaction with the overall program, whereas about 26 percent indicated a rating of 5 or less with their satisfaction
 - Over 78 percent of participants indicated 8-10 for satisfaction with the installer's quality of work
 - Over 56 percent of participants indicated 8-10 for satisfaction with Duke Energy
- Low satisfaction ratings were often associated with complaints about the equipment, particularly the reduced water pressure and lack of noticeable money savings.
- During the tenant phone surveys, a large number of participants expressed dissatisfaction with the low water pressure in their showers and sinks, along with complaints that kitchen aerators sprayed water everywhere. Additionally, about half of the property managers indicated that they had received tenant complaints about low water pressure.



6.2 Documentation Review

Navigant requested program documentation and tracking data to conduct a complete review of current processes. For the most part, the documentation was informative and easy to follow. The educational brochures were simple and to the point. The program tracking data was sufficient to identify the installation location and quantities of installed measures for each tenant at the participating properties. However, Navigant did identify one area where documentation could be improved to aid in the evaluation, measurement, and verification (EM&V) process:

1. There were several gaps in the property manager contact information provided to Navigant by Duke Energy. For example Navigant found that the property management company name and/or phone number were missing for about half of properties in the database. Furthermore, the phone numbers provided for some sites connected to regional or national corporate offices. This made it difficult to identify the proper contact person for interviews and site visits at some of the program properties. Duke Energy should encourage the implementation contractor to maintain a complete contact list for all property managers, that ideally contains the name of an application contact person.

6.3 Interviews with Key Program Management Staff

Navigant conducted interviews with program staff from Duke Energy and Franklin Energy to understand and assess program delivery and daily operations. Program staff from both organizations were responsive and helpful. The interviews focused on the marketing process, measure installation, customer satisfaction, data collection, and possible areas for growth or improvement. These interviews provided Navigant with some insight about how to focus efforts for data collection and with some ideas for questions to include in the customer satisfaction surveys. Other findings from the interviews are incorporated into descriptive text throughout this memo.

6.4 Property Manager Interviews

The evaluation team conducted interviews with property managers from the participating properties to assess decision-making (which will ultimately feed into the net-to-gross analysis), satisfaction with the program, and to recruit for onsite inspections as part of the impact analysis. The evaluation team interviewed nine property managers who were responsible for eleven properties representing almost 11,000 measures. The properties managed by these interviewees account for approximately eleven percent of all measures installed in the program during the evaluation cycle.

Overall, property managers indicated that their experience with the program was favorable. There are distinct challenges when dealing with a large number of tenant-occupied housing units, and it would be difficult to appease all customers equally. Some key findings from the property manager interviews are listed below:

- Property managers expressed high satisfaction with the free program measures and free installation by an external contractor.
- Several property managers indicated that the program allowed the management company to provide a benefit to residents by saving them money on utility bills.



6.5 Overall Marketing and Outreach

Customer outreach is a key driver to program participation. Franklin Energy indicated that they have a specific outreach team that recruits and coordinates with property managers to facilitate enrollment in the program. Franklin indicated that they provide the property managers with brochures and education that summarizes the energy and non-energy benefits (such as tenant satisfaction) of the program. Sometimes it may take some extra effort to convince hesitant property managers that the program is not a sales gimmick. Navigant recognizes the importance of marketing and outreach with regards to continued participation and satisfaction, so several questions in the tenant survey and property manager interviews were included to address this.

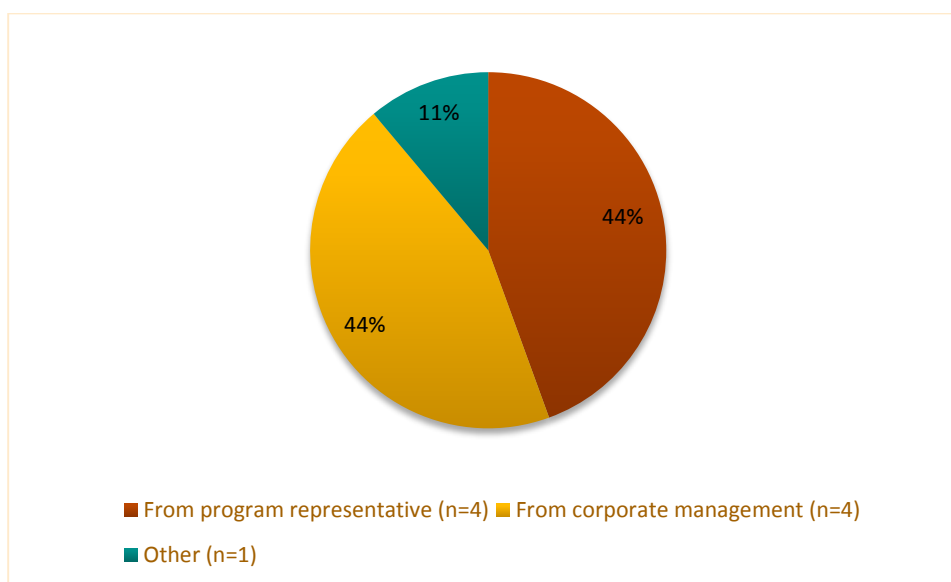
Table 20 and Figure 1 show how tenants and property managers learned about the program. Tenant participants were asked to indicate all of the sources through which they learned about the program, and three-quarters indicated they had learned about the program through property managers as would be expected given the program model. Tenants also indicated having received notice via a Duke Energy mailing or bill stuffer. Property managers indicated that they were approached in-person by a program representative, or were referred by corporate managers who were often also coordinating participation at other properties managed by the company.

Table 20. How Tenants Learned About the Program

How Tenants Learned About the Program (n=80)	
Through property manager	71%
Duke Energy mailing	11%
Through family, friend or neighbor	6%
Don't know	4%
Duke Energy bill stuffer	3%
Duke Energy website	2%
Participation in other Duke Energy Programs	2%
Other	1%

Source: Navigant analysis

Figure 1. How Property Managers Learned About the Program



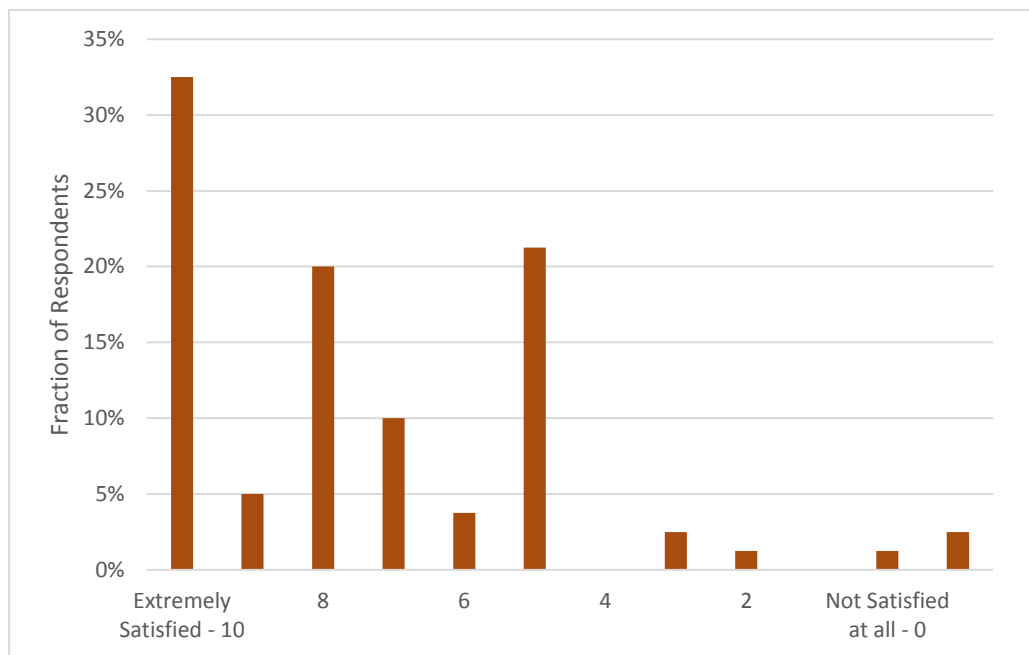
Source: Navigant analysis

6.6 Tenant Surveys

Navigant conducted phone surveys with 80 residential tenants to assess program satisfaction. Customer satisfaction with the program is high. On a scale of 0 to 10, where 0 indicates “not satisfied at all” and 10 indicates “extremely satisfied”, 33 percent of customers stated they were “Extremely satisfied”; with 58 percent of customers indicating an 8, 9, or 10 satisfaction rating as shown in Figure 2. Satisfaction ratings were similar across all measures. Participants who ranked their overall satisfaction low did so because they disliked the products or did not experience any energy savings.



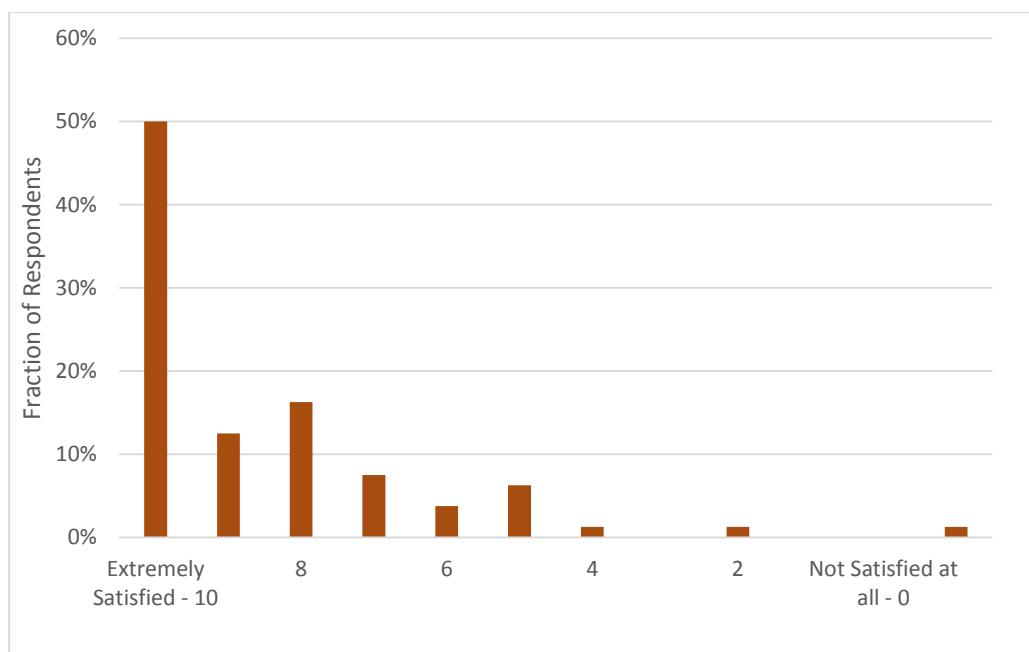
Figure 2. Tenant Satisfaction with Overall Program Experience (n=80)



Source: Navigant analysis

Customer satisfaction with the contractor quality of work was also high, as shown by Figure 3.

Figure 3. Tenant Satisfaction with Contractor's Quality of Work (n=80)

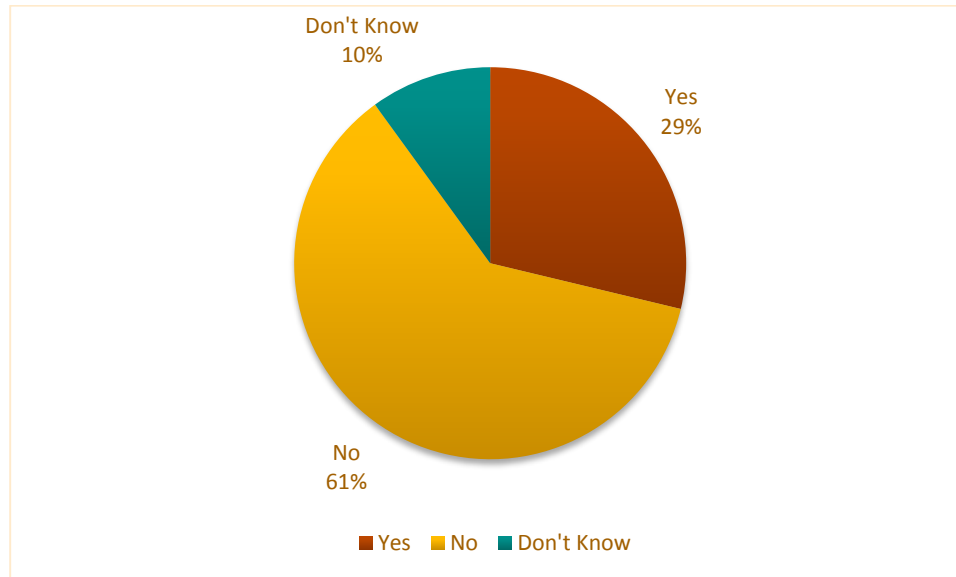


Source: Navigant analysis



As shown in Figure 4~~Error! Reference source not found.~~, about 29 percent of participants noticed a decrease in their energy bills after the new measures were installed.

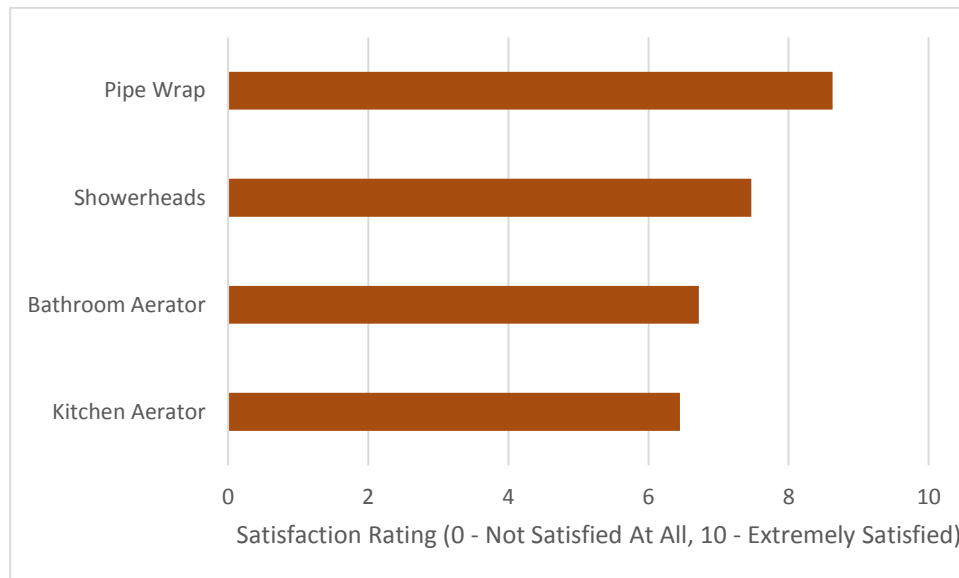
Figure 4. Participants Who Noticed a Decrease in Their Energy Bill After Installing Program Measures (N=80)



Source: Navigant analysis

While a majority of participants were satisfied with the new measures, some were not. Navigant asked the participants to rate their satisfaction for each measure installed at their home. Average satisfaction ratings ranged from as high as 8.63 out of 10 for water heater pipe wrap, to as low as 6.45 out of 10 for kitchen faucet aerators as shown in Figure 5.

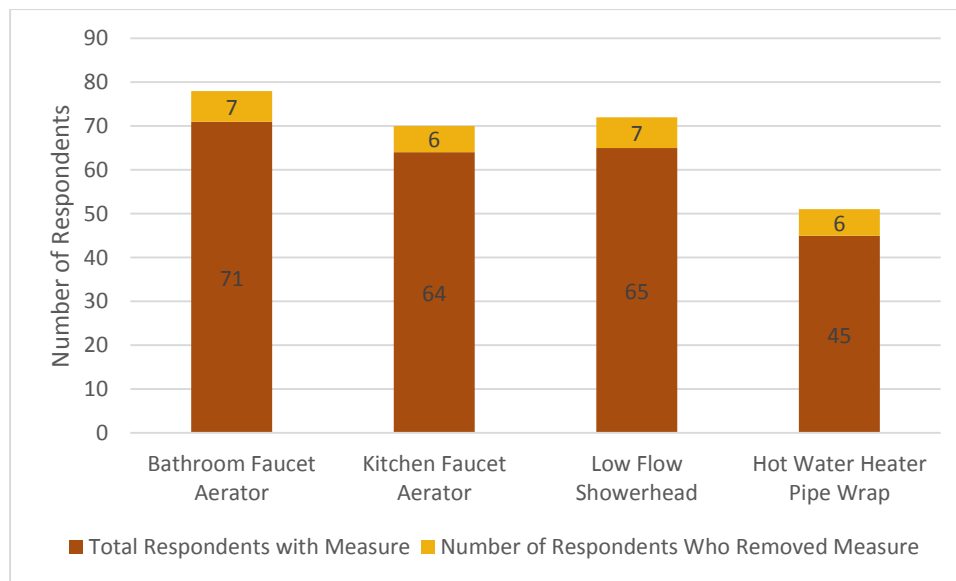
Figure 5. Tenant Satisfaction Rating for Each Measure



Source: Navigant analysis

A small percentage of tenants removed the installed measure as shown in **Error! Reference source not found..** Of the measures that were installed, about ten percent of tenants indicated they had removed measures. For example, a total of 71 respondents from the tenant survey received bathroom faucet aerators. Seven of the 71 respondents reported having removed at least one aerator. The most common reason that participants indicated for removing measures was low water pressure.

Figure 6. Participants Who Removed Any Installed Measures





Source: Navigant analysis

6.6.1.1 Participant Suggestions

Navigant also included a question in the tenant satisfaction survey that allowed respondents to offer suggestions for improving the program. About one-fourth of the respondents offered suggestions, which were as follows:

- Several respondents asked for a better quality of equipment
- One participant asked for free light bulbs
- One participant asked for window insulation
- One participant asked for HVAC service



7. Conclusions and Recommendations

Navigant's findings in this report suggest that Duke Energy's Multifamily Energy Efficiency Program is being delivered and tracked effectively in the Duke Energy Carolinas jurisdiction. Customer satisfaction is generally high, and the program measure installations appear to be tracked appropriately. Navigant presents the following list of recommendations that may help improve program delivery and impacts:

1. **Navigant recommends that Duke Energy should adopt the per unit energy and demand impacts from this evaluation and use them going forward.** The engineering analysis and data collection described in this report provide support for updating the estimated impacts for each program measure.
2. **Navigant recommends that Duke Energy maintain an updated and complete list of contact information for property managers at participating properties.** Ideally, this list would include a name of the principal contact at the site, and a more complete set of email addresses if possible. Duke Energy did provide phone numbers and the property management company name for most properties, but some of the contact information was missing which made it somewhat challenging to recruit participants for field verification and property manager surveys.
3. **Navigant recommends that no more than the first three feet of cold water inlet pipes be insulated for the water heater pipe wrap measure.** The U.S. Department of Energy recommends only insulating the first three feet of cold water inlet pipes. Beyond that, savings are likely negligible. During field verification, Navigant found that over half of the reported water heater pipe wrap was installed on cold water pipes (with about 10 percent to 15 percent being greater than three feet from the water heater on the cold water side).



8. Measure-Level Inputs for Duke Energy Analytics

Navigant used the findings from field verification, surveys, and review of Duke Energy's deemed savings to estimate an updated set of deemed savings for Duke Energy to use for tracking program activity. Table 21 provides the measure-level inputs that can be used by Duke Energy Analytics for estimates of future program savings.

Table 21. Gross Measure-Level Impacts

Measure	Annual Energy Savings Per Unit (kWh)	Annual Summer Coincident Demand Savings Per Unit (kW) ¹	Annual Winter Coincident Demand Savings Per Unit (kW) ²
Faucet Aerators MF Direct 0.5 GPM - bath	61.15	0.008	0.007
Faucet Aerators MF Direct 1.0 GPM - bath	43.16	0.006	0.005
Faucet Aerators MF Direct 1.0 GPM - kitchen	90.92	0.012	0.010
Faucet Aerators MF DIY 0.5 GPM - bath	47.99	0.006	0.006
Faucet Aerators MF DIY 1.0 GPM - bath	33.87	0.004	0.004
Faucet Aerators MF DIY 1.0 GPM - kitchen	71.03	0.009	0.008
LF Showerhead MF Direct 0.5 GPM	464.04	0.038	0.150
LF Showerhead MF Direct 1.0 GPM	348.03	0.029	0.113
LF Showerhead MF Direct 1.5 GPM	232.02	0.019	0.075
LF Showerhead MF DIY 0.5 GPM	344.66	0.028	0.111
LF Showerhead MF DIY 1.0 GPM	258.49	0.021	0.084
LF Showerhead MF DIY 1.5 GPM	172.33	0.014	0.056
Pipe Wrap MF Direct	37.09	0.003	0.003
Pipe Wrap MF DIY	29.25	0.002	0.002

1. The summer coincident period for DEC is defined as weekdays in July, hour ending 17.
 2. The winter coincident period for DEC is defined as weekdays in January, hour ending 8.
- Source: Navigant analysis

Appendix A. Detailed Survey Results

This appendix contains additional results from the property manager interviews and tenant surveys. It is meant as a supplement to other sections of the report.

A.1 Property Manager Interviews

Navigant conducted in-depth interviews with nine property managers. As shown in Table 19, the sample of five property managers represented 11 properties and accounted for 11 percent of program savings. This section presents details of the interviews. The responses to each question shown are paraphrased to maintain confidentiality and summarize the key points.

Table 22. How did you learn about the Duke Energy Multifamily Energy Efficiency Program?

Respondent(s)	Response
2, 9	Informed by company management
1, 4	Found out through "sister" property
3, 5, 6, 7	Approached by a program representative

Source: Navigant analysis

Table 23. What were the primary reasons to participate in the program?

Respondent(s)	Response
1	To save money on utility bills
2	Mandated by management
3	To save money for our tenants
4	A benefit to the residents
5	For the community
6	Because it was free, and to save water
7	To reduce utility bills
8	To save money
9	Mandated by management

Source: Navigant analysis

Table 24. On a scale of 0 to 10, with 0 being "not satisfied at all" and 10 being "extremely satisfied", how satisfied are you with your overall program experience?

Respondent(s)	Response
4, 5, 6, 7	10
8	9
2, 9	8



3	7
1	3

Source: Navigant analysis

Table 25. On a scale of 0 to 10, with 0 being “not satisfied at all” and 10 being “extremely satisfied”, how satisfied are you with the tenant notification and program materials?

Respondent(s)	Response
4, 5, 6, 7, 9	10
1, 2, 3, 8	8

Source: Navigant analysis

Table 26. On a scale of 0 to 10, with 0 being “not satisfied at all” and 10 being “extremely satisfied”, how satisfied would you say your tenants are with the new energy efficient equipment?

Respondent(s)	Response
1	5 – some tenants are unhappy with new measures
2	5 – tenants were not happy with showerheads and aerators because of low water pressure
3	10 – tenants have no comments
4	5 – unhappy with showerheads due to low water pressure 6 – kitchen aerators 5 – bathroom aerators No comment for pipe wrap
5	2 – the tenants don’t care for them
6	8 – have had some complaints
7	10
8	5 – showerheads 7 – aerators
9	8 – have had some complaints

Source: Navigant analysis

Table 27. On a scale of 0 to 10, with 0 being “not likely at all” and 10 being “very likely”, how likely are you to recommend the Multifamily Energy Efficiency Program to other property managers?

Respondent(s)	Response
1	5
2	8
3	10 – love everything but the bathroom aerators
4	10
5	10



6	7
7	10
8	8
9	10

Source: Navigant analysis

Table 28. Prior to participating in the program, had you considered installing the same energy efficient equipment at your facility?

Respondent(s)	Response
2,3,4,5,6,7,8,9	No
1	Yes for showerheads

Source: Navigant analysis

Table 29. Did your experience with the program influence you to incorporate any additional energy efficiency equipment for which you did not receive a Duke Energy program rebate?

Respondent(s)	Response
1	Yes
2,3,4,5,6,7,8,9	No

Source: Navigant analysis

A.2 Tenant Satisfaction Surveys

Satisfaction surveys were conducted with 80 program participants. Many of the results are presented in Section 6.6 of the main report, and this section serves as a supplement.

As noted earlier, overall tenant satisfaction with the program was very high, with an average rating of 7.58 on a scale of 0 to 10 with 10 be very satisfied. However, four of the 80 tenants reported a satisfaction less than five with the program for the following reasons:

- Dissatisfaction (n=1)
- No money savings (n=2)
- Don't know (n=1)

Tenants also reported a few suggestions for improving the program:

- Improve the low flow showerhead (n=3)
- Improve the quality of products (n=3)



- Improve the kitchen faucet aerator (n=9)
- Improve bathroom aerator (n=6)
- Lower energy rates (n=5)
- Offer more equipment (n=2)
- Offer free light bulbs (n=2)
- Provide window insulation (n=2)
- Check HVAC and thermostats (n=1)

OFFICIAL COPY

Mar 09 2016



Opinion **Dynamics**



Duke Energy Carolinas

Energy Efficient Appliances and Devices Program Final Evaluation Report

November 5, 2015



Contributors

Tami Buhr
Vice President, Opinion Dynamics

Kessie Avseikova
Project Manager, Opinion Dynamics

Zach Ross
Senior Analyst, Opinion Dynamics

Kai Zhou
Energy Data Scientist, Opinion Dynamics

Rob Saul
Project Analyst, Opinion Dynamics

Table of Contents

1. Evaluation Summary.....	1
1.1 Program Summary.....	1
1.2 Evaluation Objectives and High Level Findings	1
1.3 Evaluation Recommendations.....	4
2. Program Description	6
2.1 Program Design	6
2.2 Program Implementation	6
2.3 Program Performance	7
3. Key Research Objectives	8
4. Overview of Evaluation Activities	9
5. Impact Evaluation	15
5.1 Methodology	15
5.2 Gross Impact Results	22
5.3 References.....	23
6. Net-to-Gross Analysis	24
6.1 Methodology	24
6.2 NTG Results	26
6.3 Net Impact Results.....	27
7. Process Evaluation.....	29
7.1 Methodology	29
7.2 Notable Findings.....	29
8. Conclusions and Recommendations	42
9. Summary Form.....	46
10. Appendix A: Spillover Savings Assumptions.....	47
11. Appendix B: Detailed Analysis Tables	50
12. Appendix C: Chart with Measure-Level Inputs for Duke Energy Analytics	51
13. Appendix D: Detailed Survey Results.....	52

14. Appendix E: Participant Survey Instrument.....	53
15. Appendix F: Detailed Overview of the Net-To-Gross Approach.....	54

Table of Tables

Table 1-1. Summary of Gross Savings Inputs.....	2
Table 1-2. Gross Impact Results	2
Table 1-3. Evaluated and Recommended Per-Bulb Gross Impacts	3
Table 1-4. Net Impact Results for 2012-2015 Evaluation Period	3
Table 1-5. Per-Bulb Net Impact Results for 2012-2015 Evaluation Period	3
Table 2-1. Summary of Program Tracking Data for Program Period ^A	7
Table 4-1. Overview of Evaluation Research Activities	9
Table 4-2. Participant Survey Sample Sizes and Number of Completed Interviews by Sample Frame	10
Table 4-3. Participant Survey Disposition Summary	11
Table 4-4. Participant Survey Response Rate	11
Table 4-5. Precision and Margins of Error at 90% Confidence.....	12
Table 4-6. General Population Survey Sample Sizes and Number of Completed Interviews.....	13
Table 4-7. General Population Survey Disposition Summary	13
Table 4-8. General Population Survey Response Rates	14
Table 4-9. Precision and Margins of Error at 90% Confidence.....	14
Table 5-1. Summary of Gross Savings Inputs.....	17
Table 5-2. Previous Evaluation Reported and DSMore Modeled Per-Bulb Savings Values	17
Table 5-3. Installation Trajectory	18
Table 5-4. Discount Rate Summary	18
Table 5-5. First-Year ISR.....	19
Table 5-6. DEC Cumulative Installation Rate Trajectory	20
Table 5-7. Baseline Adjustments Due to EISA Standards.....	20
Table 5-8. Adjustment for Efficient Product Replacement	21
Table 5-9. CFL Wattage.....	21
Table 5-10. Gross Impact Results	22
Table 5-11. Evaluated Total and Per-Bulb Gross Impacts	23
Table 5-12. Recommended Per-Bulb Gross Impacts	23
Table 6-1. Free-Ridership and Spillover Sample Frames, Samples, and Number of Completed Interviews ...	24
Table 6-2. NTG Results	26
Table 6-3. Net Impact Results for 2012-2015 Evaluation Period	27
Table 6-4. Per-Bulb Net Impact Results for 2012-2015 Evaluation Period	27

Table 6-5. Net Realization Rates	28
Table 7-1. Bulbs Distributed by the Program.....	30
Table 8-1. Gross Impact Results	42
Table 8-2. Evaluated and Recommended Per-Bulb Gross Impacts	43
Table 8-3. Net Impact Results for 2012-2015 Evaluation Period	43
Table 8-4. Per-Bulb Net Impact Results for 2012-2015 Evaluation Period	43
Table 10-1. Spillover Savings Assumptions.....	48
Table 10-2. Spillover Savings Summary	48
Table 10-3. Spillover Rate Estimate.....	49

Table of Figures

Figure 5-1. Installation Rate Components	19
Figure 6-1. Breakdown of Free-Ridership Rates.....	26
Figure 7-1. Cumulative Program Participation over Time ¹	30
Figure 7-2. Participant Satisfaction with Residential CFL Program, Duke Energy, and Communications.....	31
Figure 7-3. Participant Satisfaction with CFLs and Electric Bill Savings.....	32
Figure 7-4. Program Bulb Shipments over the Evaluation Period	33
Figure 7-5. Sources of Program Awareness.....	34
Figure 7-6. Age of Recent Participants and Customers	35
Figure 7-7. Household Income of Recent Participants and Customers.....	35
Figure 7-8. Home Ownership of Recent Participants and Customers.....	35
Figure 7-9. Sockets with CFLs in Home Prior to Participation	36
Figure 7-10. Awareness and Experience with Bulb Types	37
Figure 7-11. Understanding of Bulbs that Use the Most Energy	38
Figure 7-12. Understanding of Bulbs that Use the Least Energy	38
Figure 7-13. Types of Bulbs Purchased by DEC Customers in the Last Year	39
Figure 7-14. DEC Customer Awareness of Online Store	40
Figure 7-15. DEC Customer EISA Awareness	41

1. Evaluation Summary

1.1 Program Summary

Duke Energy Carolinas (DEC) launched the Energy Efficient Appliances and Devices program in 2010 with the goal of reducing energy consumption and peak demand through increased awareness and adoption of energy efficient lighting technologies. The program consists of two components: a free CFL giveaway (Residential CFL program) and an online lighting store. This evaluation focuses on the Residential CFL program. Through the program, customers can request up to a lifetime limit of 15 CFLs online or over the phone. DEC manages the Residential CFL program and is responsible for marketing the program to their customers, receiving customer orders, and maintaining the program tracking database. AM Conservation Group (AMC) has implemented the Residential CFL program on behalf of DEC since April 2012 and handles fulfillment of customer orders. The program period under evaluation is from May 15, 2012 through March 30, 2015.¹ During this period, AMC shipped 873,506 CFL kits totaling over 12.1 million CFLs. Most of the packs shipped were 15-bulb packs.

DEC markets the program through direct and email mailings, promotional banners on the Duke Energy website, online services intercepts, and through interactive voice response phone intercepts.²

1.2 Evaluation Objectives and High Level Findings

This evaluation of the Residential CFL program includes process and impact assessments, and addresses several major research objectives:

- Assess program performance and estimate gross and net annual energy (kWh) and peak demand (kW) savings associated with program activity
- Assess program implementation processes and marketing strategies and identify opportunities for improvement
- Understand customer awareness, preferences, purchasing behaviors, and lighting market dynamics

To achieve these research objectives, the Evaluation Team completed a range of data collection and analytical activities, including interviews with program staff, participant and general population surveys, program tracking data analysis, deemed savings review, impact analysis, and analysis of the survey results. Through the primary data collection, the Evaluation Team developed estimates of a first-year in-service rate (ISR), adjustment rate for efficient product replacement, and net-to-gross ratio (NTGR). Table 1-1 provides an overview of the evaluated savings parameters, the sample sizes used to develop those estimates, and the associated confidence and precision.

¹ The complete time frame for the evaluation is March 1, 2012 through March 30, 2015. Due to data issues, Duke Energy was unable to provide program tracking data for the period from March 1, 2012 through May 14, 2012. As such, the period from March 1, 2012 through May 14, 2012 was excluded from the evaluation.

² Note that the phone intercept option launched in late May 2014. Prior to that, customers had an option to request free program CFLs over the phone.

Table 1-1. Summary of Gross Savings Inputs

Assumption	Sample Size	Estimate	Relative Precision (at 90% Confidence)
First-year ISR	440	60.6%	4.1%
Adjustment for efficient product replacement	393	88.0%	3.0%
NTGR	431	83.5%	4.9%

The DEC Residential CFL program has been very successful. The program exceeded its participation goal with 853,004 customers participating. The program distributed over 12.1 million bulbs during the evaluation period, which is an average of 16,158 bulbs or 1,077 15-bulb kits per weekday. The program has reached a large share of DEC customers – we estimate that since 2010 and through March 2015, 76% of DEC customers have placed orders through the program. At the current participation rate, future program potential is limited. Aside from the remaining unserved customers, additional sources of participation would include new customers moving into the DEC service territory as well as new construction activity in the service territory. The savings potential from these additional sources of participation could be limited. New customers moving into existing premises previously serviced by the program may have program CFLs already installed, which could cause new participants to either hold off on installing their program CFLs or install them in low usage sockets previously filled with incandescents or halogens. New construction premises may already have high efficiency lighting in place, which may delay the installation of program CFLs.

The program realized 105% of the reported (ex-ante) gross energy savings, 123% of summer peak demand savings and 33% of winter peak demand savings. The Evaluation Team estimated evaluated (ex-post) gross energy savings of 426,270 MWh, summer peak demand savings of 55.2 MW, and winter peak demand savings of 19.9 MW. Gross realization rates are relatively high for both energy and summer peak demand savings. While the overall installation rate is 90.1%³, first-year ISR is relatively low (60.6%). This is not surprising, given that most customers requested all 15 CFLs at once.

Table 1-2. Gross Impact Results

Savings Type	Total Number of CFLs	Reported (Ex-Ante) Gross Savings	Evaluated (Ex-Post) Gross Savings	Gross Realization Rate
Energy savings (MWh)	12,118,737	407,186	426,270	105%
Summer peak demand savings (MW)		44.8	55.2	123%
Winter peak demand savings (MW)		59.8	19.9	33%

Evaluated gross per-bulb savings achieved during the evaluation period were 35.17 kWh for energy, 0.0046 kW for summer peak demand and 0.0016 kW for winter peak demand. Only a portion of program-discounted bulbs used EISA-adjusted wattages. Moving forward, energy and demand savings for *all* program bulbs need to use EISA-adjusted baseline wattages. As such, we recommend that the program uses per-bulb savings estimates calculated using current EISA-adjusted baselines to estimate savings from future installations. Table 1-3 contains evaluated per-bulb savings and per-bulb savings recommended for future use by the program.

³ Overall installation rate incorporates a discount adjustment of future installations. This adjustment is discussed further in Section 5.1.

Table 1-3. Evaluated and Recommended Per-Bulb Gross Impacts

Savings Type	Evaluated (Ex-Post) Per-Bulb Gross Savings During Evaluation Period	Recommended Per-Bulb Gross Savings		
		13W CFL	18W CFL	Overall ^A
Energy savings (kWh)	35.17	24.44	28.51	26.35
Summer peak demand savings (kW)	0.0046	0.0032	0.0037	0.0034
Winter peak demand savings (kW)	0.0016	0.0011	0.0013	0.0012

^A This assumes no changes to the program CFL wattage mix.

Through analysis of participant self-report survey results, the Evaluation Team estimated the program net-to-gross ratio (NTGR) to be 83.5%, which is relatively high. NTGR is comprised of a program free-ridership rate of 19.7% and program spillover of 3.2%. Net program impacts are 356,036 MWh in energy savings, 46.1 MW in summer peak demand savings and 16.7 MW in winter peak demand savings.

Table 1-4. Net Impact Results for 2012-2015 Evaluation Period

Savings Type	Evaluated (Ex-Post) Gross Savings	NTGR	Evaluated (Ex-Post) Net Savings ^A
Energy savings (MWh)	426,270	83.5%	356,036
Summer peak demand savings (MW)	55.2		46.1
Winter peak demand savings (MW)	19.9		16.7

^A Evaluated net savings were calculated using unrounded NTGR.

Table 1-5 presents per-bulb net impact results for the evaluation period. Average per-bulb energy savings are 29.38 kWh and peak demand savings are 0.0038 and 0.0014 for summer and winter respectively.

Table 1-5. Per-Bulb Net Impact Results for 2012-2015 Evaluation Period

Savings Type	Evaluated Per-Bulb (Ex-Post) Gross Savings	NTGR	Evaluated Per-Bulb (Ex-Post) Net Savings ^A
Energy savings (kWh)	35.17	83.5%	29.38
Summer peak demand savings (kW)	0.0046		0.0038
Winter peak demand savings (kW)	0.0016		0.0014

^A Evaluated net savings were calculated using unrounded NTGR.

The program implementation processes ran smoothly. Program tracking data were complete and accurate. Instances of products mailed and installed outside of the service territory were minimal. Instances of participants receiving more than 15 bulbs through the program were also minimal. Participants reported high levels of satisfaction with the program, indicating that program processes are effective and well run. A large

majority of participants (90%) are satisfied with the program overall.⁴ Timely receipt of program bulbs is key to high satisfaction, and 92% of participants report receiving bulbs within three weeks of placing their order. We also asked participants about their satisfaction with Duke Energy as their electric company and found approximately three-quarters are satisfied (76%).

During the evaluation cycle, we found that recent participants are younger, have lower incomes, and are more likely to be renters than the overall DEC population. It is possible that with approximately three-quarters of DEC customers having participated in the program, the program is now reaching customers that are often considered “harder to reach.” Given cumulative participation levels to-date, reaching additional customers may prove challenging for the program moving forward.

1.3 Evaluation Recommendations

We recommend that program administrators calculate future savings from the Residential CFL program using the recommended per-bulb energy and summer peak savings presented in Table 1-3 above. We also recommend that the program team use the evaluation-recommended per-bulb values for winter peak demand savings. The Evaluation Team used recent Carolinas-specific inputs to determine these savings.

To-date, the Residential CFL program has reached a sizeable share of DEC customers. As a result, it will be increasingly challenging for the program to maintain past participation levels. The reduction in baseline wattages due to EISA legislation means the program will achieve less savings than in the past. In addition, DEC customers are aware of CFLs, and CFLs are the bulb type that customers purchase most often. These trends could indicate rising free-ridership rates in the future. DEC may want to consider winding down the program as it is currently designed and exploring alternative designs and/or bulb types offered. Based on our knowledge of the lighting market dynamics along with the findings from this evaluation, we propose the following alternative designs:

- **Introduction of specialty products.** Depending on the cost-effectiveness screening results, one possible design solution is to offer deeply discounted or free specialty LED products. This offer can be used in conjunction with the online store, which already offers discounted specialty LEDs. This combined approach could be designed to reach a broad base of customers who have a need for specialty products, stimulate customer interest in LEDs, showcase the superior quality of LEDs in specialty applications, and drive future purchase of specialty LEDs through the online store. Given that three-way and reflector bulbs are among the most common specialty bulbs, the program could give participants a choice of bulbs that they would like to see in a kit. Kits could feature several configurations and contain three to five light bulbs. In most areas of the country, use of energy efficient bulbs in specialty sockets has lagged behind their use in standard sockets. Program intervention could be key to changing customer purchase behaviors when it comes to specialty lighting. Customers are generally more satisfied with specialty LEDs than CFLs and with the drop in price for LEDs, the bulbs are more likely to be cost-effective.
- **Targeted outreach to underserved customer segments.** It is our understanding that DEC can and have started using its customer data tracking systems to identify customers that have not participated in the Residential CFL program. We recommend that the future marketing (and messaging) efforts for the free CFL offerings continue to be targeted to customers that are yet to participate. A targeted

⁴ A rating of 8, 9, or 10 on the scale from 0 to 10 where 0 is extremely dissatisfied and 10 is extremely satisfied.

Evaluation Summary

approach will expand the program's reach without unnecessarily marketing to previous participants who reached their 15-CFL lifetime limit. In addition, this approach may lead to lower free-ridership, as unserved customers are likely to have lower levels of knowledge and experience with energy efficient lighting products.

Future evaluation of the Duke Energy Progress (DEP) Energy Efficient Lighting program includes a residential lighting inventory and logger study. The study will include a representative sample of DEC customers. The findings from this study will help inform the state of the lighting market and aid with the future DEC program design.

OFFICIAL COPY

Mar 09 2016

2. Program Description

2.1 Program Design

Duke Energy Carolinas (DEC) launched the Energy Efficient Appliances and Devices program in 2010 with the goal of reducing energy consumption and peak demand through increased awareness and adoption of energy efficient lighting technologies. The program consists of two components – a free CFL giveaway (Residential CFL program) and an online lighting store. The Residential CFL program is the focus of this evaluation. As part of this program, DEC offers a variety of free CFL kits that come with 3, 6, 8, 12, or 15 CFLs. Customers can request a total of 15 CFLs online or over the phone.⁵ Fifteen CFLs is the lifetime limit per customer, and customers can choose to request all 15 CFLs at once or choose a lesser amount. To ensure that only DEC customers receive the CFLs, customers must provide their account number or the phone number associated with their account, as well as last four digits of their social security number. Once requested, program bulbs are shipped to the billing address associated with the customer's account.

2.2 Program Implementation

DEC manages the Residential CFL program and is responsible for marketing the program to their customers, receiving customer orders, and maintaining the program tracking database. AM Conservation Group (AMC) has implemented the Residential CFL program on behalf of DEC since April 2012 and handles fulfillment of customer orders. DEC supplies new orders to AMC on a daily basis. AMC handles packing, shipping, and tracking orders, as well as any shipment or product issues.⁶ AMC provides daily updates on fulfilled orders and monthly reports on performance metrics to DEC.

DEC markets the program through direct and email mailings, promotional banners on the Duke Energy website, online services intercepts (OLS intercepts), and through interactive voice response phone intercepts (IVR intercepts).⁷ The bulk of program advertising are mailings such as bill inserts, new customer letters, and co-marketing with the online Saving Store. OLS intercepts target customers who log on to their online Duke Energy account. The system checks to see if the customer has participated in the program and asks eligible customers if they would like to order their free CFL bulbs. IVR intercepts target customers who call in to Duke Energy's automated hotline with questions regarding their bill, to request a meter reading, and/or want to make a payment with a similar targeted offer for eligible customers. By regularly analyzing the program penetration of market segments, DEC adjusts marketing channels to reach the remaining potential market.

⁵ A small portion of CFL requests comes through mail. While it is not a formal request format, DEC has been accommodating it.

⁶ The program offers a two-year warranty on the shipped CFLs.

⁷ Note that the phone intercept option launched in late May 2014. Prior to that, customers had an option to request free program CFLs over the phone.

2.3 Program Performance

The program period under evaluation is from May 15, 2012 through March 30, 2015.⁸ Over this period, AMC shipped 873,506 CFL kits totaling over 12.1 million CFLs. Most of the packs shipped were 15-bulb packs. Program estimated energy savings totaled over 407 GWh. Table 2-1 provides a summary of shipments, bulbs, and energy and demand savings achieved during the program period.

Table 2-1. Summary of Program Tracking Data for Program Period^A

Kit Type Mailed	Kits Mailed	Bulbs Mailed	Reported (Ex-Ante) Gross Savings (kWh)	Reported (Ex-Ante) Gross Summer Coincident Savings (kW)	Reported (Ex-Ante) Gross Winter Coincident Savings (kW)
CFL 3-pack	27,572	82,716	2,779,231	306	408
CFL 6-pack	49,000	294,000	9,878,306	1,087	1,452
CFL 8-pack	3,783	30,264	1,016,861	112	149
CFL 12-pack	61,836	742,032	24,932,037	2,742	3,664
CFL 15-pack	731,315	10,969,725	368,579,235	40,542	54,161
Total	873,506	12,118,737	407,185,669	44,788	59,834

^A Savings may not add due to rounding

⁸ The complete time frame for the evaluation is March 1, 2012 through March 30, 2015. Due to data issues, Duke Energy was unable to provide program tracking data for the period from March 1, 2012 through May 14, 2012. As such, the period from March 1, 2012 through May 14, 2012 was excluded from the evaluation.

3. Key Research Objectives

This evaluation of the Residential CFL program includes process and impact assessments, and addresses several major research objectives:

- Assess program performance and estimate gross and net annual energy (kWh) and peak demand (kW) savings associated with program activity
- Assess program implementation processes and marketing strategies and identify opportunities for improvement
- Understand customer awareness, preferences, purchasing behaviors, and lighting market dynamics

This evaluation provides DEC with results required by the North Carolina Utilities Commission and the Public Service Commission of South Carolina. The results also provide inputs for system planning and future program design and delivery.

The North Carolina Utilities Commission requires the following for the evaluation of DEC's Residential CFL program:

- That DEC includes Carolinas-specific, both North and South Carolina, data in future EM&V reports
- That future EM&V reports include a discussion of the impacts of LEDs, EISA (Energy Independence and Security Act), and other innovations in lighting technology and relevant regulatory mandates on the calculations of measure impacts and the baseline measures used in those calculations

This evaluation satisfies Commission requirements and provides certain Carolinas-specific updated inputs into savings calculations. The evaluation also provides process and market information that DEC can use to modify the design of the Residential CFL program in a rapidly changing lighting market.

As part of the process assessment, we explored the following research questions:

- What are the sources of program information?
- How effective are the program implementation and data tracking practices?
- Are participants satisfied with their program experiences?
- How effective are the program's marketing, outreach, and educational tactics?
- What is the program reach? What percentage of DEC's customer base has participated in the program? What are the differences between participants and non-participants?
- What customer segments should the program target to minimize free-ridership?
- What are the strengths, weaknesses, and opportunities for program improvement?
- What are current and future trends in the lighting market?
- What are customer lighting preferences and purchase behaviors?
- What is the level of customer knowledge around lighting technologies?
- What is customer awareness of the Energy Independence and Security Act (EISA)?

4. Overview of Evaluation Activities

To answer the research questions outlined in the previous section, the Evaluation Team performed a range of data collection and analytic activities. Table 4-1 provides a summary of evaluation activities and associated areas of inquiry. Following the table, we provide detail on each activity's scope, sampling approach (if applicable), and timing of the activity.

Table 4-1. Overview of Evaluation Research Activities

#	Evaluation Activity	Impact	Process/ Market	Purpose of Activity
1	Program staff interviews		X	<ul style="list-style-type: none"> Provide insight into program design and delivery Support process assessment
2	Materials review	X	X	<ul style="list-style-type: none"> Provide insight into program design and delivery Inform previously used and alternative savings assumptions
3	Deemed savings review	X		<ul style="list-style-type: none"> Review accuracy and appropriateness of energy savings assumptions and determine alternative savings inputs
4	Impact analysis	X		<ul style="list-style-type: none"> Calculate gross and net energy and demand savings
5	Participant survey	X	X	<ul style="list-style-type: none"> Estimate in-service rate Estimate free-ridership and spillover Assess lighting market Support process assessment
6	General population survey (data analysis only)		X	<ul style="list-style-type: none"> Support process assessment Assess lighting market

4.1.1 Program Staff Interviews

The Evaluation Team completed two interviews with program staff at Duke Energy and at AMC. We completed interviews in March and April 2015. The interviews explored changes in program design and implementation, overview of program performance, incentivized product specifications, and data tracking and communication processes, among other topics.

4.1.2 Materials Review

In support of the impact and process evaluations, the Evaluation Team reviewed program materials and data, including marketing materials, plans, and past evaluation reports and research studies. This information informed our research design, provided insight into program design and delivery, and supported the assessment of program impacts.

4.1.3 Deemed Savings Review

In support of the impact evaluation, the Evaluation Team reviewed program tracking databases and energy savings assumptions. The objectives of the review were to identify the deemed savings values DEC used to

calculate impacts, review the deemed savings values for reasonableness, verify their accurate application, and identify data gaps, omissions, inconsistencies, and errors. We reviewed evaluation reports from previous DEC evaluations, as well as evaluation reports and Technical Reference Manuals (TRMs) from other jurisdictions to assess their reasonableness, and develop recommendations for changes where appropriate. Finally, as part of the review process, we also checked the program tracking data for accuracy, consistency, and completeness.

4.1.4 Participant Survey

The Evaluation Team completed a mixed-mode (telephone and online) survey with a sample of DEC Residential CFL program participants in June and July 2015.

Our key goals were to gather information to support the assessment of gross impacts, program attribution, program processes, and market dynamics.

Sample Design and Fielding

To improve participant recall of the 1) decision to participate and 2) participation in the program, we limited the survey sample frame to customers who received program CFLs between July 2014 and March 2015.

Free-ridership (FR) is best measured soon after customers participate in the program when it is easier to recall the decision to participate. In contrast, spillover (SO) is best measured after some time has passed after participation to allow participants time to experience the benefits of the energy efficiency measure and install additional measures because of their experience. Because the FR and SO effects are best measured over different time periods, we used two distinct sample frames of participants to estimate each. Since it takes time for SO effects to occur, the SO sample frame included customers who participated in the program between July and December 2014 (6 to 12 months prior to our survey field date). The sample frame for FR included customers who participated in the program between January and March 2015 (within 6 months of the survey field date). We drew random samples from each sample frame. Survey respondents from both samples received questions verifying the installation and persistence of program CFLs, as well as process and market-related questions. Table 4-2 presents participant survey sample sizes and number of completed interviews.

Table 4-2. Participant Survey Sample Sizes and Number of Completed Interviews by Sample Frame

Sample Frame	Sample Frame Size	Sample Size	Number of Completed Interviews
FR	45,286	2,440	222
SO	135,738	2,464	213
Total	181,024	4,904	435^A

^A Please note that seven additional participants completed the survey but did not receive either the free-ridership or spillover modules. These participants did not verify their participation in the program. Their responses are used in our calculation of the in-service rate only.

Participants received mail, email, or both mail and email invitations and reminders to take the survey; they also had a choice to take the survey online or call our phone center to take it over the telephone. Participants who did not have an email address on file received an invitation letter and one postcard reminder in the mail, while participants with email addresses received invitations and reminders via email and mail. We fielded the participant survey between June 22, 2015 and July 15, 2015. Participants were offered incentives in the form of several cash prize drawings.

Survey Dispositions and Response Rate

Table 4-3 provides the final survey dispositions.

Table 4-3. Participant Survey Disposition Summary

Disposition	Count
Completed Interviews (I)	442
Internet survey complete	410
Phone survey complete	32
Partial Interviews (P)	52
Eligible Non-interviews (NC)	12
Answering machine	1
Callback to complete	1
Disconnected Phone	2
Left voicemail	3
No answer	1
Not available	2
Non-specific callback/secretary/NTG	2
Not Eligible (NE)	35
Email bounce-back	18
Mail undeliverable	17
Refused (R)	4,363
Survey never initiated by participant	4,361
Initial refusal	1
Web refusal	1
Total Participants in Sample	4,904

Table 4-4, below, provides the survey response rate. We do not report a cooperation rate, because it is difficult to estimate it accurately with mailed and emailed survey invitations. The cooperation rate is the ratio of participants who completed the survey out of all eligible participants *contacted*. While we recorded returned mail invitations and bounce-back email invitations, we cannot say with certainty that the ones that were not returned were received and opened by qualified participants. Therefore, we do not have an accurate number of eligible contacted participants to calculate cooperation rate.

Table 4-4. Participant Survey Response Rate

AAPOR Rate	Rate
Response rate	9%

Survey Data Weighting

We completed a disproportionate number of interviews with customers with email addresses as compared to customers in our sample frame. Relative to customers who do not provide their email address to their utility, customers who do provide their email address are often more engaged with their utility and energy in general, and can also be different in terms of characteristics such as age or educational attainment. To ensure that

our survey results were not biased due to the disproportionate number of respondents with email addresses, we applied post-stratification weights to the survey data to make it align with the population.

Targeted and Achieved Confidence and Precision

The evaluation targeted 10% precision at a 90% confidence level for all data collection tasks that involved sampling. These precision goals were met (Table 4-5).

Table 4-5. Precision and Margins of Error at 90% Confidence

Metric of Interest	Relative Precision (At 90% Confidence)
First-year in-service rate	4.1%
Adjustment for efficient product replacement	3.0%
Net-to-gross ratio	4.9%
Process results	3.9% (standard margin of error)

4.1.5 General Population Survey

The Evaluation Team completed a general population survey with a sample of DEC customers. The survey was completed as part of the DEC Appliance Recycling Program (ARP). The goal of the survey was to identify customers who recently disposed of eligible appliances through means other than the ARP. The survey contained a separate module of lighting questions. To minimize the survey length, the lighting module was not asked of respondents who had disposed of an appliance without participating in the DEC ARP. As described below, we also applied survey weights to correct for demographic differences between the survey sample and the DEC general population.

The lighting survey battery explored lighting-specific topics such as awareness of the DEC Residential CFL program, CFL and LED awareness and usage, lighting preferences and purchase behaviors, and customer awareness of EISA legislation.

Sample Design and Fielding

The survey was fielded via telephone and online. DEC provided a random sample of 50,000 customers. We emailed customers invitations to complete the survey online and sent up to two email reminders. We called customers without email addresses and completed the survey over the telephone. We fielded the general population survey between June 10, 2015 and July 30, 2015.

Lighting Battery Completes

The Evaluation Team contacted 3,960 customers as part of the Appliance Recycling survey, and 503 completed the residential lighting module.

Table 4-6. General Population Survey Sample Sizes and Number of Completed Interviews

	Sample Size	Total Number of Interviews	Total Number of Interviews With Lighting Module Completed
General population survey	3,960	597	503

Survey Dispositions and Response Rate

Table 4-7 provides the final survey dispositions.

Table 4-7. General Population Survey Disposition Summary

Disposition	Count
Completed Interviews (I)	597
Web, complete	322
Phone, complete	275
Partial Interviews (P)	108
Eligible Non-interviews (NC)	835
Phone, answering machine	314
Phone, business/residential phone	22
Phone, busy	10
Phone, callback to complete	20
Phone, cell phone callback	4
Phone, computer tone	10
Phone, customer indicated called already	3
Phone, customer said wrong number	47
Phone, language problems	11
Phone, no answer	106
Phone, non-specific callback/secretary/NTG	139
Phone, not available	119
Phone, scheduled appointment	27
Phone, terminate - not DEC customer	1
Web, terminate - not DEC customer	2
Unknown Eligibility, Non-interviews (UH)	256
Phone, open sample not called	251
Phone, privacy line/number blocked	5
Not Eligible (NE)	255
Web, email bounced	39
Phone, disconnected phone	216
Refused (R)	1,909
Phone, add to do not call list	14
Phone, refusal because of cell phone	4
Phone, hard refusal	13

Disposition	Count
Phone, Initial refusal	303
Web, do not contact	1
Web, no response	1,574
Total Participants in Sample	3,960

Table 4-8 provides the survey response rate. As with the participant survey, we do not report a cooperation rate for the email sample, because it is difficult to estimate it accurately with emailed survey invitations. We do however report cooperation rate for the sample targeted through outbound phone calls (Table 4-8).

Table 4-8. General Population Survey Response Rates

AAPOR Rate	Rate
Response rate	17%
Cooperation rate (outbound phone calls only)	41%

Survey Data Weighting

As with the participant survey, we observed differences between the survey participants and the sample frame in terms of email address presence. We also observed differences in home ownership rates. Because these characteristics are often correlated with customer lighting knowledge, behaviors, and preferences, we applied post-stratification weights to align respondents' characteristics with the population.

Targeted and Achieved Confidence and Precision

The evaluation targeted 10% precision at a 90% confidence level for all data collection tasks that involved sampling. These precision goals were met (Table 4-9).

Table 4-9. Precision and Margins of Error at 90% Confidence

Metric of Interest	Standard Margin of Error
Process results	3.7%

5. Impact Evaluation

This section describes the methodology for conducting the gross impact analysis and the results of the analysis. The Evaluation Team completed the following activities:

- Reviewed program tracking data and savings assumptions for accuracy, completeness, and consistency
- Conducted engineering analysis of energy and demand savings and developed evaluated savings estimates

5.1 Methodology

The Evaluation Team reviewed reported savings assumptions and verified that the inputs used to calculate those assumptions were in line with the previous evaluation's recommendations.

As part of the engineering analysis, we reviewed the past evaluation of the Residential CFL program and checked the savings assumptions used to calculate program reported savings against the previous evaluation's recommended assumptions to confirm their accuracy. We also reviewed evaluation reports and TRMs from other jurisdictions to compare the savings assumptions, assess their reasonableness, and determine alternative assumptions, where appropriate. Using data collected as part of the participant survey, we developed an updated estimate of the first-year in-service rate (ISR) and a rate at which program CFLs are replacing energy efficient lighting products (CFLs or LEDs).

We estimated savings using the Uniform Methods Project (UMP protocols) recommended approach. Per the UMP protocols, energy savings calculations include delta watts and ISR. Equation 5-1 provides the formula that we used to estimate energy savings, while Equation 5-2 provides the formula that we used to estimate demand savings.

Many upstream lighting programs⁹ also account for leakage of discounted products outside of the utility service territory and for installation of program-discounted lighting in commercial applications. Leakage results in decreased savings, whereas installations in commercial applications lead to higher savings. Unlike upstream residential lighting programs that oftentimes have little control over who purchases discounted lighting products, DEC's Residential CFL program tightly controls who receives program CFLs and where customers can receive their CFLs, thus making leakage to non-DEC customers and installations in commercial applications unlikely. We explored the incidence of leakage and commercial installations through the participant survey and found that both are minimal (see Section 7.2.1 for additional information on leakage). Therefore, we chose not to revise the equation to add a separate adjustment factor for leakage. However, we did account for program bulb leakage outside of the DEC service territory as part of the ISR by removing these bulbs from the installed base. This resulted in a negligible change to ISR. We also did not apply a separate set of savings assumptions to account for installations in commercial applications because of the small number of bulbs installed in such applications.

⁹ Upstream lighting programs provide incentives to retailers and manufacturers who, in turn, pass them to customers in the form of price markdowns.

Equation 5-1. Algorithm for Energy Savings

$$\Delta kWh = ISR * \frac{(Watts * HOU)_{base} - (Watts * HOU)_{ee}}{1000} * EE_{adj} * 365 * (1 + HVAC_c)$$

Equation 5-2. Algorithm for Peak Demand Savings

$$\Delta kW = ISR * \frac{Watts_{base} - Watts_{ee}}{1000} * EE_{adj} * CF * (1 + HVAC_d)$$

Where:

ΔkWh = first-year electric energy savings

ΔkW = peak electric demand savings

ISR = in-service rate

$Watts_{base}$ = Baseline wattage

$Watts_{ee}$ = Efficient bulb wattage

HOU = residential annual operating hours

EE_{adj} = adjustment for efficient product replacement

CF = peak coincidence factor

$HVAC_c$ = HVAC system interaction factor for energy

$HVAC_d$ = HVAC system interaction factor for demand

Table 5-1 presents a summary of the inputs used to calculate program gross energy and demand impacts and specifies the sources of the inputs. Following the table, we detail the source(s) behind each input and rationale for the input selection. For reference purposes, Table 5-1 also provides savings assumptions used to estimate reported (ex-ante) energy and demand savings.

Table 5-1. Summary of Gross Savings Inputs

Assumption	Reported (Ex-Ante) Assumption	Evaluated (Ex-Post) Assumption	Evaluated (Ex-Post) Assumption Source
ISR	80.0%	90.1% ^A	Participant survey (for first-year ISR and trajectory adjustments) Duke Energy Progress (DEP) 2013 Storage Log Study (for installation trajectory) DEC discount rates (for discounting future installations)
Baseline wattage	64.60	58.58 ^B	Evaluation Team analysis using lumen equivalency conversion DEP 2014 Shelf-Stocking study (for EISA adjustments)
Adjustment for efficient product replacement	Integrated as part of ISR and baseline wattage approach ^C	88.0%	Participant survey
CFL wattage	16.35	15.34	Program tracking database
Hours of use	2.48 hours/day	2.92 hours/day	2013 evaluation of DEP Energy Efficient Lighting Program
Summer coincidence factor	0.1230	0.1138	2013 evaluation of DEP Energy Efficient Lighting Program
Winter coincidence factor	Not used	0.0960	
HVAC _c	-0.037	-0.037	2012 Process & Impact Evaluation of Residential Smart \$aver Energy Efficiency Products Program
HVAC _d – Summer	0.168	0.168	
HVAC _d – Winter	Not used	-0.500	2013 evaluation of DEP Energy Efficient Lighting Program

^A This ISR is a weighted average and is presented with utility discount rate applied. Please see the ISR section below for further discussion.

^B Please note that this is the average baseline wattage across all program bulbs. Individual baseline wattages ranged between 43 and 72 watts depending on the date of program bulb installation and program bulb wattage.

^C The ex-ante ISR assumes that 43% of bulbs installed in future years replace other CFLs. In addition, the ex-ante baseline wattage is based on participant self-report from the previous evaluation, and incorporates program replacement of efficient bulbs.

Note that the reported savings assumptions presented in the table above are from the previous evaluation report. The final per-bulb savings were modeled in DSMore. Modeled energy savings remained the same as the reported savings, while summer peak demand savings changed. The reported (ex-ante) savings were estimated using the modeled values. Table 5-2 provides a comparison between previous evaluation reported and DSMore modeled per-bulb savings.

Table 5-2. Previous Evaluation Reported and DSMore Modeled Per-Bulb Savings Values

Assumption	Previous Evaluation Reported Per-Bulb Savings	DSMore Modeled Per-Bulb Savings
Energy savings	33.60	33.60
Summer peak demand savings	0.0056	0.0037
Winter peak demand savings	Not estimated	0.0049

In-Service Rate (ISR)

Although the first-year in-service rate (ISR) is generally less than 100%, research studies across the country have found that customers eventually install nearly all bulbs received through a program. Approaches to claiming savings from these later installations vary and include 1) staggering the claiming of savings over time and 2) claiming the savings from the expected installation in the program year but discounting them by a societal or utility discount rate. While the “staggered” approach allows program administrators to more accurately capture the timing of the realized savings, the “discounted” savings approach allows for simplicity of claiming all costs and benefits during the program year and eliminates the need to keep track of and claim savings from future installations. We chose to use the “discounted” savings approach for this evaluation.

To allocate installations over time, we used the installation trajectory from the recently completed lighting storage log study conducted for DEP (discussed as part of the 2013 evaluation report of DEP Energy Efficient Lighting Program). The DEP study estimates that participants install 97% of bulbs within four years of purchase. Table 5-3 presents the approach to developing installation rates over the four years following purchase based on the study.

Table 5-3. Installation Trajectory

Year	Installation Trajectory Formula
Year 1	First-Year ISR
Year 2	$((1 - \text{First-Year ISR}) * 41\%) + \text{First-Year ISR}$
Year 3	$((1 - \text{First-Year ISR}) * 69\%) + \text{First-Year ISR}$
Year 4	97%

We estimated the first-year ISR through the participant survey and discounted future savings by the utility discount rate using the net present value (NPV) formula (Equation 5-3).

Equation 5-3. Net Present Value Formula

$$NPV = \frac{R_t}{(1 + i)^t}$$

where:

R: savings

t: number of years in the future savings take place

i: discount rate

We used different discount rates by state and by year. Table 5-4 provides a summary of the discount rates that we used to discount the future savings.

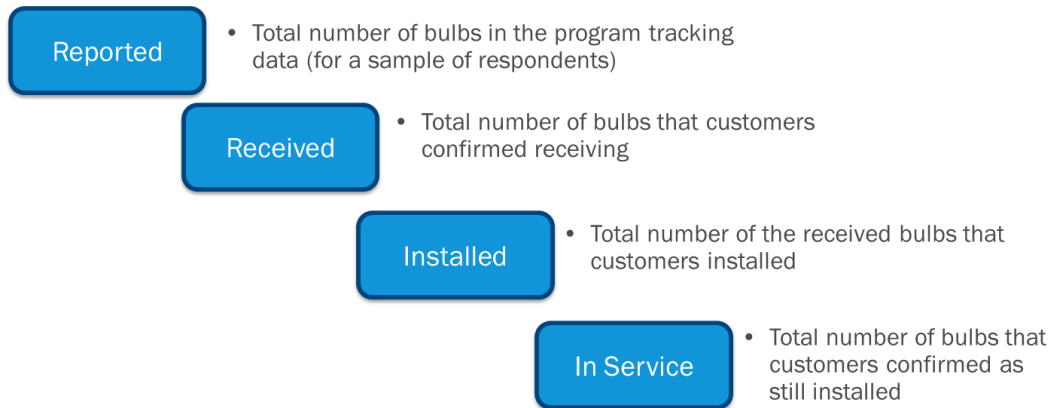
Table 5-4. Discount Rate Summary

Year	North Carolina Discount Rate	South Carolina Discount Rate
2012	7.46%	7.77%
2013	7.46%	7.77%
2014	7.09%	7.25%
2015	7.09%	7.25%

We made an additional adjustment to the installation trajectory to account for bulbs that participants never received or received damaged. This adjustment was necessary, because the installation rate trajectory assumes that light bulbs were acquired (purchased), and we found that not all program bulbs were received and some were received broken (and therefore cannot be considered acquired).

The first-year ISR is calculated by dividing the total number of program CFLs reported in service by the total number of CFLs reported in the program tracking database. We incorporated the receipt, installation, and persistence of program CFLs into the first-year ISR.

Figure 5-1. Installation Rate Components



The evaluation found a first-year ISR of 60.6%. Relative precision around this point estimate is 4.1% at 90% confidence.

Table 5-5. First-Year ISR

	Sample Size	ISR Estimate	Relative Precision (at 90% Confidence)
First-year ISR	440	60.6%	4.1%

After adjusting for CFLs that participants never received or received damaged, the overall installation rate decreased from 97.0% to 94.0%. Table 5-6 provides the installation rate trajectory that we used to allocate savings over time. After discounting the future installations by the DEC utility discount rate, the overall ISR decreased to 90.1%.

Table 5-6. DEC Cumulative Installation Rate Trajectory

Program Year	Installation Trajectory before Discounting Future Installations	Installation Trajectory after Discounting Future Installations
Year 1	60.6%	60.6%
Year 2	75.5%	74.5%
Year 3	85.7%	83.3%
Year 4	94.0%	90.1%

Baseline Wattage

To estimate the baseline wattages of the bulbs replaced by program CFLs, the Evaluation Team used the equivalent baseline wattage approach. This approach assumes that customers will replace existing bulbs with CFLs that produce a similar lumen output. The provisions of the 2007 Energy Independence and Security Act (EISA) have slowly increased the efficiency requirements of general service incandescent light bulbs. The regulations were gradually phased in, affecting 75-watt incandescents in January 2013 and 60-watt incandescents in January 2014. Manufacturers responded to EISA by developing a halogen bulb that meets the new requirements and uses fewer watts per lumen. These new “EISA-compliant” halogens will replace incandescents as the baseline for calculating program savings. Because manufacturers and retailers were allowed to sell through their existing inventory of incandescents, products did not immediately disappear from the market.

As part of the PY2013 Duke Energy Progress (DEP) Energy Efficient Upstream Lighting program evaluation, Navigant Consulting completed a shelf study that, among other things, captured presence of 75-watt and 60-watt general service incandescent products on store shelves in DEP’s service area. This study is a recent Carolinas-focused effort, and as such, we used the results to adjust baseline wattages. Table 5-7 below provides an overview of pre- and post-EISA equivalent baseline wattages for program CFLs.

Table 5-7. Baseline Adjustments Due to EISA Standards

CFL Wattage	Pre-EISA Equivalent Baseline Wattage	Post-EISA Equivalent Baseline Wattage	EISA Effective Date
18 watt	75-watt	58-watt	January 1, 2013
13 watt	60-watt	49-watt	January 1, 2014

Adjustment for Efficient Product Replacement

The Evaluation Team also adjusted the equivalent baseline wattage approach to account for instances in which customers installed program CFLs in sockets that already contained a CFL or LED. We developed these adjustments using participant survey data about the types of bulbs that respondents replaced when they installed their new program CFLs.

We found a low rate of program bulbs replacing CFLs or LEDs. Based on the participant survey results, 88.0% of program bulbs installed replaced incandescents or halogens. We applied this adjustment to the delta watts. Table 5-8 presents the adjustment for efficient product replacement and its relative precision.

Table 5-8. Adjustment for Efficient Product Replacement

	Sample Size	Adjustment Estimate	Relative Precision (at 90% Confidence)
Adjustment for efficient product replacement	393	88.0%	3.0%

CFL Wattage

CFL wattage was based on the counts and wattages of the actual bulbs distributed by the program during the evaluation period. Program kits featured mixes of 13-watt and 18-watt CFLs. We calculated an average bulb-weighted wattage of 15.34 watts.

Table 5-9. CFL Wattage

CFL Wattage	Number	Wattage
13-watt	6,438,812	13
18-watt	5,679,925	18
Total	12,118,737	15.34

Hours of Use (HOU)

The industry standard to estimate hours of use (HOU) is to conduct lighting logger studies. No recent HOU study has been completed in DEC service territory, but a recently reported HOU estimate from the 2013 evaluation of Duke Energy Progress (DEP) Energy Efficient Lighting Program is available. This evaluation established an estimated daily hours of use in DEP territory as 2.92 hours per day. The Evaluation Team believes that the hours of use established in that study are appropriate to use here, as DEP borders and overlaps with DEC territory, and household characteristics are very similar between DEP and DEC customers.

Coincidence Factors (CF)

As with the HOU, the industry standard is to use a lighting logger study to estimate coincidence factors. In the absence of a recent DEC-specific study, we chose to use a summer peak coincidence factor of 0.1138 and a winter peak coincidence factor of 0.0960 from the 2013 evaluation of DEP's Energy Efficient Lighting Program. Similar to the HOU estimates, the Evaluation Team believes that the source of the coincidence factors is appropriate, as DEP borders and overlaps with DEC territory, and household characteristics are very similar between DEP and DEC customers.

Interactive Effects

The Evaluation Team chose to use the HVAC system interaction factors for energy and summer demand estimated as part of the most recent evaluation of this program by TecMarket Works. Our review of the estimates determined that these factors were reasonable, relatively recent, and based on Carolinas-specific research.

Interactive factors for winter demand were not estimated as part of the most recent evaluation of the Residential CFL program. As such, we used the interactive effects estimated as part of the 2013 evaluation of Duke Energy Progress' Energy Efficient Lighting Program. We believe that the interactive effects value established in that study is appropriate to use here, as DEP borders and overlaps with DEC territory, and household characteristics are very similar between DEP and DEC customers. The DEP-estimated interactive factor for winter demand is -0.500.

5.2 Gross Impact Results

The Evaluation Team received program tracking data as two extracts: shipment information and customer information. The shipment data extract did not contain participant contact information (phone numbers and email addresses) that is critical for conducting a participant survey. As such, we merged shipment information with customer information using customer account number as the linking unique identifier. Our merge resulted in a 99% match rate. A follow-up discussion with the Duke Energy evaluation staff revealed that the two extracts come from different sources and a small percent of unmatched cases is expected.

Upon merging the program tracking data files, the Evaluation Team analyzed the data for any gaps and inconsistencies. As part of the analysis, we performed the following steps:

- Checked the core data fields for missing values¹⁰
- Checked the data for temporal gaps (due to missing invoices, transactions, or other data gaps) by exploring reasonable variation in monthly invoiced sales

We found that necessary data fields were clean, fully populated, and contained all necessary information to proceed with the impact analysis.

Using the equations and inputs discussed in the Gross Impact Methodology section of this report, we calculated gross energy and peak demand savings achieved by the program during the evaluation period. Table 5-10 presents the results of the analysis. The Residential CFL program realized 105% of the reported gross savings, 123% of the reported summer peak demand savings, and 33% of the reported winter peak demand savings.

Table 5-10. Gross Impact Results

Savings Type	Total Number of CFLs	Reported (Ex-Ante) Gross Savings	Evaluated (Ex-Post) Gross Savings	Gross Realization Rate
Energy savings (MWh)	12,118,737	407,186	426,270	105%
Summer peak demand savings (MW)		44.8	55.2	123%
Winter peak demand savings (MW)		59.8	19.9	33%

The key driver of the higher than reported energy savings is the use of a higher HOU estimate. The reduction in baseline wattage and adjustment for efficient replacement drove energy savings downward, but did not outweigh the effect of the higher HOU estimate. Reported winter and summer peak demand savings are based on DSMore modeling. We do not have visibility into all savings assumptions used to estimate reported demand

¹⁰ This excludes email address data field as we expect that not every participant would have provided their email address.

savings. As such, we cannot reliably comment on the complete list of factors driving the differences between reported and evaluated demand savings.

Using total evaluated energy and demand savings, the Evaluation Team calculated per-bulb savings (Table 5-11).

Table 5-11. Evaluated Total and Per-Bulb Gross Impacts

Savings Type	Number of Bulbs	Evaluated (Ex-Post) Gross Savings	Evaluated (Ex-Post) Per-Bulb Gross Savings
Energy savings (kWh)	12,118,737	426,269,780	35.17
Summer peak demand savings (kW)		55,204	0.0046
Winter peak demand savings (kW)		19,935	0.0016

Depending on the year program bulbs were mailed to customers, the Evaluation Team used different baseline wattages to account for the effects of EISA. Moving forward, energy and demand savings for all program bulbs need to use EISA-adjusted baseline wattages. As such, we recommend that the program uses per-bulb savings estimates calculated using EISA-adjusted baselines to estimate savings from future installations. Table 5-12 presents these assumptions by CFL wattage as well as overall.

Table 5-12. Recommended Per-Bulb Gross Impacts

Savings Type	Recommended Per-Bulb Gross Savings		
	13W CFL	18W CFL	Overall ^A
Energy savings (kWh)	24.44	28.51	26.35
Summer peak demand savings (kW)	0.0032	0.0037	0.0034
Winter peak demand savings (kW)	0.0011	0.0013	0.0012

^A This assumes no changes to the program CFL wattage mix.

5.3 References

Apex Analytics, LLC and Navigant Consulting, Inc. *Shelf-Stocking Study Results for the Energy Efficient Lighting Program*. Prepared for Duke Energy Progress. February 27, 2015.

Navigant Consulting, Inc. and Apex Analytics, LLC. *EM&V Report for the 2013 Energy Efficient Lighting Program*. Prepared for Duke Energy Progress. August 13, 2014.

TecMarket Works. *Process and Impact Evaluation of the Residential Smart \$aver Energy Efficiency Products (CFLs) Program in the Carolina System*. Prepared for Duke Energy Carolinas. September, 2012.

6. Net-to-Gross Analysis

This section describes our approach for estimating the net-to-gross ratio (NTGR) for the Residential CFL program and presents the resulting NTGR and the program net impacts.

6.1 Methodology

The NTGR represents the portion of the gross energy savings associated with a program-supported measure or behavior change that would not have been realized in the absence of the program. In other words, the NTGR represents the share of program induced savings. The NTGR consists of free-ridership (FR) and spillover (SO) and is calculated as $(1 - FR + SO)$. FR is the proportion of the program-achieved verified gross savings that would have been realized absent the program. There are two types of spillover – participant and nonparticipant. Participant spillover occurs when participants take additional energy-saving actions that are influenced by program interventions but did not receive program support. Nonparticipant spillover is the reduction in energy consumption and/or demand by nonparticipants because of the influence of the program.

As part of this evaluation, the Evaluation Team estimated FR and participant spillover (SO). Quantifying savings from nonparticipant spillover activities is a challenging task that warrants a separate study and was outside of the scope of this evaluation effort. In addition, the free CFL program design is less likely to result in significant amounts of nonparticipant spillover than upstream lighting programs that exist in the larger market. Both FR and SO components of the NTGR were derived from self-reported information from telephone interviews with program participants.

The final NTGR is the percentage of gross program savings that can reliably be attributed to the program. We estimate a separate NTGR for each participant, which we weighted to reflect the relative contribution of each participant's evaluated gross savings to the overall program estimate.

Free-ridership (FR) is best measured soon after customers participate in the program when it is easier to recall the decision to participate. In contrast, spillover (SO) is best measured after some time has passed after participation to allow participants time to experience the benefits of the energy efficiency measure and install additional measures because of their experience. Due to the fact that the FR and SO effects are best measured over different time periods, we used two distinct sample frames of participants to estimate each. Since it takes time for SO effects to occur, the SO sample frame included customers who participated in the program between July and December 2014 (6 to 12 months prior to our survey field date). The sample frame for FR included customers who participated in the program between January and March 2015 (within 6 months of the survey field date). We drew random samples from each sample frame. We asked survey respondents from both samples questions to verify the installation and persistence of program CFLs, as well as process and market-related questions.

Table 6-1. Free-Ridership and Spillover Sample Frames, Samples, and Number of Completed Interviews

NTGR Component	Sample Frame Size	Sample	Number of Completed Interviews
FR	45,286	2,440	222
SO	135,738	2,464	213

Below is a general overview of the method for developing FR and SO estimates. Section 12 of this report contains the participant survey instrument. Appendix A contains a detailed discussion of our spillover methodology. Appendix F provides a detailed overview of the FR and SO algorithm.

6.1.1 Free-Ridership

Free-riders are program participants who would have installed high efficiency lighting products on their own without the program. FR represents the percent of savings that would have been achieved in the absence of the program. Through participant surveys, we asked program participants a series of structured and open-ended questions about the influence of the program on their decision to order and install program CFLs. The survey questions measured the following areas of program influence:

- Influence efficiency – we asked participants what type of light bulbs they would have purchased the next time they needed light bulbs if they had not received free CFLs through the program
- Influence on timing – we asked participants who replaced working incandescent bulbs if they would have replaced working light bulbs on their own if they had not received free CFLs, or if they would have waited for the bulbs to burn out
- Influence on quantity – we asked participants whether they would have purchased fewer CFLs or LEDs if they had purchased the bulbs on their own instead of receiving them for free through the program

As part of the FR survey module, we included follow-up questions to check participant responses for consistency. We also referenced retail bulb pricing to ground participant responses.¹¹

We calculated FR rate per the agreed-upon algorithm. We checked survey data for item non-response. Four respondents had missing data to FR questions. We dropped these respondents from the analysis.

6.1.2 Spillover

Spillover represents energy savings from additional actions (expressed as a percent of total program savings) that were due to the program but did not receive program financial support. While SO can result from a variety of measures, it is not possible to ask about a large number of potential spillover measures on a survey due to the need to limit the length of the survey. The Evaluation Team chose to focus on the measures that participants would reasonably take following their program participation and would do so without additional program support. As such, we focused SO questions on CFLs and LEDs. We asked participants if they purchased any CFLs or LEDs after receiving program CFLs. We asked those who purchased additional bulbs about the degree to which program influenced their decision to purchase high efficiency bulbs as opposed to less efficient alternatives. We asked participants to rate the degree to which the program influenced their purchase decision as well as provide a rationale for their rating. We carefully reviewed participant responses to establish eligibility for spillover participants and purchases.

To estimate the spillover rate, we estimated savings for each spillover measure using the standard savings equation and a set of engineering assumptions. We determined the program-level spillover rate by dividing the sum of spillover savings by the evaluated gross savings achieved by the sample of participants who received spillover questions.

¹¹ We used a per-bulb price of \$2.50 for CFLs and \$10 for LEDs. This pricing was confirmed by the program staff.

Equation 6-1. Spillover Rate Formula

$$\text{Spillover Rate} = \frac{\text{Spillover Savings}}{\text{Evaluated Gross Savings in the Respondent Sample}}$$

6.2 NTG Results

We estimate free-ridership to be 19.7% and spillover to be 3.2%. The resulting NTGR for DEC for the evaluation period is 83.5%. Relative precision around this point estimate is 4.9% at 90% confidence.

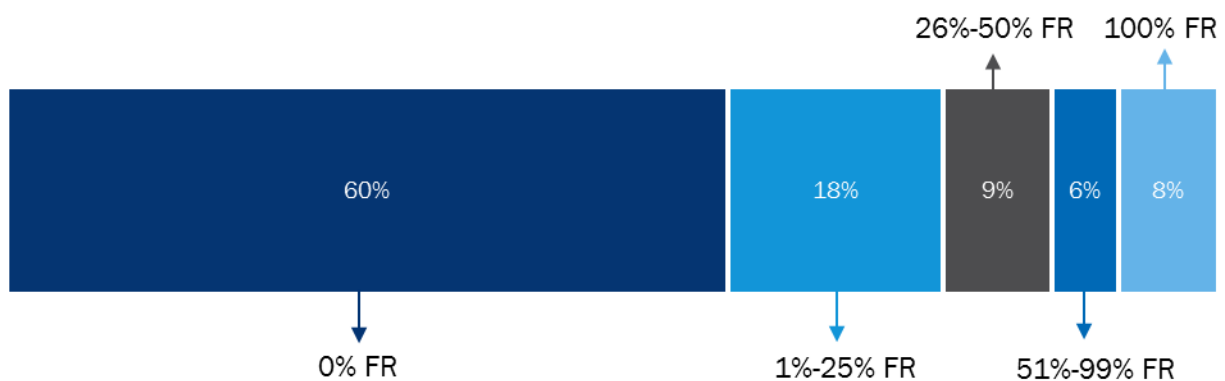
Table 6-2. NTG Results

NTGR Component	Estimate	Number of Completed Interviews	Relative Precision (At 90% Confidence)
FR	19.7%	218	--
SO	3.2%	213	
NTGR (1-FR+SO)	83.5%	-	4.9%

6.2.1 Free-Ridership

Six in ten participants (60%) are complete non-free-riders. That is, they would not have purchased any of the CFLs they received for free through the program. At the opposite end of the free-ridership spectrum, less than one in ten (8%) are complete free-riders who reported that they would have purchased all of the CFLs they received. Approximately one-third (33%) are partial free-riders, because they would have purchased some, but not all of the CFLs they received, and, in addition, some replaced working light bulbs, which they would not have done on their own. These results indicate that the program not only caused participants to switch to CFLs, but also had an effect on the number of bulbs they installed and when they installed them.

Figure 6-1. Breakdown of Free-Ridership Rates



The Evaluation Team investigated a wide range of participant demographic attributes and their relationship to free-ridership, but we do not find any subgroups of participants with statistically significant differences in free-ridership. We observed difference in FR between homeowners and renters, but this difference was not statistically significant.

6.2.2 Spillover

Approximately one-third of DEC Residential CFL Program participants (32%) purchased light bulbs in addition to those they received through the program in the past year. Nearly two-thirds of these participants (63%, or 20% of all participants) purchased light bulbs since participating in the program, with most purchasing efficient light bulbs (85%, or 17% of all participants). Of those, one-third (35%, or 6% of all participants) gave the program credit for motivating their purchase. Overall, 6% of all participants qualified for spillover. The average spillover participant purchased 6.2 bulbs which qualified for spillover, split evenly between CFLs and LEDs.

A number of customers also reported that the program influenced them to purchase incandescent efficient bulbs through the DEC online store. While these bulbs are not considered spillover, as they can be claimed as savings by the online store program, this provides evidence of effective channeling of customers from the Residential CFL program to the online store.

6.3 Net Impact Results

Table 6-3 presents evaluated gross and net savings for the evaluation period. The program achieved 356,036 MWh in net energy savings, 46.1 MW in net summer peak demand savings, and 16.7 MW in net winter peak demand savings.

Table 6-3. Net Impact Results for 2012-2015 Evaluation Period

Savings Type	Evaluated (Ex-Post) Gross Savings	NTGR	Evaluated (Ex-Post) Net Savings
Energy savings (MWh)	426,270	83.5%	356,036
Summer peak demand savings (MW)	55.2		46.1
Winter peak demand savings (MW)	19.9		16.7

^A Unrounded NTGR was used to calculate evaluated net savings.

Table 6-4 presents per-bulb net impact results for the evaluation period. Average per-bulb energy savings are 29.38 kWh and peak demand savings are 0.0038 and 0.0014 for summer and winter respectively.

Table 6-4. Per-Bulb Net Impact Results for 2012-2015 Evaluation Period

Savings Type	Evaluated Per-Bulb (Ex-Post) Gross Savings	NTGR	Evaluated Per-Bulb (Ex-Post) Net Savings ^A
Energy savings (kWh)	35.17	83.5%	29.38
Summer peak demand savings (kW)	0.0046		0.0038
Winter peak demand savings (kW)	0.0016		0.0014

^A Evaluated net savings were calculated using unrounded NTGR.

Table 6-5 presents net realization rates for the program. We developed net realization rates by dividing evaluated net savings by reported net savings. Because the NTGR we estimated for this evaluation is very similar to the one estimated as part of the previous evaluation, the net realization rate is very similar to the gross realization rate.

Table 6-5. Net Realization Rates

Savings Type	Reported (Ex-Ante) Gross Savings	Reported (Ex-Ante) NTGR	Reported (Ex-Ante) Net Savings	Evaluated (Ex-Post) Net Savings	Net RR
Energy savings (MWh)	407,186	91.1%	370,905	356,036	96%
Summer peak demand savings (MW)	44.8		40.8	46.1	113%
Winter peak demand savings (MW)	59.8		54.5	16.7	31%

^A Savings were calculated using unrounded assumptions.

7. Process Evaluation

7.1 Methodology

Process assessment leveraged the following data collection methods and research activities:

- Program staff interviews (n=2)
- Materials review
- Program tracking data analysis
- Participant survey (n=435)
- General population survey (n=503)

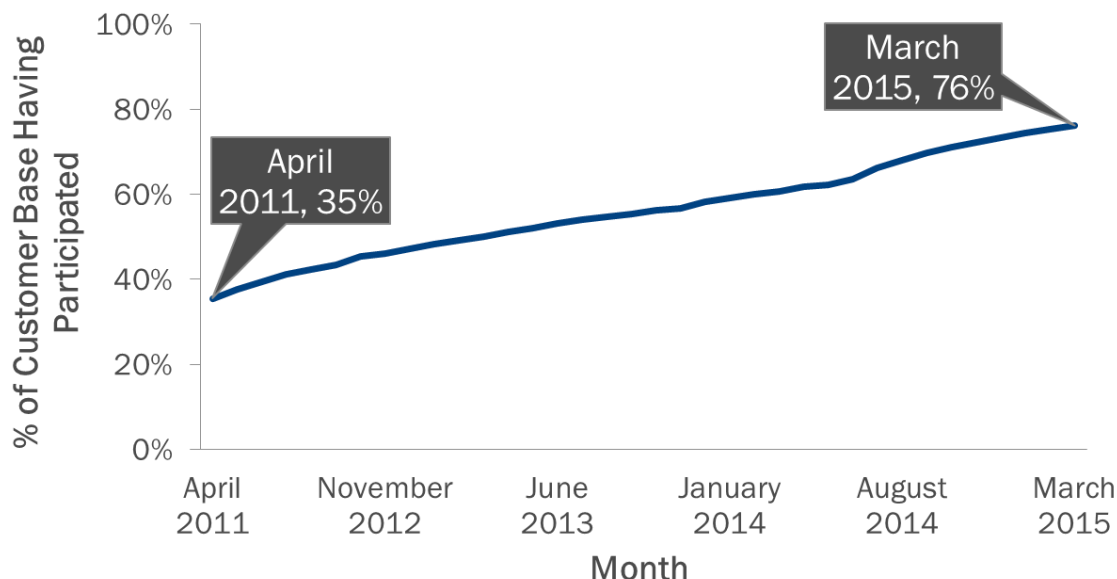
We provide a detailed overview of each data collection method, as well as achieved confidence and precision in Section 4 of this report.

7.2 Notable Findings

7.2.1 Program Implementation

The Residential CFL Program ran smoothly during this evaluation cycle (May 15, 2012 through March 30, 2015). The program exceeded its participation goals with 853,004 customers participating. The program has reached a large proportion of DEC customers. Based on the number of participants during the previous evaluation period and this one, we estimate that more than three-quarters of DEC customers had participated in the program through March 2015 (Figure 7-1). At the current participation rate, future program potential is limited. Aside from the remaining unserved customers, additional sources of participation would include new customers moving into the DEC service territory as well as new construction activity in the service territory. The savings potential from these additional sources of participation could be limited. New customers moving into existing premises previously serviced by the program may have program CFLs already installed, which could cause new participants to either hold off on installing their program CFLs or install them in low usage sockets previously filled with incandescents or halogens. New construction premises may already have high efficiency lighting in place, which may delay the installation of program CFLs.

Figure 7-1. Cumulative Program Participation over Time¹



¹ The starting percentage is the number of participants cited in the previous evaluation divided by the total number of DEC customers.

During the current evaluation cycle, the vast majority (98%) of customers placed only one order through the program. Most of the kits requested through the program (84%) were 15-bulb kits, the maximum allowable through the program, as seen in Table 7-1 below. On average, participants received 14.2 bulbs.

Table 7-1. Bulbs Distributed by the Program

Kit Type Mailed	Kits Mailed	% of Kits	Bulbs Mailed	% of Bulbs
CFL 3-pack	27,572	3%	82,716	<1%
CFL 6-pack	49,000	6%	294,000	2%
CFL 8-pack	3,783	<1%	30,264	<1%
CFL 12-pack	61,836	<7%	742,032	6%
CFL 15-pack	731,315	84%	10,969,725	91%
Total	873,506		12,118,737	

The Evaluation Team found that 10,579 participants received more than 15 bulbs (about 1% of all participants totaling 248,715 bulbs or 2% of all bulbs). Most received 18 bulbs, which is likely due to additional bulbs received through the Home Energy Assessment program. Alternatively, ordering more than one kit of different size configurations can result in participants receiving more than 15 bulbs. Though this is a small number of bulbs and is not a large concern for the program, we did find that 412 customers received 45 or more bulbs. The program may want to review these cases to identify how these shipments happened, so it does not become a larger problem.

Program Satisfaction

Participants expressed high levels of satisfaction with the program, which is another indication that program processes are effective and well run. Figure 7-2 shows that a large majority of participants (90%) are satisfied with the program overall. Timely receipt of program bulbs is key to high satisfaction, and 92% of participants report receiving bulbs within three weeks of placing their order. We also asked participants about their satisfaction with Duke Energy as their electric company and found approximately three-quarters are satisfied (76%). Very few customers contacted Duke Energy or the program staff with questions. Of those who did, 72% are satisfied with their interactions.

Figure 7-2. Participant Satisfaction with Residential CFL Program, Duke Energy, and Communications

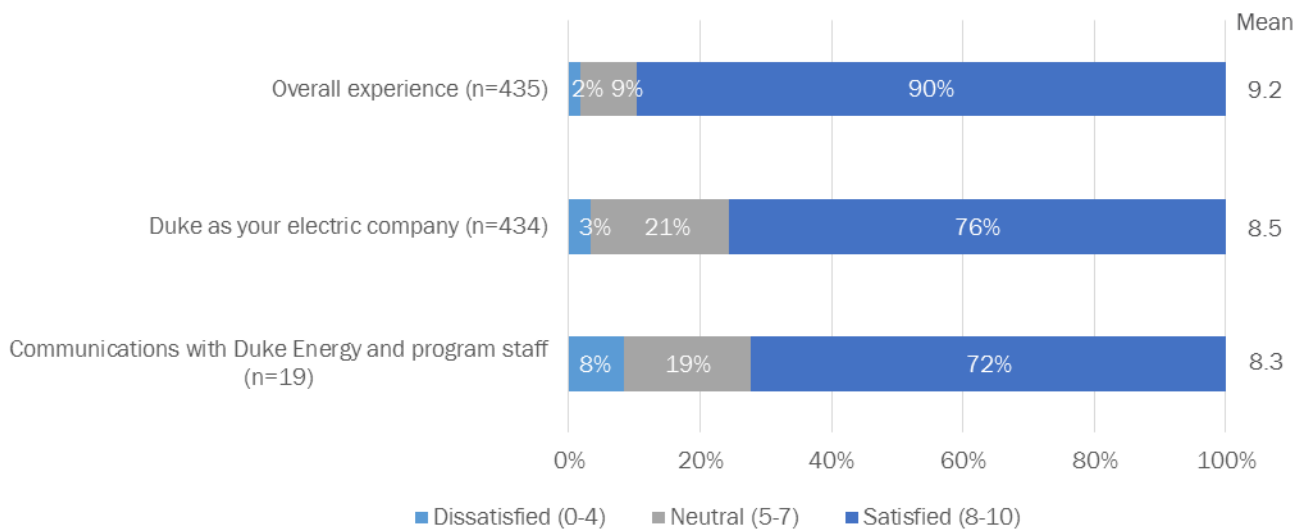
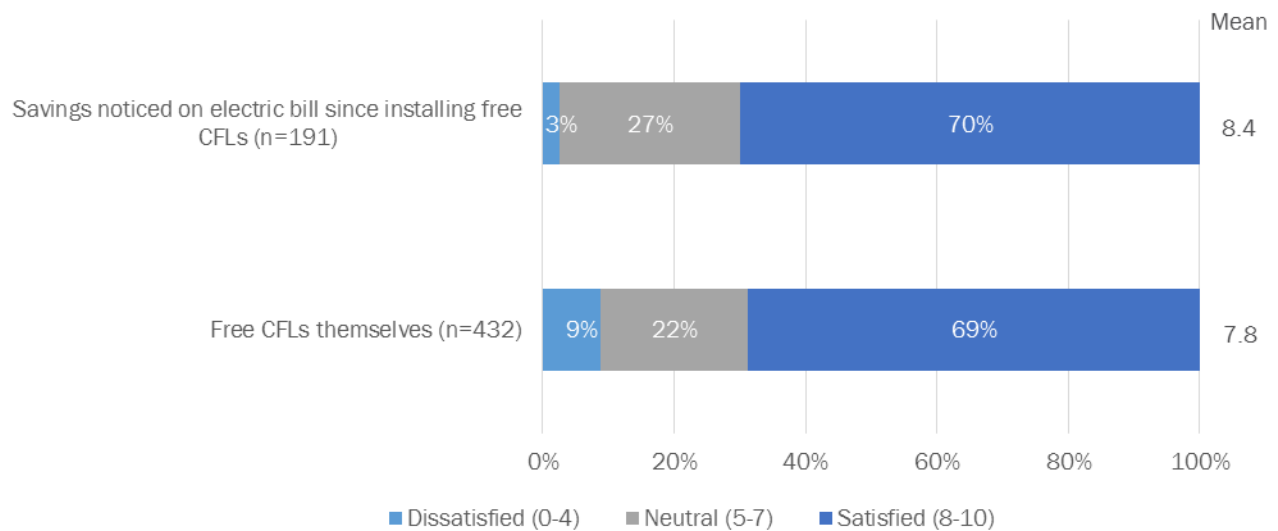


Figure 7-3 shows that a sizable majority of participants are satisfied with the program CFLs (69%). A few participants are dissatisfied (9%). Dissatisfied customers did not like the light color of the bulbs or thought the bulbs were too dim. Less than half (46%) of participants noticed savings on their electric bill since installing the free CFLs. Among those who did, seven in ten (70%) are satisfied with the savings.

Figure 7-3. Participant Satisfaction with CFLs and Electric Bill Savings



Program Leakage

The program ships the free CFLs to customers' billing addresses, which, in a small number of cases, 1) is not the same as the service address and 2) is outside DEC territory. While reviewing program data, the Evaluation Team found that the program shipped 68,945 bulbs (less than 1% of all program bulbs) to 4,730 customer addresses outside of North and South Carolina. In order for customers to receive the bulbs, they must agree to install them at the account service address. While some customers with billing addresses in neighboring states may bring their bulbs back to DEC territory, it is likely that many install the bulbs at their out-of-territory billing address. In fact, through our participant survey, we found that 88% of participants with out-of-state billing addresses installed the bulbs at that billing address. Bulbs installed outside of DEC territory constitute leakage and energy savings that DEC will not realize. While the number of bulbs leaking out of the territory is small, mailing bulbs to the customer service address instead of the billing address would reduce leakage.

7.2.2 Program Marketing

DEC markets the program through direct mailings, online advertising, online services intercepts, and through interactive voice response (IVR) phone intercepts. Program marketing efforts were focused around mailings, such as bill inserts, new customer letters, and co-marketing in other DEC program mailings. Online services intercepts target customers who log on to their online Duke Energy account. The system checks to see if the customer has participated in the program and asks eligible customers if they would like to order their free CFL bulbs. IVR intercepts target customers who call in to Duke Energy's automated hotline with a similar offer for eligible customers.

The level of program participation varied over time, some of which can be tied to program marketing. During the current evaluation cycle, the most significant shift in participation occurred during the summer of 2014. In a two-month span, the number of kits ordered more than tripled, as seen in Figure 7-4 below. This spike in participation corresponds to the introduction of IVR phone intercepts during the summer of 2014.

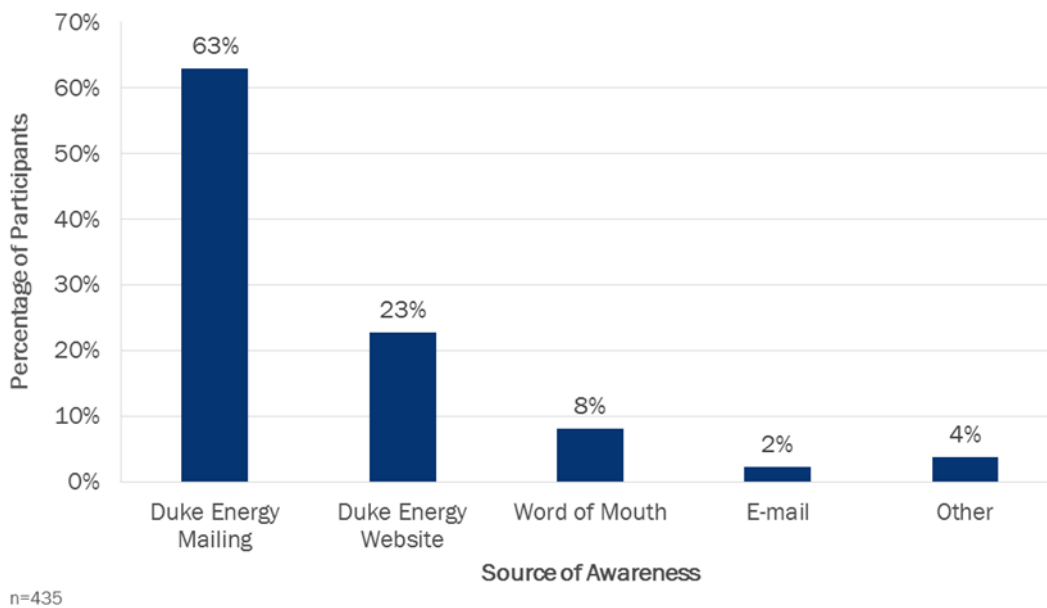
Figure 7-4. Program Bulb Shipments over the Evaluation Period



The 2015 marketing materials present data in a format that effectively links marketing efforts to program performance. This formatting, if continued consistently through the next evaluation cycle, should provide a useful source of information for the next evaluation.

IVR marketing may have encouraged many customers to participate in the program, but participants recall first learning about the program through Duke Energy mailings. According to our participant survey, nearly two-thirds of participants (63%) first heard about the program through mailings (Figure 7-5). Far fewer recall learning about the program through the Duke Energy website (23%) or through word of mouth (8%).

Figure 7-5. Sources of Program Awareness



7.2.3 Who is the Program Reaching?

Demographics

To learn more about the types of customers the program is reaching, the Evaluation Team compared the demographics of program participants with those of DEC customers as a whole. We compared survey results of the most recent participants with data from the American Community Survey for DEC territory.¹² We found that recent participants are younger, have lower incomes, and are more likely to be renters than the overall DEC population (Figure 7-6, Figure 7-7, and Figure 7-8). It is possible that with approximately three-quarters of DEC customers having participated in the program, the program is now reaching customers that are often considered “harder to reach.”

¹² The participant survey included customers who had participated between July 2014 and March 2015. We calculated DEC territory demographics from the 2009-2013 American Community Survey 5-year estimates at the census block group level.

Figure 7-6. Age of Recent Participants and Customers

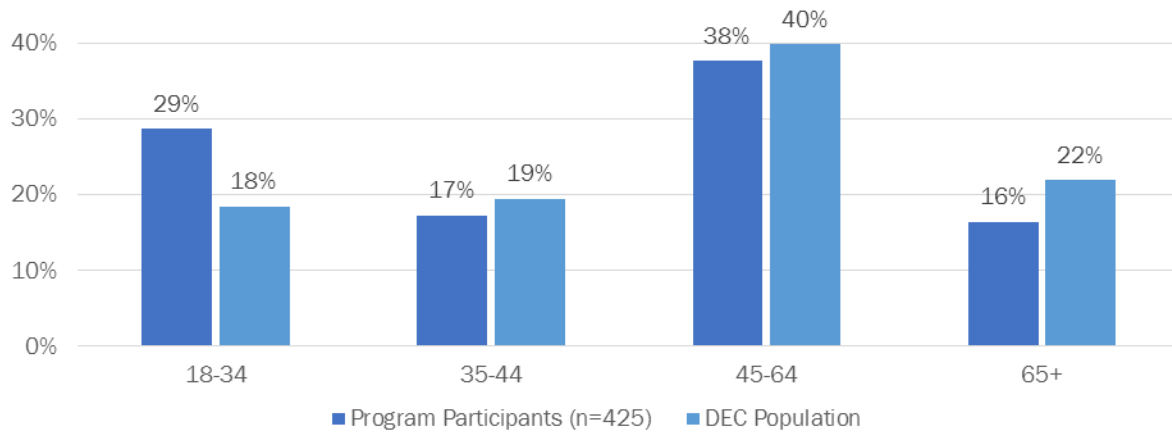


Figure 7-7. Household Income of Recent Participants and Customers

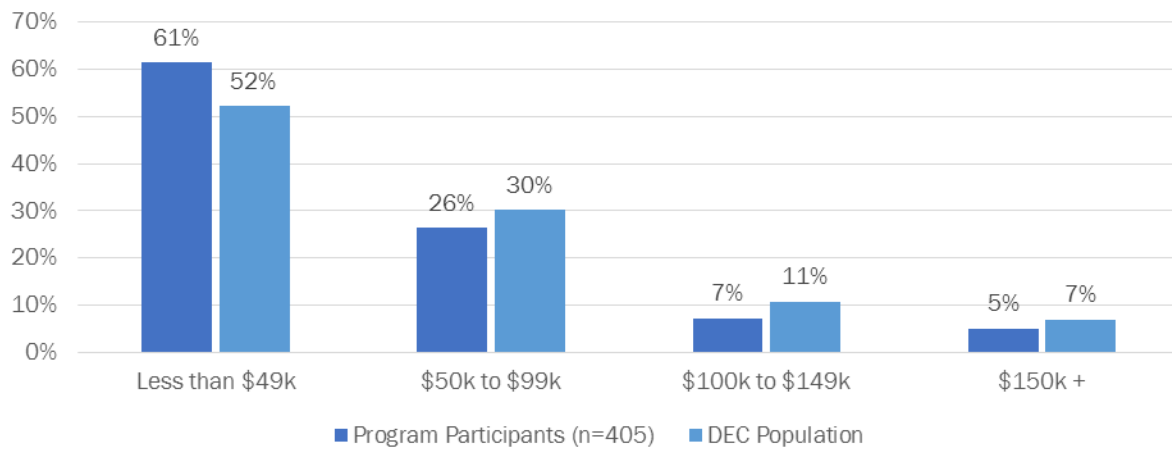
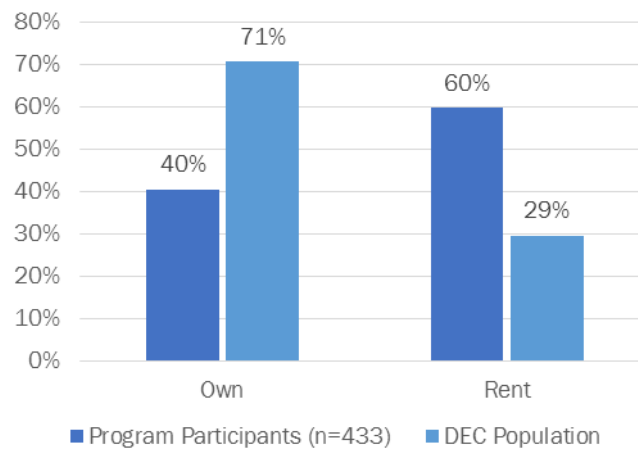


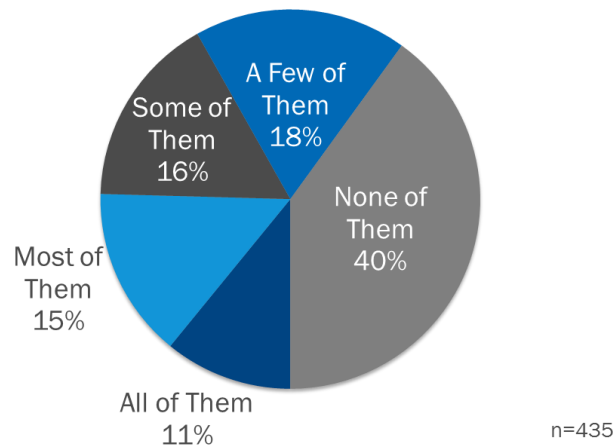
Figure 7-8. Home Ownership of Recent Participants and Customers



Lighting Awareness and Purchase Behaviors

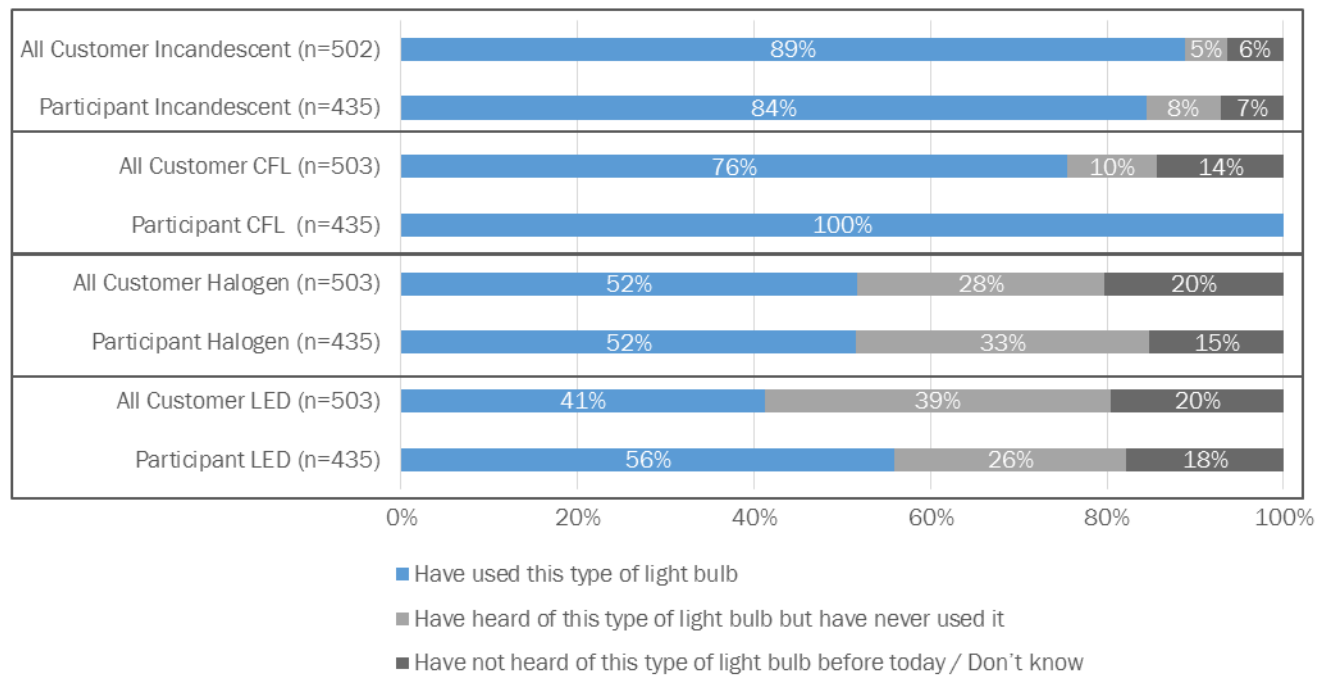
We asked recent participants about their prior use of CFLs. While a majority of participants reported having at least some CFLs installed prior to receiving the free CFLs from the program (60%), self-reported CFL saturation was low. Two-fifths of recent participants (40%) did not have any CFLs installed and almost one-fifth (18%) had CFLs installed in just a few light sockets (Figure 7-9).

Figure 7-9. Sockets with CFLs in Home Prior to Participation



The Evaluation Team included lighting questions on a general population survey of DEC customers that was part of the DEC Appliance Recycling program Evaluation. The results allow us to compare recent program participants with DEC customers as a whole in terms of their lighting usage and awareness to identify the types of customers the program is reaching. Recent participants are similar to all DEC customers in terms of their awareness and usage of different lighting technologies (Figure 7-10). A large majority of recent program participants, as well as DEC customers, are aware of and have used incandescent light bulbs. Both groups have a high awareness of EISA compliant halogen bulbs. CFL usage is high among DEC customers (76%); we assume that 100% of recent participants have used CFLs given their participation in the program. A majority of DEC customers and recent program participants are aware of LEDs, though more customers report having used LEDs than program participants.

Figure 7-10. Awareness and Experience with Bulb Types



The Evaluation Team assumes that program participants have used CFL light bulbs as survey participants confirmed receiving program CFL bulbs, though we did not explicitly ask program participants of their awareness of CFLs.

Recent participants and DEC customers demonstrate a moderately high understanding of the energy use of different lighting technologies. Approximately two-thirds of both groups correctly identify incandescents as the most energy-intensive technology (Figure 7-11). However, recent participants show some confusion about the bulb that uses the least energy (Figure 7-12). Though LEDs use slightly less energy than CFLs, recent participants are more likely to think that CFLs are the most efficient bulb. DEC customers are more likely to correctly identify LEDs as the most efficient bulb. The confusion about LEDs among participants is understandable since LEDs are a new technology and the efficiency gains over CFLs are relatively small. Participants may also have concluded that the bulbs they recently received through the program would be the most efficient.

Figure 7-11. Understanding of Bulbs that Use the Most Energy

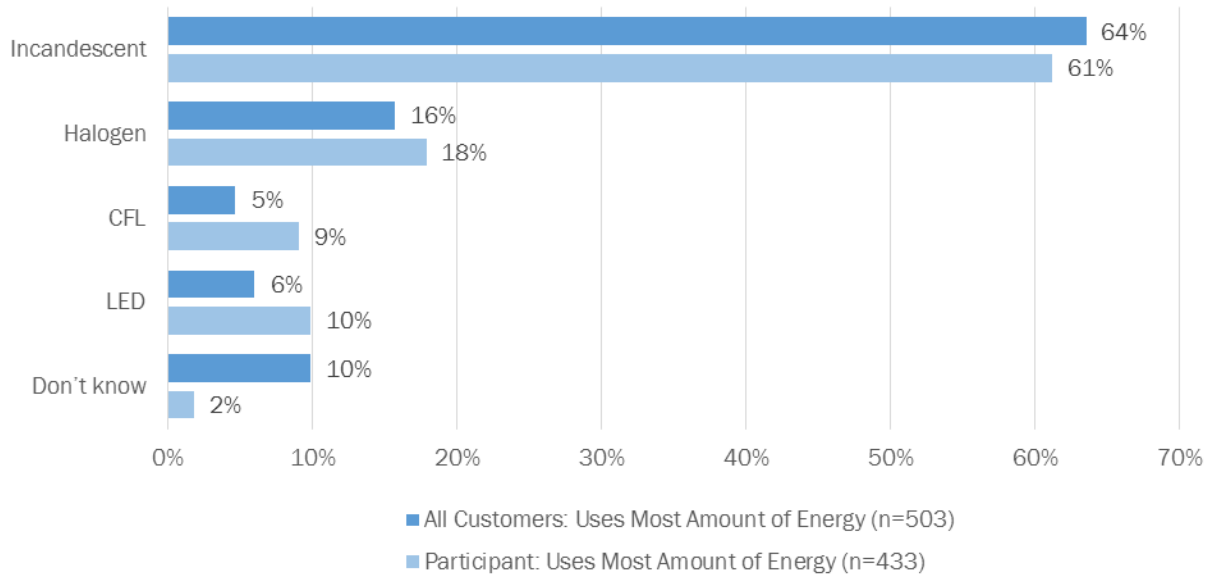
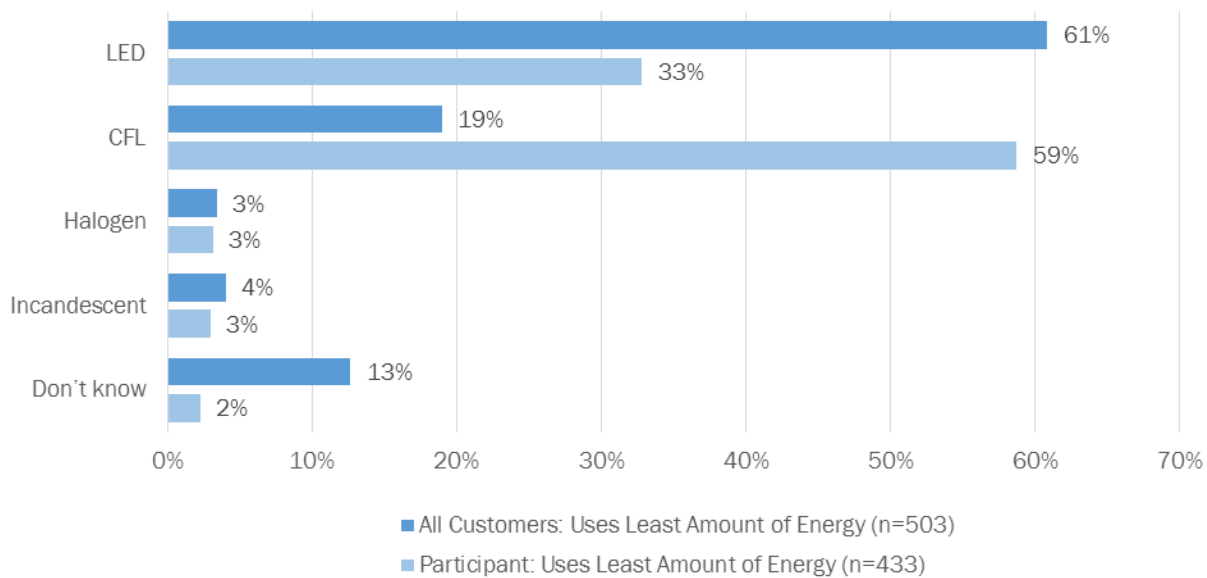


Figure 7-12. Understanding of Bulbs that Use the Least Energy

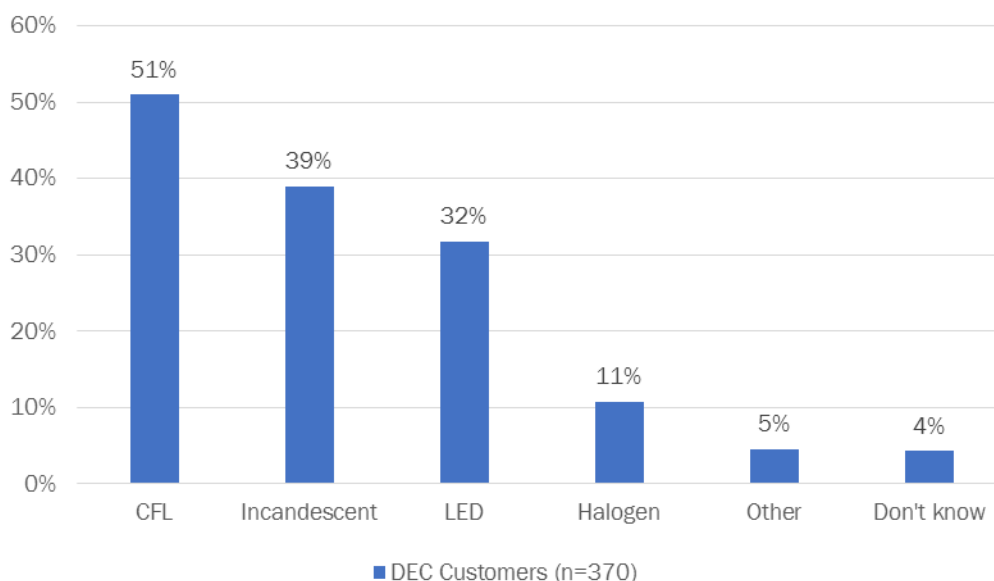


7.2.4 Future of the Program

As we noted earlier in this section, the Evaluation Team estimates that three-quarters of DEC customers had participated in the program as of March 2015. At current participation rates, nearly all DEC customers will have participated in the Residential CFL program by December 2016. While reaching the remaining one-quarter of customers will likely be more challenging, the program is approaching the end in terms of its current design. The results of the lighting questions we asked on the general population survey provide information about customers purchasing habits that can help guide future program direction.

Though CFLs and LEDs last longer than incandescents and might slow the demand for new light bulbs, 72% of DEC customers said they had purchased light bulbs during the past year, regardless of type. CFLs were the most frequently purchased type of light bulb followed by incandescents (51% and 39%). LEDs are also a popular option with approximately one-third of customers purchasing LEDs (32%). More than four-fifths of customers (85%) report making their most recent light bulb purchase in a retail store.

Figure 7-13. Types of Bulbs Purchased by DEC Customers in the Last Year



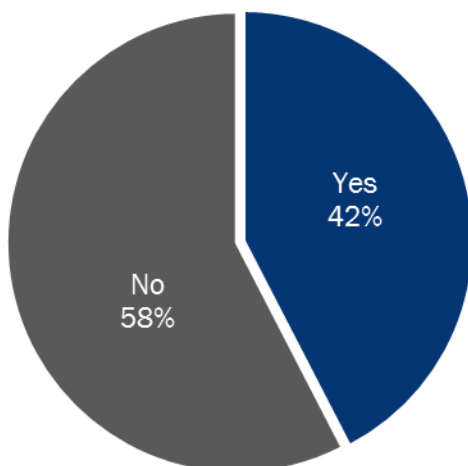
Note: Numbers sum to more than 100% because respondents could purchase more than one type of light bulb.

Since a majority of customers purchases CFLs on their own, the program may want to consider a shift in focus to LEDs. In particular, specialty LEDs may be the area where the program could have the greatest impact. CFL saturation in light sockets that utilize a specialty bulb has lagged behind standard light sockets. In an attempt to make inroads in this market, a number of lighting programs in other jurisdictions are dropping support of specialty CFLs in favor of specialty LEDs due to their superior light quality.

The program might also choose to put a greater emphasis on the online store. We asked DEC customers if they were aware of the Duke Energy online lighting store and more than two-fifths had heard of the store, which is a relatively high number for an energy efficiency program (Figure 7-14).

The program is currently growing awareness with additional marketing targeting past participants of the free CFL program.

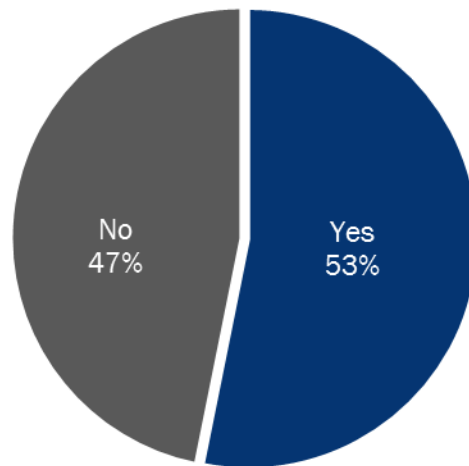
Figure 7-14. DEC Customer Awareness of Online Store



n=503

DEC customers are also facing a more challenging environment when they purchase light bulbs. In 2007, Congress passed the Energy Independence and Security Act (EISA), which set higher efficiency standards for light bulbs. We asked DEC customers if they were aware of EISA and found that about half had heard of the regulations (Figure 7-15). Increasingly, customers will not find standard incandescents on shelves when they go to their local retailer to purchase light bulbs, and a sizable percentage will not know the reason why the bulbs are gone and what the best alternative may be. The DEC program can help fill this vacuum with educational marketing and by directing customers to the online store where DEC-endorsed products are sold.

Figure 7-15. DEC Customer EISA Awareness



n=502

8. Conclusions and Recommendations

This section presents conclusions and recommendations resulting from the process and impact evaluation of the Residential CFL program.

Conclusions

The DEC Residential CFL program has been very successful. The program exceeded its participation goal with 853,004 customers participating. The program distributed over 12.1 million bulbs during the evaluation period, which is an average of 16,158 bulbs or 1,077 15-bulb kits per weekday. The program has reached a large share of DEC customers – we estimate that since 2010 and through March 2015, 76% of DEC customers have placed orders through the program. At the current participation rate, future program potential is limited. Aside from the remaining unserved customers, additional sources of participation would include new customers moving into the DEC service territory as well as new construction activity in the service territory. The savings potential from these additional sources of participation could be limited. New customers moving into existing premises previously serviced by the program may have program CFLs already installed, which could cause new participants to either hold off on installing their program CFLs or install them in low usage sockets previously filled with incandescents or halogens. New construction premises may already have high efficiency lighting in place, which may delay the installation of program CFLs.

The program realized 105% of the reported (ex-ante) gross energy savings, 123% of summer peak demand savings and 33% of winter peak demand savings. The Evaluation Team estimated evaluated (ex-post) gross energy savings of 426,270 MWh, summer peak demand savings of 55.2 MW, and winter peak demand savings of 19.9 MW. Gross realization rates are relatively high for both energy and summer peak demand savings. While the overall installation rate is 90.1%¹³, first-year ISR is relatively low (60.6%). This is not surprising, given that most customers requested all 15 CFLs at once.

Table 8-1. Gross Impact Results

Savings Type	Total Number of CFLs	Reported (Ex-Ante) Gross Savings	Evaluated (Ex-Post) Gross Savings	Gross Realization Rate
Energy savings (MWh)	12,118,737	407,186	426,270	105%
Summer peak demand savings (MW)		44.8	55.2	123%
Winter peak demand savings (MW)		59.8	19.9	33%

Evaluated gross per-bulb savings achieved during the evaluation period were 35.17 kWh for energy, 0.0046 kW for summer peak demand and 0.0016 kW for winter peak demand. Only a portion of program-discounted bulbs used EISA-adjusted wattages. Moving forward, energy and demand savings for *all* program bulbs need to use EISA-adjusted baseline wattages. As such, we recommend that the program uses per-bulb savings estimates calculated using current EISA-adjusted baselines to estimate savings from future installations. Table 8-2 contains evaluated per-bulb savings and per-bulb savings recommended for future use by the program.

¹³ Overall installation rate incorporates a discount adjustment of future installations. This adjustment is discussed further in Section 5.1.

Table 8-2. Evaluated and Recommended Per-Bulb Gross Impacts

Savings Type	Evaluated (Ex-Post) Per-Bulb Gross Savings During Evaluation Period	Recommended Per-Bulb Gross Savings		
		13W CFL	18W CFL	Overall ^A
Energy savings (kWh)	35.17	24.44	28.51	26.35
Summer peak demand savings (kW)	0.0046	0.0032	0.0037	0.0034
Winter peak demand savings (kW)	0.0016	0.0011	0.0013	0.0012

^A This assumes no changes to the program CFL wattage mix.

Through analysis of participant self-report survey results, the Evaluation Team estimated the program net-to-gross ratio (NTGR) to be 83.5%, which is relatively high. NTGR is comprised of a program free-ridership rate of 19.7% and program spillover of 3.2%. Net program impacts are 356,036 MWh in energy savings, 46.1 MW in summer peak demand savings and 16.7 MW in winter peak demand savings.

Table 8-3. Net Impact Results for 2012-2015 Evaluation Period

Savings Type	Evaluated (Ex-Post) Gross Savings	NTGR	Evaluated (Ex-Post) Net Savings ^A
Energy savings (MWh)	426,270	83.5%	356,036
Summer peak demand savings (MW)	55.2		46.1
Winter peak demand savings (MW)	19.9		16.7

^A Evaluated net savings were calculated using unrounded NTGR.

Table 8-4 presents per-bulb net impact results for the evaluation period. Average per-bulb energy savings are 29.38 kWh and peak demand savings are 0.0038 and 0.0014 for summer and winter respectively.

Table 8-4. Per-Bulb Net Impact Results for 2012-2015 Evaluation Period

Savings Type	Evaluated Per-Bulb (Ex-Post) Gross Savings	NTGR	Evaluated Per-Bulb (Ex-Post) Net Savings ^A
Energy savings (kWh)	35.17	83.5%	29.38
Summer peak demand savings (kW)	0.0046		0.0038
Winter peak demand savings (kW)	0.0016		0.0014

^A Evaluated net savings were calculated using unrounded NTGR.

The program implementation processes ran smoothly. Program tracking data were complete and accurate. Instances of products mailed and installed outside of the service territory were minimal. Instances of participants receiving more than 15 bulbs through the program were also minimal. Participants reported high levels of satisfaction with the program, indicating that program processes are effective and well run. A large

majority of participants (90%) are satisfied with the program overall.¹⁴ Timely receipt of program bulbs is key to high satisfaction, and 92% of participants report receiving bulbs within three weeks of placing their order. We also asked participants about their satisfaction with Duke Energy as their electric company and found approximately three-quarters are satisfied (76%).

During the evaluation cycle, we found that recent participants are younger, have lower incomes, and are more likely to be renters than the overall DEC population. It is possible that with approximately three-quarters of DEC customers having participated in the program, the program is now reaching customers that are often considered “harder to reach.” Given cumulative participation levels to-date, reaching additional customers may prove challenging for the program moving forward.

Recommendations

We recommend that program administrators calculate future savings from the Residential CFL program using the recommended per-bulb energy and summer peak savings presented in Table 8-2 above. We also recommend that the program team use the evaluation recommended per-bulb values for winter peak demand savings. The Evaluation Team used recent and Carolinas-specific inputs to determine these savings.

To-date, the Residential CFL program has reached a sizeable share of DEC customers. As a result, it will be increasingly challenging for the program to maintain past participation levels. The reduction in baseline wattages due to EISA legislation means the program will achieve less savings than in the past. In addition, DEC customers are aware of CFLs, and CFLs are the bulb type that customers purchase most often. These trends could indicate rising free-ridership rates in the future. DEC may want to consider winding down the program as it is currently designed and exploring alternative designs and/or bulb types offered. Based on our knowledge of the lighting market dynamics along with the findings from this evaluation, we propose the following alternative designs:

- **Introduction of specialty products.** Depending on the cost-effectiveness screening results, one possible design solution is to offer deeply discounted or free specialty LED products. This offer can be used in conjunction with the online store, which already offers discounted specialty LEDs. This combined approach could be designed to reach a broad base of customers who have a need for specialty products, spur customer interest in LEDs, showcase the superior quality of LEDs in specialty applications, and drive future purchase of specialty LEDs through the online store. Given that, three-way and reflector bulbs are among the most common bulb types, the program could give participants a choice of bulbs that they would like to see in a kit. Kits could feature several configurations and contain three to five light bulbs. In most areas of the country, use of energy efficient bulbs in specialty sockets has lagged behind their use in standard sockets. Program intervention could be key to changing customer purchase behaviors when it comes to specialty lighting. Customers are generally more satisfied with specialty LEDs than CFLs and with the drop in price for LEDs, the bulbs are more likely to be cost-effective.
- **Targeted outreach to underserved customer segments.** It is our understanding that DEC can and have started using its customer data tracking systems to identify customers that have not participated in the Residential CFL program. We recommend that the future marketing (and messaging) efforts for the free CFL offerings continue to be targeted to customers that are yet to participate. A targeted approach will expand the program’s reach without unnecessarily marketing to previous participants

¹⁴ A rating of 8, 9, or 10 on the scale from 0 to 10 where 0 is extremely dissatisfied and 10 is extremely satisfied.

Conclusions and Recommendations

who reached their 15-CFL lifetime limit. In addition, this approach may lead to lower free-ridership, as unserved customers are likely to have lower levels of knowledge and experience with energy efficient lighting products.

Future evaluation of the Duke Energy Progress (DEP) Energy Efficient Lighting program includes a residential lighting inventory and logger study. The study will include a representative sample of DEC customers. The findings from this study will help inform the state of the lighting market and aid with the future program design.

OFFICIAL COPY

Mar 09 2016

9. Summary Form

Energy Efficient Appliances and Devices Program Completed EMV Fact Sheet

The Residential CFL program, a subcomponent of the Energy Efficient Appliances and Devices Program, offers customers up to a lifetime limit of 15 free CFLs mailed directly to their homes by Duke Energy.

Date	October 26, 2015
Region(s)	Duke Energy Carolinas
Evaluation Period	May 2012 through March 2015
Gross Annual kWh impact	105% realization rate
Coincident kW impact	123% realization rate (summer) 33% realization rate (winter)
Measure life	5 years
Net to Gross	83.5%
Process Evaluation	Yes
Previous Evaluation(s)	September 28, 2012

Evaluation Methodology

The Evaluation Team reviewed reported savings assumptions and verified that the inputs used to calculate those assumptions were in line with the previous evaluation's recommendations. The Evaluation Team also performed an engineering analysis of energy and demand savings to develop evaluated savings estimates, including estimation of a net-to-gross ratio (NTGR) and first-year in-service rate (ISR) through a participant survey. The Evaluation Team also conducted a program process evaluation including results from participant and general population surveys.

Impact Evaluation Details

- The Evaluation Team estimates baseline wattages using the equivalent baseline wattage approach and recent regionally specific research
- All Duke Energy Carolinas customers who have not previously participated in the program are eligible to receive up to 15 free CFLs through the program
- The Evaluation Team uses the Uniform Methods Project (UMP) recommended approach to estimate gross energy savings, and incorporates additional adjustments as necessary
- Some overlap is present with other Duke Energy programs, including the Duke Energy Online Store and the Duke Energy Home Energy Assessment programs
- North Carolina Utilities Commission requires that evaluations of DEC's Energy Efficient Lighting program include Carolinas-specific data
- North Carolina Utilities Commission requires that evaluations of DEC's Energy Efficient Lighting program include a discussion of the impacts of LEDs, the Energy Independence and Security Act (EISA), and other innovations in lighting technology on the calculations of measure impacts and the baseline measures used in those calculations

10. Appendix A: Spillover Savings Assumptions

This section presents the approach for estimating energy and demand savings for spillover CFLs and LEDs.

Spillover represents additional savings (expressed as a percent of total program savings) that were achieved without program rebates but would not have occurred in the absence of the program. For the purposes of this study, we limited the exploration of spillover effects to CFLs and LEDs. We explored non-program CFL and LED purchases and the degree of program influence on those purchases through the participant survey. Overall, 16 participants qualified for spillover. We asked those participants about the types of bulbs (CFLs or LEDs) and the quantity of bulbs they purchased as a result of their experience with the program CFLs. We did not ask participants to report bulb wattages because customers typically have difficulty recalling wattage information, especially if they purchased bulbs across a range of wattages. Due to survey length, we did not ask questions about bulb type (standard or specialty).

Equation 10-1 shows the formula that we used to estimate spillover energy savings and Equation 10-2 shows the formula that we used to estimate spillover peak demand savings.

Equation 10-1. Spillover Energy Savings Formula

$$\Delta kWh = \frac{(Watts * HOU)_{base} - (Watts * HOU)_{ee}}{1000} * 365 * (1 + HVAC_c)$$

Equation 10-2. Spillover Peak Demand Savings Formula

$$\Delta kW = \frac{Watts_{base} - Watts_{ee}}{1000} * CF * (1 + HVAC_d)$$

Where:

ΔkWh = first-year electric energy savings

ΔkW = peak electric demand savings

$Watts_{base}$ = Baseline wattage

$Watts_{ee}$ = Efficient bulb wattage

HOU = residential annual operating hours

CF = peak coincidence factor

$HVAC_c$ = HVAC system interaction factor for energy

$HVAC_d$ = HVAC system interaction factor for demand

Table 10-1 shows the savings assumptions that we used to estimate spillover energy and demand savings and details the sources of those assumptions. We assumed that spillover bulbs were standard bulbs and assumed an efficient wattage of 13 watts for CFLs and 9.5 watts for LEDs. These wattages represent typical wattages of the standard CFLs and LEDs. We used the EISA-adjusted baseline wattages for 60-watt incandescent equivalents. All other savings assumptions mirror the ones we used to estimate energy and demand savings for program CFLs.

Table 10-1. Spillover Savings Assumptions

Assumption Type	Assumption Value	Assumption Source
Efficient bulb wattage – CFL	13	Typical standard CFL wattage
Efficient bulb wattage – LED	9.5	Typical standard LED wattage
Baseline wattage	49	EISA-adjusted wattage for 60-watt incandescent equivalents
Hours of use	2.92 hours/day	2013 evaluation of Duke Energy Progress (DEP) Energy Efficient Lighting Program
Summer coincidence factor	0.1138	2013 evaluation of DEP Energy Efficient Lighting Program
Winter coincidence factor	0.0960	
HVAC _c	-0.037	2012 Process & Impact Evaluation of Residential Smart \$aver Energy Efficiency Products Program
HVAC _d – Summer	0.168	
HVAC _d – Winter	-0.500	2013 evaluation of DEP Energy Efficient Lighting Program

Using the savings formula and the savings assumptions above, we estimated per-bulb kWh savings of 36.9 for CFLs and 40.5 for LEDs. We then multiplied the per-bulb savings by the total quantity of spillover CFLs and LEDs. Overall, the program achieved spillover savings of 2,945 kWh, 0.38 summer peak kW, and 0.14 winter peak kW.

Table 10-2. Spillover Savings Summary

Product Type	Total Number of Spillover Bulbs	Total Per-Bulb Savings			Total Spillover Savings		
		kWh	Summer Peak kW	Winter Peak kW	kWh	Summer Peak kW	Winter Peak kW
CFLs	38	36.9	0.0048	0.0017	1,404	0.18	0.07
LEDs	38	40.5	0.0053	0.0019	1,541	0.20	0.07
Total	76	38.7	0.0050	0.0018	2,945	0.38	0.14

Note that the values have been rounded.

We estimated the program spillover rate by dividing the spillover savings by the evaluated gross savings for the survey respondents who received spillover questions.

Equation 10-3. Spillover Rate Formula

$$\text{Spillover Rate} = \frac{\text{Spillover Savings}}{\text{Evaluated Gross Savings in the Respondent Sample}}$$

The resulting spillover rate is 3.2% (Table 10-3).

Table 10-3. Spillover Rate Estimate

	kWh	Summer Peak kW	Winter Peak kW
Spillover savings	2,945	0.38	0.14
Evaluated (ex-post) gross savings in the respondent sample	91,372	11.8	4.3
Spillover rate	3.2%	3.2%	3.2%

Note that the values have been rounded.

11. Appendix B: Detailed Analysis Tables

The Excel spreadsheet embedded below contains detailed analysis of program gross and net impacts. The data in the file is at the kit configuration and month and year of shipment level. The file contains reported (ex-ante) savings, all of the gross savings assumptions, evaluated gross savings, NTGR, evaluated net savings, and recommended gross savings.



Duke
Energy_Detailed An:

12. Appendix C: Chart with Measure-Level Inputs for Duke Energy Analytics

The Excel spreadsheet embedded below contains measure-level inputs for Duke Energy Analytics. Per-bulb savings values in the spreadsheet represent our recommended values and not the evaluated values. We discuss the difference between the recommended and evaluated values in Section 5.2 of this report. Column O in the spreadsheet includes the estimate of NTG ($1-FR+SO$). Consistent with the previous evaluation, Opinion Dynamics included a CFL measure life of 5 years.



DEC Residential CFL
Chart for Duke Ener

13. Appendix D: Detailed Survey Results

The Word document embedded below contains detailed survey results from the participant and general population survey efforts. We provide results in the form of the Wincross tables with breakdown of the survey results across core customer demographic and household characteristics.



DEC Residential CFL
Detailed Participant



DEC Residential CFL
Detailed General Po

14. Appendix E: Participant Survey Instrument

The Word document embedded below contains the participant survey instrument used as part of this evaluation.



DEC and DEO
Residential CFL Parti

15. Appendix F: Detailed Overview of the Net-To-Gross Approach

The Word document embedded below contains a detailed overview of the net-to-gross approach used to estimate program free-ridership and spillover rates.



DEC Residential CFL
NTG Algorithm Over

For more information, please contact:

Kessie Avseikova
Project Manager

617 492 1400 tel
617 497 7944 fax
kavseikova@opiniondynamics.com

1000 Winter St
Waltham, MA 02451

OFFICIAL COPY

Mar 09 2016



Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

San Francisco Bay

510 444 5050 tel
510 444 5222 fax

1999 Harrison St
Suite 1420
Oakland, CA 94612

Madison, WI

608 819 8828 tel
608 819 8825 fax

2979 Triverton Pike
Suite 102
Fitchburg, WI 53711

Orem, UT

510 444 5050 tel
510 444 5222 fax

206 North Orem Blvd
Orem, UT 84057



Save Energy and Water Kit Program

November 18, 2015

Evaluation, Measurement, & Verification for Duke Energy Carolinas

This page left blank.

Prepared by:
Jake Wise
Anna Carvill
Sara Wist
Danielle Kolp
Maggie Buffum

Cadmus

Table of Contents

Evaluation Summary	1
Evaluation Objectives	1
High-Level Impact Findings.....	2
Gross Impacts.....	3
Evaluation Parameters.....	4
High-Level Process Findings	4
Stakeholder Feedback.....	4
Participant Feedback	5
Installation Rates	6
Conclusions and Recommendations	6
Introduction	9
Program Description.....	9
Program Design and Goals	10
Evaluation Methodology.....	12
Stakeholder Interviews.....	12
Participant Surveys.....	12
Savings Analysis	12
Net-to-Gross Analysis	13
Program Comparison.....	16
Process Evaluation Findings.....	17
Stakeholder Interviews.....	17
Communication.....	17
Program Delivery	17
DEC and Implementer Data Tracking.....	19
Market Barriers and Program Challenges.....	20
Program Feedback and Suggestions	20
Participant Surveys.....	20
Save Energy and Water Program Kit.....	20
Program Awareness and Participation	23
Satisfaction.....	27

Impact Evaluation Findings	35
Gross Program Savings	35
Electric Water Heater Saturation.....	35
Energy-Efficient Showerhead.....	35
Faucet Aerators.....	39
Pipe Wrap.....	42
Total Gross Verified Savings	44
Net-to-Gross Findings.....	44
Freeridership.....	44
Spillover	45
Net Program Savings	46
Summary Form.....	48
Appendix A. Participant Household Characteristics and Demographics	49
Appendix B. Save Energy and Water Kit Program Participant Survey	51
Appendix C. Participant Survey Frequency Tables.....	52
Energy Efficient Showerhead Installations.....	52
Faucet Aerator Installations	57
Pipe Insulation	60

Evaluation Summary

Duke Energy engaged Cadmus to perform process and impact evaluations of the Save Energy and Water Kit Program (SEWKP). This report provides findings for the evaluation period from May 13, 2014 through February 27, 2015, for the Duke Energy Carolinas (DEC) jurisdiction only.

The SEWKP was approved as a component of the Energy Efficient Appliances and Devices residential program. The SEWKP was launched in May 2014 and was deployed in North and South Carolina (the Carolinas).

The SEWKP was designed to increase energy efficiency by offering residential customers energy-efficient water fixtures and water pipe insulation to install in high-use fixtures within their homes, thereby extending the market penetration of energy-efficient water measures. The overall program strategy is to reach residential customers who have not adopted energy-efficient water devices. DEC will continue to educate customers about the benefits of energy-efficient water devices while addressing barriers for consumers who have not participated in the program.

Evaluation Objectives

Cadmus sought to document program operations, identify areas for improving program implementation, gauge customer satisfaction with the program, and estimate program energy savings and demand reduction. Table 1 lists the key process and impact evaluation research questions.

Table 1. Evaluation Research Questions

Key Questions	Methods and Data Collection
Process Questions	
What is the level of participation?	Analysis of program participation records provided by DEC.
What are the installation rates for various measures and participants' satisfaction with these measures?	Analysis of survey respondent data.
Are there any recommendations for program process improvements?	Analysis of implementer and program management interviews, and of survey respondent data.
Impact Questions	
What are the measure installation rates and program savings?	Savings analysis using survey respondent results to feed technical reference manual impact calculation algorithms.
What is the program net-to-gross ratio (i.e., freeridership and spillover)?	Estimates calculated from survey responses.
Are there any recommendations for program impact improvements?	Based on all of the above.

High-Level Impact Findings

This section summarizes Cadmus' key impact findings for the evaluation period.

Cadmus conducted a savings analysis to estimate the relative savings contributions from items provided in the SEWKP kit, along with a net-to-gross (NTG) analysis accounting for freeridership and spillover adjustments. Table 2A presents the total savings details for SEWKP measures per kit, and Table 2B presents the savings details for the entire kit.

Table 2A. Save Energy and Water Kit Measure Savings Details

Metric	Energy-Efficient Showerhead 1.5 GPM	Kitchen Aerator 1.0 GPM	Bathroom Aerator 1.0 GPM	Pipe Wrap
Average In-Service Rate	62%	51%	25%	36%
Evaluated Gross Summer Coincident kW per Unit*	0.010	0.027	0.006	0.013
Evaluated Gross kWh per Unit*	240	183	6.45	112
NTG Percentage	91.8%	95.7%	98.8%	90.9%
Evaluated Net Summer Coincident kW Per Unit	0.009	0.027	0.006	0.012
Evaluated Net kWh Per Unit	220.3	175.1	6.4	101.8
Measure Life (Years)	10	9	9	15
Effective Useful Life Net kWh Per Unit	2,203	1,576	58	1,527

* Gross kW or kWh per Unit represents weighted average per Unit Gross kW or kWh savings, adjusted for electric water heater saturation and ISR.

Table 3B. Save Energy and Water Kit Program Kit Savings Details

Metric	Small Kit	Medium Kit	Large Kit
Kit Contents	1 showerhead 1 kitchen aerator 3 bathroom aerators 1 pipe wrap	2 showerheads 1 kitchen aerator 5 bathroom aerators 1 pipe wrap	3 showerheads 1 kitchen aerator 7 bathroom aerators 1 pipe wrap
Average In-Service Rate of Kit Contents	43%	37%	26%
Weighted Average Gross Summer Coincident kW per Kit*	0.076	0.093	0.086
Weighted Average Gross kWh per Kit*	650	811	657
NTG Percentage	92.9%	92.9%	92.9%
Weighted Average Net Summer Coincident kW Per Kit	0.071	0.086	0.079
Weighted Average Net kWh Per Kit	603.9	753.4	610.4
Measure Life (Years)**	10.4	10.3	10.4
Effective Useful Life Net kWh Kit	6,280	7,760	6,348
* Gross kW or kWh per Kit represents per Kit Gross kW or kWh savings, adjusted for electric water heater saturation and ISR.			
** To calculate the entire kit measures' effective useful lives (EULs), Cadmus used a weighted average derived from the kWh savings and EULs of individual kit items.			

Gross Impacts

As a component of the larger Energy Efficient Appliances and Devices Program, SEWKP does not have filed savings goals specific to the kit measures. The evaluated gross energy savings and demand reductions are shown in Table 3 and Table 4, respectively.

Table 4. Program Projected, Claimed, and Evaluated Gross Energy Impacts

Program	Gross Savings Goal (kWh)	Gross Reported Savings (kWh)	Total Gross Evaluated Savings (kWh)	Per Participant Gross Savings (kWh)
SEWKP	N/A	N/A	10,228,421	725

Table 5. Program Projected, Claimed, and Evaluated Gross Peak Demand Impacts

Program	Gross Savings Goal (kW)	Gross Reported Savings (kW)	Total Gross Summer Coincident Evaluated Savings (kW)	Per Participant Gross Savings (kW)
SEWKP	N/A	N/A	1,197	0.085

Net Impacts

Based on 14,117 SEWKP kits being delivered to the DEC service territory during the evaluation period, the program achieved overall net energy savings and demand reduction of 9,502,203 kWh and 1,139 kW, respectively, as shown in Table 5 and Table 6. On a per-participant basis, the program realized net energy savings of 673 kWh and a net peak demand reduction of 0.081 kW.

Table 6. Program Net Energy Impacts

Program	Total Net Savings (kWh)	Per Participant Net Savings (kWh)
SEWKP	9,502,203	673

Table 7. Program Net Summer Coincident Peak Demand Impacts

Program	Total Net Savings (kW)	Per Participant Net Savings (kW)
SEWKP	1,139	0.081

Evaluation Parameters

Cadmus used participant survey responses to conduct the SEWKP impact evaluation. Table 7 lists this activity's parameters, along with the estimated precision.

Table 8. Evaluated Parameter with Value, Units, Precision, and Confidence

Program	Parameter	Value	Units	Confidence/Precision
SEWKP	Participant survey responses	Varies by question	Varies by question	±6.7% precision at the 90% confidence interval

Table 8 lists the start and end dates for the impact evaluation activities.

Table 9. Sample Period Start and End Dates

Evaluation Component	Sample Period	Dates Conducted	Total Conducted
Stakeholder Interviews	–	May 26 and June 3, 2015	2
Participant Surveys (to inform savings and NTG analysis)	April 1, 2014– February 15, 2015	June 18–June 25, 2015	150

High-Level Process Findings

The section summarizes Cadmus' key process findings for the evaluation period.

Stakeholder Feedback

Cadmus focused the interviews with program stakeholders (program management and implementation staff) on elements of program process and delivery, which have fundamentally remained unchanged since program inception in the spring of 2014. Stakeholders reported that the program ran smoothly, they communicated frequently with each other, and that the program successfully reached participation goals.

Stakeholders reported minimal challenges with the SEWKP this year. Both program and implementer staff discussed the merits of establishing an online store in the future. No inventory or logistical challenges are anticipated from allowing participants to customize their kit measures.

Participant Feedback

Cadmus asked survey respondents a series of questions designed to inform the process and impact evaluation efforts. As shown in Table 9, we focused the survey on verifying measure installation, assessing participating customers' decision making, and gathering household characteristics.

Table 10. Survey Instrument Detail

Survey Topic	Question Description	Question Count as % of Total Survey
Verification	Primarily installation and use of the kit items	34%
Attribution	Participation likelihood and indirect effects	24%
Demographics	Household and customer characteristics	22%
Satisfaction	Program features and delivery	15%
Marketing and Awareness	Communication channel, mode, and customer motivation	5%

Survey respondents most often reported installing the showerheads and kitchen aerators included in the SEWKP kits (with installation rates greater than 60% and 50%, respectively). Customer respondents reported lower installation rates for the bathroom aerator (34%) and pipe insulation (36%).

Of customer respondents who did not currently have the measures installed (either because they never installed the measures or installed and subsequently removed the measures), only a few (less than 3%) cited an explanation, as shown in Table 10.

Table 11. Reasons Provided for Not Installing Kit Measures

Measure	Survey Response
Showerheads	Does not fit/would have to change pipes Does not work with handheld shower fixture
Kitchen Aerators	Does not fit on faucet Does not work with water filter Low flow/not enough water pressure
Bathroom Aerators	Does not fit on faucet Low flow/not enough water pressure

Surveyed customer respondents reported high satisfaction ratings across all categories:¹

- Overall satisfaction with kit measures (76%—high satisfaction).
- Overall satisfaction with the SEWKP (83%—high satisfaction).
- Overall satisfaction with DEC (78%—high satisfaction).

Installation Rates

Table 11 shows the achieved installation rates of kit measures provided to survey respondents. The original program assumption was a 75% installation rate for each measure.

Table 12. Installation Rates by Measure

Measure	Installation Rate
Showerheads	62%
Kitchen Aerators	51%
Bathroom Aerators	25%
Pipe Wrap	36%

Conclusions and Recommendations

Cadmus' evaluation revealed a few areas for potential improvements. This section, which summarizes our conclusions resulting from process and impact evaluation activities, provides potential areas DEC could explore to further refine program operations or expand program benefits.

1. **Conclusion: Program communication and delivery proved positive and effective.** The program manager and implementer clearly indicated that the program functions well. According to stakeholders, frequent and reciprocal communications aided in the program success of exceeding its participation goals.

Recommendation: Given that the program functions well, continue using the same program delivery mechanism and processes and continue to contract with vendors, Energy Federation Incorporated (EFI), and Direct Options. Proceed with the planned expansion into two newly proposed jurisdictions.

2. **Conclusion: The program achieved high customer satisfaction levels.** Surveyed customers reported high satisfactions levels with kit measures, the program, and DEC, yielding results of 76%, 83%, and 78%, respectively.

Recommendation: Continue to field customer satisfaction (CSAT) cards and react quickly to feedback provided.

¹ Cadmus measured satisfaction on a scale from 0 to 10, with 0 being “very dissatisfied” and 10 being “very satisfied.” Then we defined satisfaction by ranges: high 8–10; moderate 5–7; and low 0–4. For example, 76% of customer respondents provided a score between 8 and 10 for their overall satisfaction with kit items, making overall satisfaction with the kit high.

3. **Conclusion: Asymmetry occurs in the program kit measure counts and information.** The number of bathroom aerators provided to survey respondents differed from the number reported. Such asymmetry presents implications for the realization rate. For this evaluation, Cadmus used the number of bathroom aerators provided to customers of three, five, and seven for small, medium, and large kits, respectively. This assumption yielded a lower realization rate for that measure than when using the reported numbers of two, four, and five.

Recommendation: While the reported number of bathroom aerators arose from a conservative estimate of measures likely installed, which is prudent to ensuring accurate savings analysis results, Cadmus recommends that DEC provide a number of bathroom aerators equivalent to the number reported. This approach is consistent with that used for other DEC programs and is industry standard practice.

4. **Conclusion: The program successfully encourages energy-saving behaviors among survey respondents, and may lead them to increase energy savings by installing additional quantities of items.** Survey respondents did not indicate a strong correlation between receiving a kit with more measures and having higher installation rates. The results showed the same installation rate for showerheads in the medium and large kit, with relatively lower installation rates for bathroom and kitchen aerators in the large kits. Based on these data, providing more measures may not necessarily translate into more installations, and there are diminishing returns for the large kit configuration.

Recommendation: Consider streamlining the quantity of kit items and reallocating resources away from the large kit.

5. **Conclusion: Customer respondents and the implementer favored having an online store.** Surveys revealed that over 70% of customer respondents would likely install showerheads if they could choose the color or finish. Establishing an online store present three benefits: (1) increasing CSAT by allowing customization (as validated by CSAT responses requesting this); (2) reducing delivery time through an expedited shipping process; and (3) providing indirect exposure and potential advertising of other programs via the one-stop-shop aspect of an online store.

Recommendation: Proceed with implementing an online store that allows participants to self-register and customize the color and/or finish of their kit measures. Leverage this online channel to further capture participants' motivations to conserve resources: customer survey respondents most often indicated wanting to upgrade water heaters and install lighting measures. Additionally, it would be beneficial to track the number of enrollment requests received via business reply cards (BRC) versus call-in versus an online store. As the entry method drives the delivery costs, that cost could be greatly reduced through an online store that allows near real-time enrollments.

6. **Conclusion: The adoption of a 75% in-service rate (ISR) across all measures is not realistic.** The reported installations of kit measures are each less than 75%, with showerheads at 62%, kitchen at aerators at 51%, bathroom aerators at 25%, and pipe wrap at 36%.

Recommendation: Assign kit measure-specific ISRs.

7. **Conclusion: The original reported savings estimates undervalue showerhead and kitchen aerator savings and overvalue bathroom aerator and pipe wrap savings.** Energy savings and demand reduction are primarily a function of the technical reference manual (TRM) used and, to some degree, of the data collected from survey respondents.

Recommendation: Re-evaluate the impact assumptions for kit measures. Leverage new values into program planning and execution.

Introduction

Program Description

Free of charge, DEC provides showerheads, aerators, and insulated pipe wrap to eligible, residential customers via a BRC. DEC markets the program solely through a BRC direct-mail campaign, subject to program eligibility requirements. To be eligible, a customer must not have received a program kit as a result of participating in a past campaign, they must not reside in a multifamily dwelling, and they must have an electric water heater.

At this time, DEC does not wish to market the program to customers who are not eligible; therefore, they only send BRCs to prescreened, eligible customers. In the future, DEC has expressed interest in expanding the program into two new jurisdictions (Duke Energy Progress and Duke Energy Indiana), and adding a web-based ordering platform.

By opting in, confirming they have an electric water heater, and asserting they will install the measures, customers can have a kit shipped directly to their home, free of charge. DEC markets the kits by presenting the free offer by mail or through phone ordering options and providing free home delivery. Customers receive a small, medium, or large kit with varying amounts of the following devices: energy-efficient (1.0 gpm) bath and kitchen aerators; 1.5 gpm energy-efficient showerheads; and water heater pipe wrap and Teflon tape. The kit also includes energy-saving educational materials, directions, and items to help with installation.

Table 12 shows the available measure bundles, with the actual size for each customer based on the number of full bathrooms in their home.

Table 13. Measure Kit Configurations

Small: 1 Full Bath (0-1,200 SF)	Medium: 2 Full Baths (1,201-2,800 SF)	Large: 3 Full Baths (1,201-2,800 SF)
Kit Bundle #1: <ul style="list-style-type: none"> • 1 Showerhead • 3 Bath Aerators (additional aerators for double sinks or half bath) <ul style="list-style-type: none"> ▪ 2 reported to EE* • 1 Kitchen Aerator • 1 Roll Plumbers Tape • Informational Flyer • Rubber Jar Opener • 15' of Insulated Pipe Wrap (enough to cover 5' of pipe) <ul style="list-style-type: none"> ▪ 5' reported to EE* Cost: \$12.71**	Kit Bundle #2: <ul style="list-style-type: none"> • 2 Showerheads • 5 Bath Aerators (additional aerators for double sinks or half bath) <ul style="list-style-type: none"> ▪ 4 reported to EE* • 1 Kitchen Aerator • 2 Rolls Plumbers Tape • Informational Flyer • Rubber Jar Opener • 15' of Insulated Pipe Wrap (enough to cover 5' of pipe) <ul style="list-style-type: none"> ▪ 5' reported to EE* Cost: \$16.92**	Kit Bundle #3: <ul style="list-style-type: none"> • 3 Showerheads • 7 Bath Aerators (additional aerators for double sinks or half bath) <ul style="list-style-type: none"> ▪ 5 reported to EE* • 1 Kitchen Aerator • 3 Rolls Plumbers Tape • Informational Flyer • Rubber Jar Opener • 15' of Insulated Pipe Wrap (enough to cover 5' of pipe) <ul style="list-style-type: none"> ▪ 5' reported to EE* Cost: \$21.09**

* For bath aerators and insulated pipe wrap, DEC adopted a conservative approach, providing more measures to customers than it reports in the Energy Efficiency (EE) database.

** Kit costs provided by EFI.

Program Design and Goals

DEC designed the SEWKP to increase residential customers' energy efficiency by offering them energy-efficient water fixtures and water pipe insulation to install in high-use fixtures within their homes, thereby extending the market penetration of energy-efficient water measures.

DEC's primary goal with the SEWKP is to reach residential customers who have not adopted energy-efficient water devices. In an interview, the program manager said DEC looks at programs holistically by taking a portfolio approach to achieving targets. DEC will continue to educate customers about the benefits of energy-efficient water devices while addressing barriers for consumers who have not participated in the program. Additionally, DEC strives to meet the following goals through the program:

- Achieve participation targets set by jurisdiction (Kentucky, North Carolina, Ohio, and South Carolina).²
- Achieve target participation and energy impacts through delivery of SEWKP kits and through participant installation of energy-saving measures in eligible households.
- Create program sustainability by reaching new participants every year who have not received a SEWKP kit in the previous three years.

² SEWKP participation goals were included in the larger Energy Efficient Appliances and Devices Program.

Table 14 and Table 15 list program goals and achievements for the two Carolina jurisdictions in 2014 and 2015.

Table 14. 2014 Save Energy and Water Kit Program Participation Achievement*

Market Size	Eligible Participants (A)	BRCs Mailed (B)	Kits Shipped (C)	Market Penetration (B/A)	Take Rate (C/B)	Percentage of Eligible Participants	Percentage of Total Kits Shipped
NC	333,872	44,833	6,446	13%	14%	74%	72%
SC	115,281	16,414	2,485	14%	15%	26%	28%
Total	449,153	61,247	8,931	14%	15%	100%	100%

* Source: DEC (2014 goal: 6,934; data represents April to December 2014).

Table 15. 2015 Save Energy and Water Program Kit Participation Achievement*

Market Size	Eligible Participants (A)	BRCs Mailed (B)	Kits Shipped (C)	Market Penetration (B/A)	Take Rate (C/B)	Percentage of Eligible Participants	Percentage of Total Kits Shipped
NC	333,872	35,850	9,667	11%	27%	74%	73%
SC	115,281	12,379	3,500	11%	28%	26%	27%
Total	449,153	48,229	13,167	11%	27%	100%	100%

* Source: DEC (2015 goal: 13,385; data represents January 1 to July 15, 2015).

Evaluation Methodology

In evaluating DEC's SEWKP, Cadmus identified the following objectives:

- Estimate energy savings and demand reduction resulting from installing SEWKP Kit measures through savings analysis;
- Assess freeridership and spillover through participant surveys;
- Assess program performance against goals; and
- Assess participant experience, satisfaction, and decision-making motivations.

Stakeholder Interviews

Cadmus interviewed one program management staff member and one implementation staff member to capture insights about program operations and challenges:

- SEWKP Program Manager: (May 26, 2015)
- EFI Program Manager: (June 3, 2015)

Participant Surveys

Cadmus designed participant surveys to cover process and impact evaluation topics, including the following:

- Use of SEWKP kit items;
- Energy-saving behavior changes;
- Freeridership;
- Spillover;
- Decision making; and
- Satisfaction

Cadmus conducted surveys by telephone and analyzed the survey responses. We attempted to contact 2,770 customers who received a SEWKP kit between May 13, 2014, and February 27, 2015, according to program records. Of those, 150 respondents completed the survey, for a response rate of 5.4%. The survey sampling methodology achieved precision of $\pm 6.7\%$ at the 90% confidence interval, based on the total of 14,117 participants receiving a SEWKP kit during the evaluation period.

Savings Analysis

Cadmus conducted a savings analysis to determine the SEWKP kits' contribution to household gross energy savings. We collected data through participant surveys and used energy-savings algorithms taken

from the Mid-Atlantic and Illinois TRMs.³ We then used the analysis results, in conjunction with the NTG analysis, to estimate net energy savings for items included in the kits.

Net-to-Gross Analysis

To inform savings calculations, Cadmus conducted a NTG analysis. We used participant surveys to collect the data necessary to estimate participant freeridership and spillover.

Cadmus calculated the NTG estimate at the program level using participant survey responses. We estimated measure-level freeridership, then weighted each measure-type freeridership estimate by its proportion of the total evaluated gross population energy savings. These values summed to an overall program-level freeridership estimate. We calculated spillover separately from freeridership, based on participants' level of attribution of the program's influence on additional actions they took outside the program to save energy.

Cadmus calculated freeridership estimates for showerheads, aerators, and water heater and pipe insulation based on participants' intentions to purchase and use these energy-efficient measures before receiving them through the program. We used survey questions to delineate between survey respondents who indicated an intention to purchase and install these measures in the program's absence, but who would not have done so, and those who would have followed through and acquired these measures in the program's absence. We also used survey questions to determine *when* participants would have acquired these measures in the program's absence.

In assessing freeridership, we asked customer respondents a series of questions about whether they would have purchased and installed any of the high-efficiency kit measures within the next year in the program's absence. Table 16 presents freeridership questions administered to survey respondents along with the response options, skip patterns, and scoring decrements associated with each question. Text in parentheses indicate a program skip in the survey for that given response option. If a response option does not have a trailing value in parentheses, then we asked the next question of the participant. Values in brackets indicate the freeridership scoring we applied to a respondent's initial freeridership estimate of 100%.⁴ We considered all respondents freeriders at the outset of the analysis, then gave them the opportunity to prove as non-freeriders through their answers to the questions in Table 16.

³ Cadmus relied primarily on the Mid-Atlantic TRM (and Illinois TRM for aerators as it distinguishes between kitchen n bathroom as Mid-Atlantic did not) for the savings analysis; however, we avoided using deemed values in favor of primary data whenever possible. Because this analysis relied, in part, on participant responses, results may have been affected by self-selection bias, false-response bias, or positive-result bias.

⁴ Cadmus based the freeridership scoring on the probability assessment provided in: Nation Action Plan for Energy Efficiency. *Handbook on DSM Evaluation*. Pg. 75, Table 5-1. 2007. Available online: http://www.epa.gov/cleanenergy/documents/suca/evaluation_guide.pdf

Table 16. Freeridership Questions, Response Options, Skip Patterns, and Scoring Decrements

E1. If these items were not offered by the Save Energy and Water Kit Program from DEC, would you have ...	E2. Let me make sure I understand. When you say you would not have installed the same equipment or made the same upgrades, do you mean that you...	E3. Which water-efficiency upgrades or installations would you still have made on your own if you had not participated in the Save Energy and Water Kit Program? [Multiple selections allowed]	E4. For the equipment that you indicated you would have installed or upgraded without the Save Energy and Water Kit Program, when did you make that decision? Would you say it was...	E5. (IF E4=2 ASK E5) So is it correct that you decided to install or upgrade these energy-saving measures or items after you learned about the Save Energy and Water Kit Program?	E6. (IF E5=2, ask E6. otherwise, skip to next section) When did you make the decision to install the package of equipment or make the upgrade(s)? Was it...	E7. If the program had not been available, would you have made the improvement (or all the improvements)...	*E8. When you say you would have installed [KIT MEASURE] on your own, without the program, would you have installed the same number of [KIT MEASURE] that you installed from the DEC kit?
1. Installed ALL of the energy-efficient equipment or made upgrades on your own (SKIP TO E4)	1. Would not have installed ANY of the equipment or made any upgrades at all [-100%]	1. Energy-efficient showerhead	1. Before you learned of the Save Energy and Water Kit Program (SKIP TO E7)	1. Yes [-100%]	1. Before you learned about the Save Energy and Water Kit Program	1. At roughly the same time [-0%]	Yes [-0%]
2. Installed NONE of the energy-efficient equipment or none of the upgrades on your own	2. Or, that you would have installed SOME of the equipment or made some of the upgrades	2. Kitchen and bathroom faucet aerators	2. After you learned about the program	2. No	2. After you learned about the program, but before you received the kit in the mail [-0%]	2. Within a few months [-25%]	No (-50%)

E1. If these items were not offered by the Save Energy and Water Kit Program from DEC, would you have ...	E2. Let me make sure I understand. When you say you would not have installed the same equipment or made the same upgrades, do you mean that you...	E3. Which water-efficiency upgrades or installations would you still have made on your own if you had not participated in the Save Energy and Water Kit Program? [Multiple selections allowed]	E4. For the equipment that you indicated you would have installed or upgraded without the Save Energy and Water Kit Program, when did you make that decision? Would you say it was...	E5. (IF E4=2 ASK E5) So is it correct that you decided to install or upgrade these energy-saving measures or items after you learned about the Save Energy and Water Kit Program?	E6. (IF E5=2, ask E6. otherwise, skip to next section) When did you make the decision to install the package of equipment or make the upgrade(s)? Was it...	E7. If the program had not been available, would you have made the improvement (or all the improvements)...	*E8. When you say you would have installed [KIT MEASURE] on your own, without the program, would you have installed the same number of [KIT MEASURE] that you installed from the DEC kit?
3. Installed SOME of the equipment or made some of the upgrades on your own (SKIP TO E3)	98-99. DK-RF (SKIP TO NEXT SECTION)	3. Pipe insulation	98-99. DK-RF (SKIP TO E7)	98-99. DK-RF [-100%]	98-99. DK-RF	3. Within a year [-50%]	98-99. DK-RF [-25%]
98-99. DK-RF (SKIP TO E3)		98-99. DK-RF				4. More than a year out [-100%]	
						5. Never [-100%]	
						98-99. DK-RF [-25%]	

* Asked for each kit measure selected in question E3.

Cadmus weighted the measure-level freeridership estimates by verified measure installations, and weighted the overall program-level freeridership estimate by the relative proportion of each measure-level freerider estimate to the total evaluated gross program population energy savings.

Spillover occurs when participants purchase energy-efficient measures or adopt energy-efficient practices due to participation in an energy efficiency program, but choose not to participate (or otherwise are unable to participate) in an incentive program for those particular measures. These customers' savings are not credited to the program until a spillover assessment has been conducted.

Cadmus used the self-report surveys to assess participant spillover. We asked respondents about energy-efficient products and if they installed any high-efficiency products in their home since participating in the program. If survey respondents had made energy-efficient improvements and/or purchased products, we asked how important the program was on their purchasing decisions ("not at all," "not too," "somewhat," or "very" important).

Cadmus estimated energy savings for measures that survey respondents said the program proved "very important" in their decision to purchase.⁵ We calculated the spillover percentage for a measure by dividing the sum of additional spillover savings reported by participants across the whole program by the total reported gross program savings achieved by program survey respondents, as shown in the equation below:

$$\text{Spillover \%} = \frac{\sum \text{Spillover Measure Evaluated Gross kWh Savings for All Survey Respondents}}{\sum \text{Program Measure Evaluated Gross kWh Savings for All Survey Respondents}}$$

Program Comparison

Although this is the first evaluation of the SEWKP, Cadmus has previously evaluated residential water measures provided by other DEC programs and is currently evaluating the National Theatre for Children Schools Program. While these school kit programs differ in delivery and full kit content from SEWKP, the comparison provides some context for the program.

The following recent evaluations by Cadmus are of programs in the Carolina System that include residential water measures:

- *Process and Impact Evaluation of the 2013–2014 Residential Neighborhood Program in the Carolina System* (November 2014)
- *Impact Evaluation of the Energy Efficiency for Schools Program (The National Theatre for Children (NTC)) in the Carolina System* (August 2013)
- *Process Evaluation of the Energy Efficiency for Schools Program (The National Theatre for Children (NTC)) in the Carolina System* (November 2012)

⁵ We estimated savings for non-like program measures using the Mid-Atlantic TRM v5.0.

Process Evaluation Findings

This chapter presents Cadmus’ process evaluation findings for DEC’s SEWKP kits. The findings are divided into two sections: stakeholder interviews and participant surveys. Table 18 lists the primary evaluation activities and the dates they were conducted.

Table 17. Process Evaluation Data Collection and Analysis

Evaluation Component	Dates of Data Collection	Total Conducted
Stakeholder Interviews	May 26–June 3, 2015	2
Participant Surveys	June 18–25, 2015	150

Stakeholder Interviews

Cadmus interviewed program stakeholders to gain an in-depth understanding of the program and to identify its successes and challenges. Discussion results follow, presented by topic.

Communication

Program staff and partners reported communicating on a regular basis, with communications being positive and effective. DEC conducts weekly conference calls with EFI to discuss CSAT survey results, call center volumes and associated escalations, and inventory levels. During those meetings, EFI reports to DEC regarding issues identified during the week, and DEC shares results from CSAT card responses. In addition, EFI stated that kit conversion rate forecasts greatly aided in their ability to maintain adequate inventory levels and to frontload kit assembly.

Program Delivery

SEWKP delivers kits to eligible single-family home dwellers (SFHDs). They begin the delivery process by sending a monthly mailer to the DEC jurisdiction—North Carolina, and South Carolina—inquiring as to the presence of an electric water heater in a household. If the respondent has an electric water heater, has not previously participated in SEWKP, and has not previously participated in a similar program (e.g., Home Energy House Call or related low-income or K-12 program), the respondent is deemed eligible to participate.

Per the workflow shown in Figure 1, DEC compiles a list of eligible SFHDs, reconciles this with customer demographic data (e.g., number and square footage of bathrooms) and, based on these data, configures participant-specific kits. DEC sends the list of participants and associated kit configurations to Direct Options, which generates and mails out BRCs, each with a unique ID and barcode, to the eligible population. In parallel, EFI receives the list of participants and associated kit configurations, and uploads this into their Kit Manager database. EFI then orders a measure inventory and begins preassembling kits, based on conversion rate forecasts provided by DEC.

Upon receiving the BRC, a customer may choose one of two options for program enrollment:

- Return the completed BRC via mail; or
- Call the EFI support center at the number provided on the BRC.

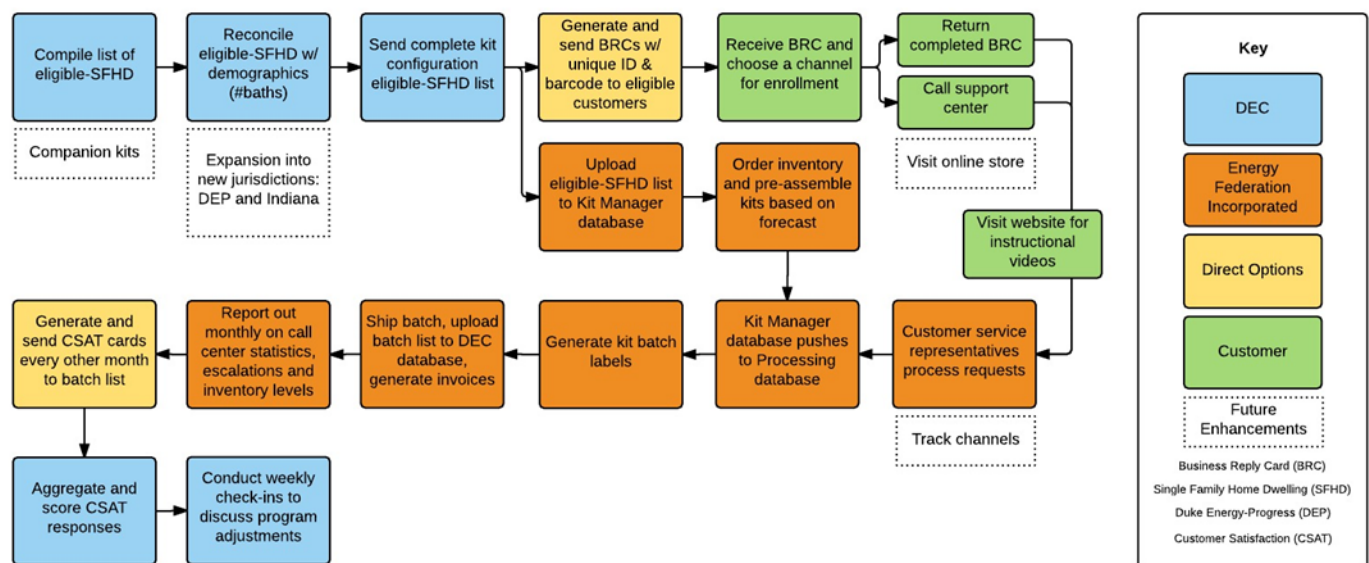
The BRC also includes a website URL (duke-energy.com/savewater/) that provides instructional videos to aid in installation.

For both methods, an EFI customer service representative processes the enrollment requests, entering these into the EFI Kit Manager database, which pushes these to the Processing database. This results in the generation of a label for each kit in the batch. EFI ships the batch of kits upon reaching a pallet threshold, uploads the batch list to DEC's database, and generates an invoice for the batch. The entire process takes four to six weeks.

On a monthly basis, EFI provides reports of call center volumes and escalations and of inventory levels. Direct Options generates and mails CSAT cards every other month to the batch list after kits have been sent. DEC scores and aggregates CSAT responses, using these data points to inform program adjustments (along with metrics discussed in weekly calls between DEC and EFI).

Figure 1. Program Delivery Process

Duke Energy Save Energy and Water Kit Program: As- Is Workflow



DEC plans to expand the program in two ways:

1. Home Energy House Call, Low Income, and K12 programs' participants that receive measures, but not entire kits will be sent companion kits to provide the whole bundle of measures for installation.
2. In addition to continuing the program in Kentucky, North Carolina, Ohio, and South Carolina, expanding the program into Duke Energy Progress during Q4-2015 and into Indiana on January 1, 2016.

DEC is also developing plans to provide customers with a third enrollment option: visiting an online store to register themselves, select customized measure colors or finishes (such as for showerheads), and otherwise upgrade their kits.

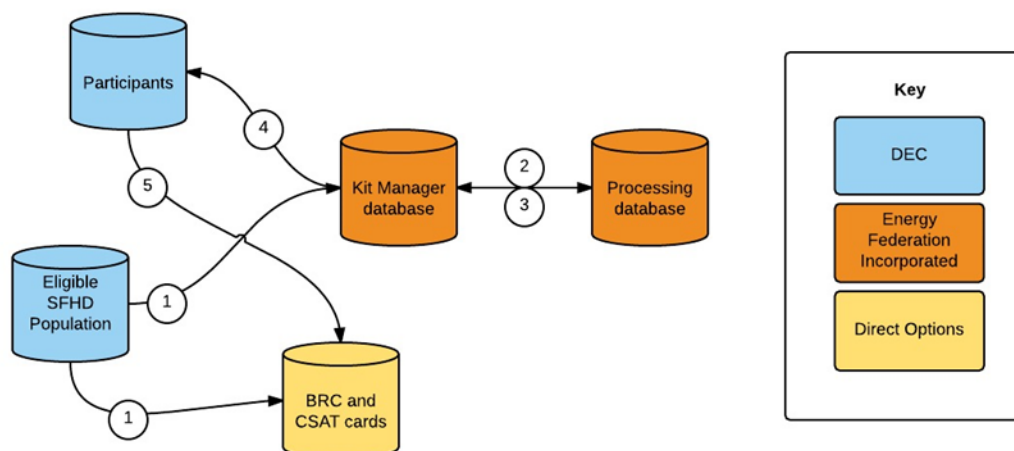
Promotion and Marketing

Eligible customers receive a BRC containing a description of kit items, information regarding electric water heater consumption, and an opportunity to reduce their monthly energy bills by signing up for a free SEWKP kit. No other promotion or marketing have been discussed.

DEC and Implementer Data Tracking

As shown in Figure 2, DEC maintains a database of eligible and participating SFHDs. As the first step in the process, DEC simultaneously provides a list of eligible SFHDs to EFI and Direct Options. When EFI's call center receives a phone request for enrollment or a BRC via mail, it inputs the data into its Kit Manager database. EFI uploads DEC's eligible SFHD list data to its Kit Manager database and joins that population data with a verified list of participants it tracks in its Processing database. In the Processing database, EFI collects the following data attributes: unique identifier, name, phone, premise and mailing address, registration date, record created date, kit type, and shipping date. Interviewees did not identify issues regarding data availability or tracking.

Figure 2. Data Flow



Market Barriers and Program Challenges

Program and implementer staff agreed that the program functions well and they receive sufficient resources. Although program uptake started slowly, with a 13.2% adoption rate in 2014, this rate more than doubled in 2015. Those interviewed agreed that much of the program success stems from its simplicity: it serves as a well-supported do-it-yourself program. The BRC highlights the installation process, as do the kit materials and instructional videos available online.

Program Feedback and Suggestions

Program and implementation staff provided feedback and suggestions about program elements that worked well and about possible changes.

Both program and implementer staff discussed the merits of establishing an online store. Benefits from pursuing this option include (but are not limited to):

- Increasing CSAT by allowing customization (validated by CSAT responses requesting this ability);
- Reducing delivery time through an expedited shipping process; and
- Indirect exposure to other programs through the online store's one-stop shopping aspect.

The implementer noted that the kit measures are now a couple years old, and better products may be on the market to increase customer receptivity. The implementer does not anticipate inventory or logistical challenges due to customization resulting from the launch of an online store.

Additionally, both respondents discussed the benefits of tracking the number of enrollment requests received via BRC versus call-in, as the entry method drives delivery costs, which would likely be greatly reduced through an online store allowing for near real-time enrollment.

Program staff are responsive to CSAT scores. For example, when customers notified DEC that aerators did not fit, program staff revised the BRC and kit language to include instructions for requesting an adapter.

Participant Surveys

Cadmus surveyed 150 randomly selected DEC customers who received a SEWKP kit (105 customers from North Carolina and 45 customers from South Carolina). This section presents results by topic. Except where noted, Cadmus excluded "don't know" and "refused" responses, reflected in accompanying n-values.

Save Energy and Water Program Kit

Cadmus asked survey respondents about their experiences with the SEWKP kit, including their recollection of receiving kit items, using them, and their satisfaction with the items.

DEC sends the kits in small, medium, and large bundle configurations, each of which includes different numbers of items as outlined above in Table 12. Nearly one-half of surveyed participants received a

small kit (47%, n=150), while 9% received a large kit. According to program records, the 150 surveyed participants received a total of 244 showerheads and 788 faucet aerators through the program.

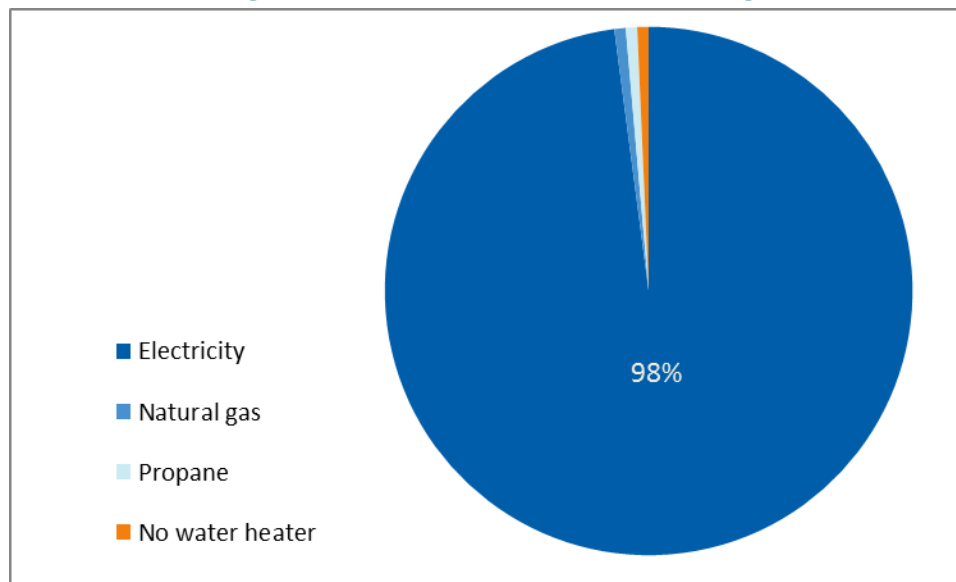
Table 18. Kit Configurations Received by Survey Participants

Kit Configuration	Showerheads in Kit	Bathroom Aerators in Kit	Kitchen Aerators in Kit	Count of Surveyed Participants	Percentage of Surveyed Participants*
Small kit	1	3	1	70	47
Medium kit	2	5	1	66	44
Large kit	3	7	1	14	9
Total	244	638	150	150	100

* The percentage of survey participants provided with a small, medium, or large kit configuration aligned with the population: 44% (small), 46% (medium), and 10% (large).

DEC targets households for the SEWKP that heat water with electricity, and 98% (n=144) of participants confirmed they have an electric hot water heater (Figure 3).

Figure 3. Fuel Source for Hot Water Heating



Source: Participant Survey Question B1. What is the fuel used by your water heater? (n=144)

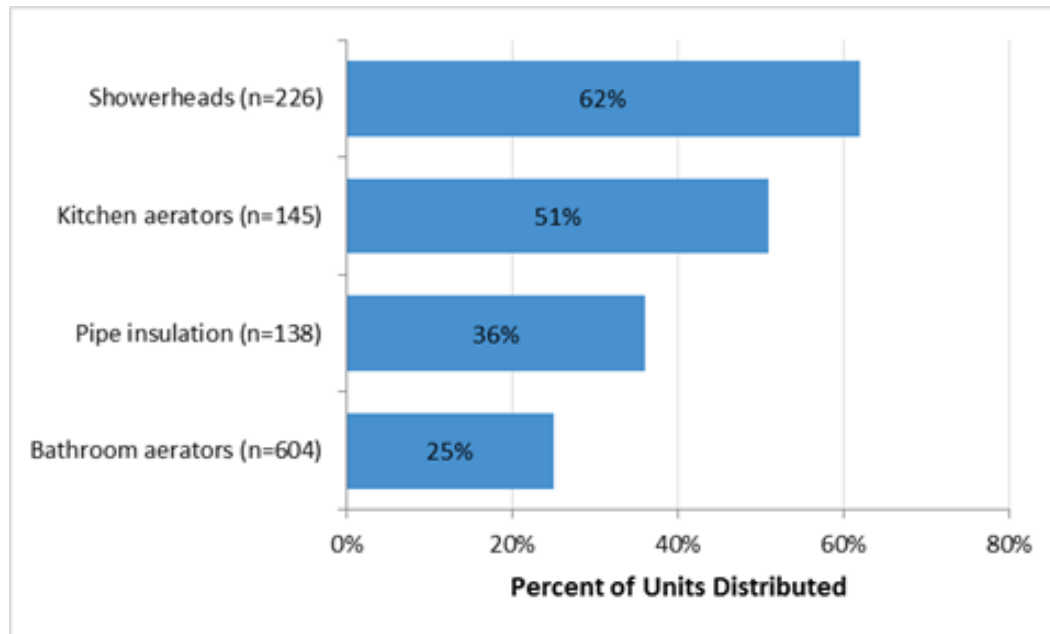
Use of Kit Measures

Cadmus asked survey respondents a series of questions regarding their use of kit measures. Specifically, we asked participants to indicate the following:

- The number of measures currently installed.
- Whether they had attempted to install any measures not currently installed.
- What problems they encountered if unsuccessful in installing a measure.

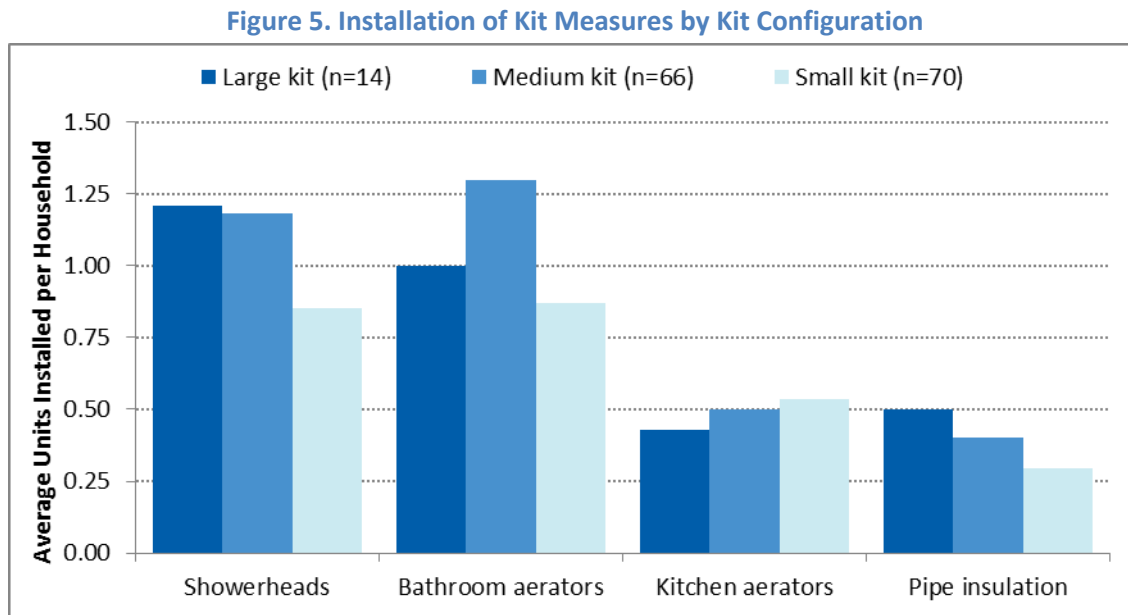
Participants most often reported installing showerheads included in the kits (62%, n=226 showerheads), as shown in Figure 4. One-half of kitchen aerators (51%, n=145 aerators) and only one-quarter of bathroom aerators (25%, n=604 aerators) were installed. Approximately one-third of participants installed the pipe insulation (36%, n=138). Note that the figure shows the percentage of a measure, not the percentage of people; for example, 62% of the 226 showerheads shipped to these 150 survey respondents were installed.

Figure 4. Installation Rates of Water-Saving Kit Measures



Source: Participant Survey Questions. Is the [item] / how many [items] that you received in the Save Energy and Water Kit Program kit are currently installed in your home? (n=150)

Figure 5 indicates that participants who received the large kit bundle did not install more items. Participants who received three showerheads installed an average of 1.2 per household, the same amount as those who received two showerheads. Customers who received the large kit bundle actually installed fewer bathroom aerators (an average of 1.0 of seven provided in this kit) than those who received the medium kit bundle (an average of 1.3 of five provided in this kit).



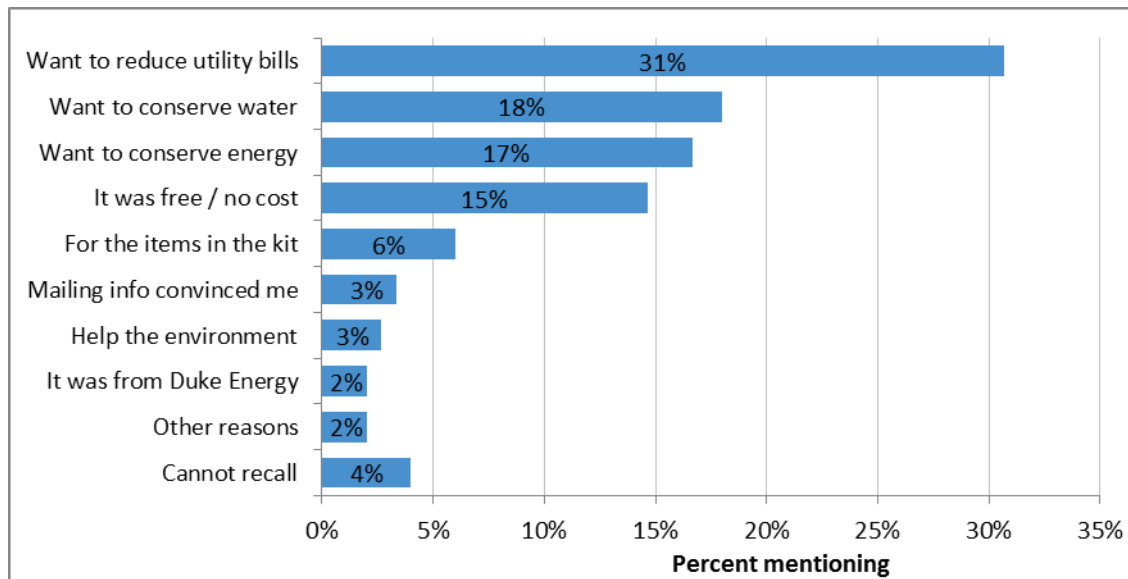
Source: Participant Survey Questions. Is the [item] / how many [items] that you received from the Save Energy and Water Kit Program kit are currently installed in your home? (n=150)

The participant survey, provided in Appendix B, contains further details regarding the installation and use of items in the SEWKP kits.

Program Awareness and Participation

As shown in Figure 6, customers' most commonly cited reason for choosing a SEWKP kit was to save money on utility bills, followed by wanting to conserve water and energy, and the lack of out-of-pocket costs. Ninety-six percent of participants (n=150) could state a reason for participating.

Figure 6. Main Reason for Participating in the Save Energy and Water Kit Program

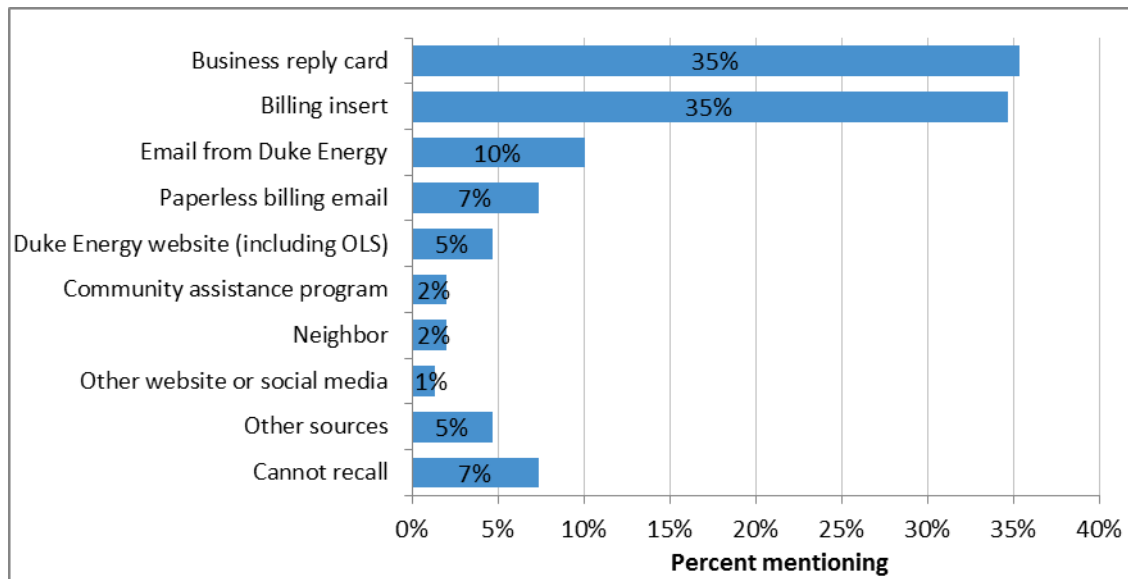


Source: Participant Survey Question C2. Please think back to the time when you were deciding to participate in the Save Energy and Water Kit Program. What was the main reason you decided to take advantage of this offer?
(n=150)

As shown in Figure 7, most customers who participated in SEWKP stated they learned of the program from BRCs and bill inserts⁶ from DEC, with e-mail and DEC's website being the next most common sources. Ninety-three percent (n=150) of customers receiving a SEWKP kit could recall how they first heard about the program.

⁶ DEC did not provide bill inserts and e-mails as a marketing element of this program. It is likely that survey respondents confused the BRC with a bill insert.

Figure 7. How Customers Became Aware of the Save Energy and Water Kit Program

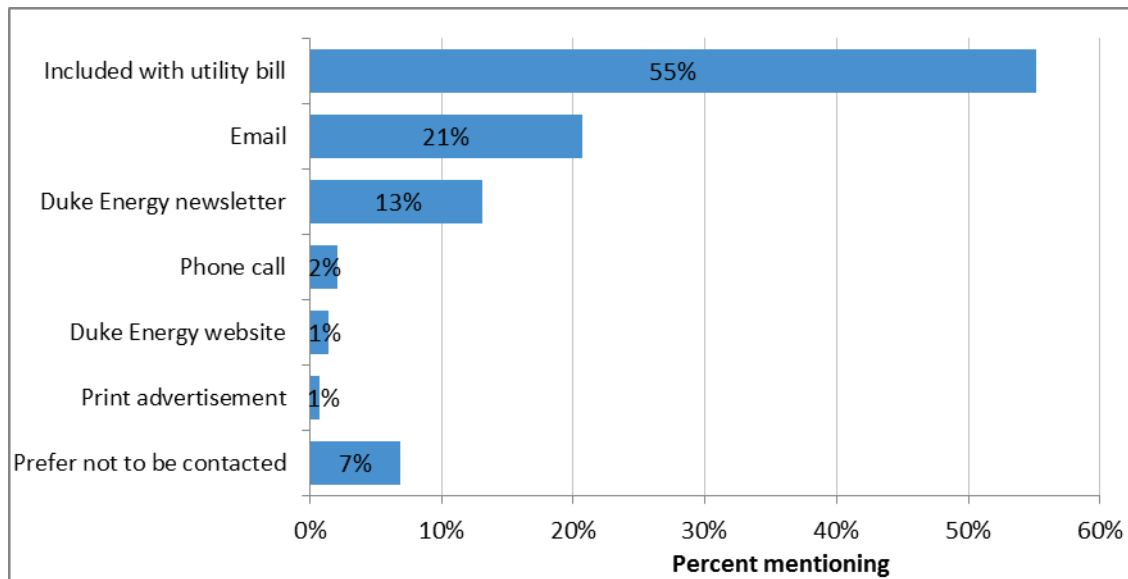


Source: Participant Survey Question C1: How did you first hear about the Save Energy and Water Kit Program? (n=150; multiple responses permitted; percentages are of total number of survey respondents and exceed 100%).

Note: OLS represents online services

As shown in Figure 8, when asked which method they prefer for receiving information to help save on utility bills, customers most commonly (55%; n=145) cited information included with their utility bills, although 21% prefer e-mail and 13% prefer to read about it in a DEC newsletter. Very few customers cited phone calls, the DEC website, or traditional advertising, and only 7% said they do not want to receive such information.

Figure 8. Survey Respondents' Preferred Method for Receiving Information



Source: Participant Survey Question C3. If you are interested in receiving additional information that could help you save money on your bill, what is your preferred method to receive that information? (n=145)

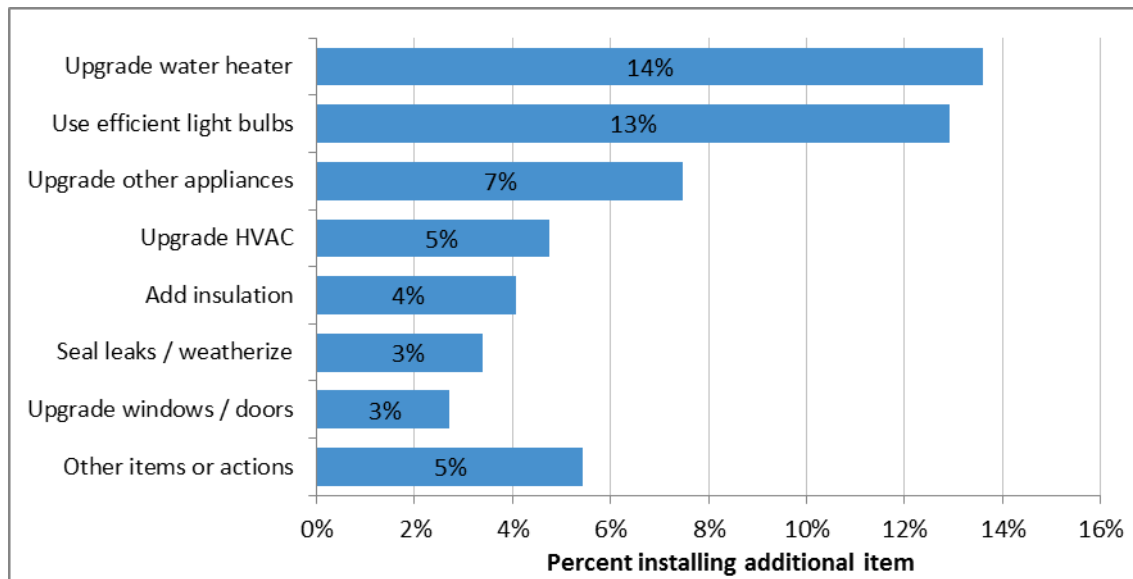
Although very few customers cited DEC's website as a preferred source for learning about ways to save on utility bills, 37% (n=148) of surveyed participants reported visiting the website to find more information about the SEWKP kit.

Additional Measures Installed Since Receiving Kit

As shown in Figure 9, Cadmus asked participants if they installed additional energy efficiency measures after receiving the program kit: 35%⁷ (n=147) said they had, including 14% who upgraded to a more efficient electric water heater (the most frequent additional action taken).

⁷ This 35% represents those who reported installing an additional measure and who reported what they installed. At first, 41% said they installed additional measures, but 10 of these survey respondents said "none" when asked which specific measures they installed.

Figure 9. Installation of Additional Items Since Participating in the Program



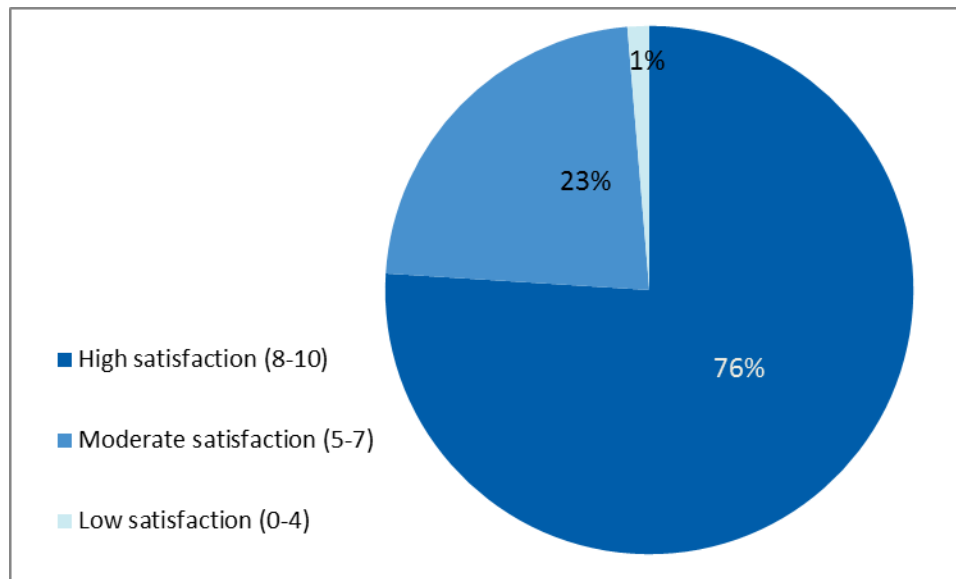
Source: Participant Survey Questions F1: Since participating in the program, have you installed any energy-efficient equipment or made other changes to improve the energy efficiency of your home, changes for which you did NOT receive a rebate or otherwise provided for free? F2: Was one of the improvements an upgrade to a more energy-efficient water heater? F4: What other energy-efficient improvements have you made? (n=147; multiple responses permitted; percentages are of total number of survey respondents)

Satisfaction

Program Satisfaction, Improvements, and Benefits

Cadmus asked participants to rate their satisfaction with kit measures on a 0 to 10-point scale, where 0 indicated being “extremely dissatisfied” and 10 indicated being “extremely satisfied.” As shown in Figure 10, 76% of survey respondents (n=150) provided a satisfaction rating of 8 or higher, including 47% who rated the kit measures as a 10. Only 1% of survey respondents gave a program satisfaction rating of 4 or lower; these two participants said their dissatisfaction resulted from not being able to use all kit items.

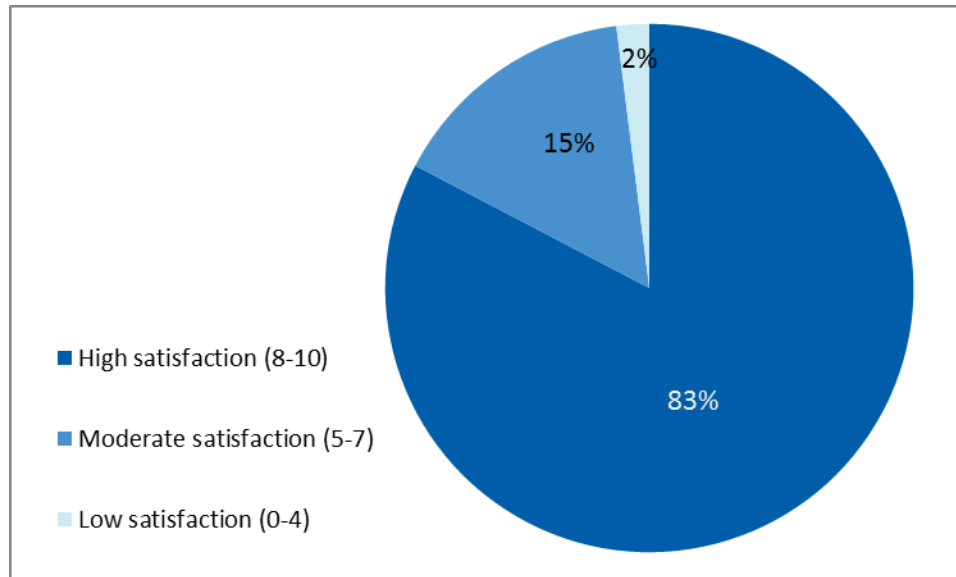
Figure 10. Overall Satisfaction with Measures in the Program Kit



Source: Participant Survey Question D1: On a scale from 0 to 10, with 0 being *very dissatisfied* and 10 being *very satisfied*, what is your overall satisfaction with the items that were provided in the Save Energy and Water Kit Program kit? (n=150)

Cadmus also asked surveys participants to rate their satisfaction with the SEWKP overall. As shown in Figure 11, 83% of survey respondents (n=150) provided a satisfaction rating of 8 or higher, including 53% who rated the program a 10. Only 2% of survey respondents rated the program a 4 or lower. Two of these three participants said their dissatisfaction resulted from not being able to use all kit items, while the third participant complained that their utility bill was not lower than before program participation.

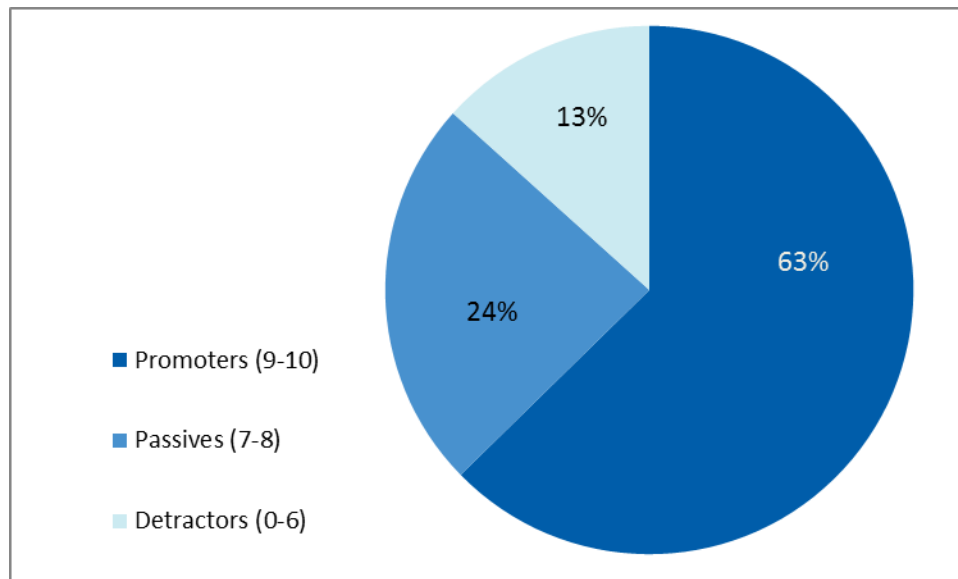
Figure 11. Overall Satisfaction with the Save Energy and Water Kit Program



Source: Participant Survey Question D3: Using the same scale from 0 to 10, overall, how would you rate the Save Energy and Water Kit Program? (n=150)

Participants rated the likelihood they would recommend the SEWKP to others, also on a 0-to-10 scale, with 0 being “not at all likely to recommend” and 10 being “extremely likely to recommend.” As shown in Figure 12, 63% of survey respondents (n=150) provided a recommendation score of 9 or 10, 57% of whom rated this as a 10. Only 13% of survey respondents rated their likelihood of recommending the program as a 6 or lower.

Figure 12. Likelihood of Recommending the Save Energy and Water Kit Program



Source: Participant Survey Question D10: On a 0 to 10 scale, with 0 meaning you are “not at all likely to recommend,” and 10 meaning you are “very likely to recommend,” how likely are you to recommend the program to a friend? (n=150)

When asked for suggestions to improve the program, 14% (n=150) of surveyed participants responded. Table 20 summarizes their suggestions, showing that several customers suggesting measures or equipment the program could offer (although many of these suggested items would not be appropriate for a mail order kit program due to size and expense). Multiple customers suggested having more functions (e.g., adjustability) or options (e.g., design, fit) for faucet aerators and showerheads. Three survey respondents (2%; n=150) requested a larger quantity of a kit measure (two who wanted more aerators and one who wanted more pipe insulation tape).

Table 19. Participant Suggestions to Improve the Save Energy and Water Kit Program

Suggestion	Count of Responses (n=21)
Offer items not currently included in kit: <ul style="list-style-type: none"> • Water-saving attachment for outdoor hose • Water-saving toilet devices • Water heater blanket • “Efficient water pumps” • “Hot water circulator” • LEDs • “It seemed like the kit was incomplete” 	7
More functionality/options for aerators and showerheads	4
Include a larger quantity of a measure already included in the kit: <ul style="list-style-type: none"> • Faucet aerators (2 customers) • Pipe insulation tape (1 customer) 	3
Lower bills/information about saving money on bills	3
Higher water pressure/higher flow aerators and showerheads	2
Send out more kits/get more customers to participate	2

When specifically asked what other equipment or upgrades could be included in the kits, 23% (n=150) made the suggestions summarized in Table 21, most frequently suggesting lighting and weather-stripping/air-sealing measures.

Table 20. Participant Suggestions for Additional Equipment or Upgrades to Include in the Save Energy and Water Kit Program

Suggested Equipment or Upgrade	Count of Responses (n=35)
Efficient light bulbs (CFL, LED)	10
Weather-stripping/air-sealing	6
Efficient water heaters	4
Insulation	3
Lighting occupancy sensors	2
HVAC or ventilation filters	2
Appliance upgrades other than water heaters	2
Solar panels/solar-powered measures	2
A tool or app to monitor HVAC usage	2

Suggested Equipment or Upgrade	Count of Responses (n=35)
Home audit/energy assessment	2
Other suggestions (one mention each): <ul style="list-style-type: none"> • More showerheads • Toilet “flapper” to conserve water • New windows • Efficient phone chargers 	4

Note: Some survey respondents made multiple suggestions; therefore, the number of responses exceeds the number of survey respondents (n=35).

When asked if their energy or water usage had changed since installing items from the SEWKP kit, 39% (n=136) said they noticed a difference. Forty-four survey respondents specified these changes, as summarized in Table 22. Most of these participants noticed a decrease in their utility bills, while three participants reported improved water flow, two said their hot water lasted longer, and two said installing the kit items fixed a leaky faucet or showerhead.

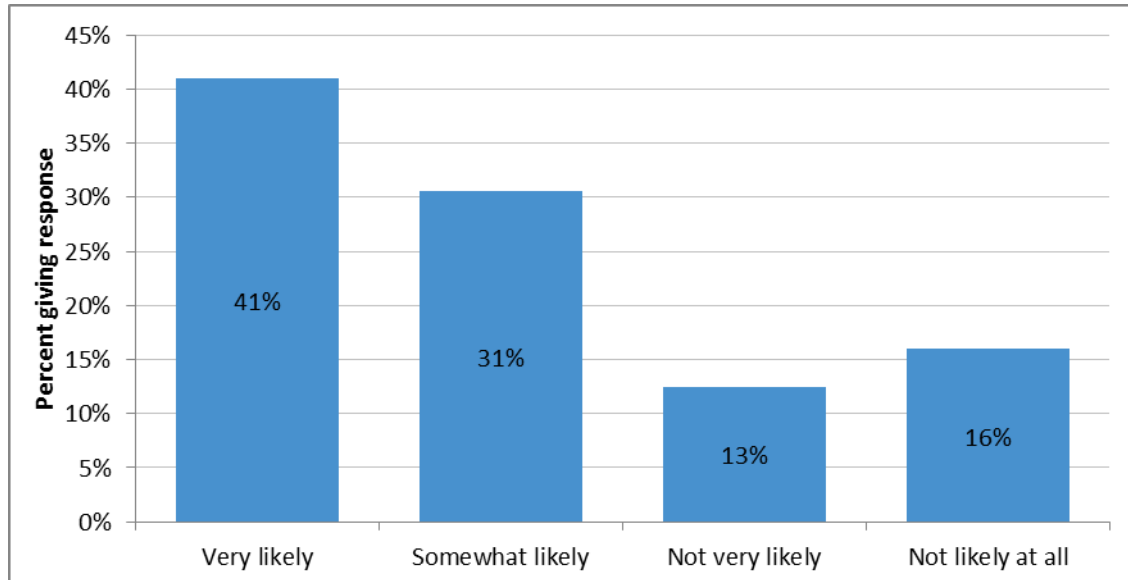
**Table 21. Changes in Home Energy Usage Noticed
Since Participating in the Save Energy and Water Kit Program**

Response	Count of Responses (n=44)
Lower utility bills	34
Using less water	6
Water flow from faucets/shower is better	3
Hot water lasts longer	2
Using less energy	2
Installing kit measure fixed a leak	2
Home is warmer in winter	1

Note: Some survey respondents cited multiple reasons; therefore, the number of responses exceeds the number of survey respondents (n=44).

Cadmus asked participants if an online store that would allow them to choose different models of energy-efficient showerheads would make them more likely to install these showerheads. As shown in Figure 13, 41% (n=144) said this would make them very likely to install the showerheads, and another 31% said it would make them somewhat more likely.

Figure 13. Likelihood that an Online Store Offering Choices Would Increase the Likelihood of Installing Energy-Efficient Showerheads

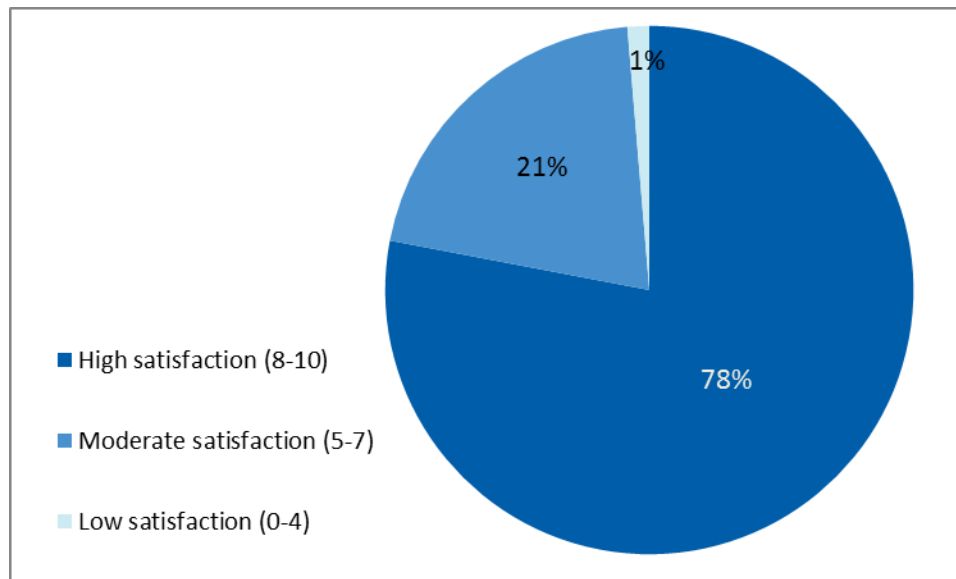


Source: Participant Survey Question D7: In the future, would the presence of an online store where you could pick the color or finish of your showerhead increase the likelihood of you actually installing more of these types of showerheads? (n=144)

Utility Satisfaction

Cadmus also asked participants to rate their satisfaction with DEC as an energy provider. As shown in Figure 14, 78% of survey respondents (n=150) provided a satisfaction rating of 8 or higher, which includes 49% who rated DEC as a 10. Only 1% of survey respondents rated their satisfaction with DEC at 4 or lower. The two survey respondents who gave DEC a low satisfaction rating both cited increasing energy costs as the reason for their dissatisfaction.

Figure 14. Overall Satisfaction with DEC



Source: Participant Survey Question D5: Using the same scale from 0 to 10, overall, how would you rate DEC as your energy provider? (n=150)

Impact Evaluation Findings

This section presents the results of Cadmus' impact evaluation of the DEC SEWKP, divided into four sections: Gross Program Savings, Total Gross Verified Savings, Net-to-Gross Findings, and Net Program Savings. Table 23 lists the primary evaluation activities and dates.

Table 22. Impact Evaluation Data Collection and Analysis

Evaluation Component	Participation Dates	Data Source(s)	Dates of Data Collection/Analysis
Savings Analysis	April 1, 2014 - February 15, 2015	<ul style="list-style-type: none"> Participant surveys (n=150) Mid-Atlantic TRM Illinois TRM Ohio Draft TRM 	June-July 2015
NTG Analysis	April 1, 2014 - February 15, 2015	<ul style="list-style-type: none"> Participant surveys (n=150) 	June-July 2015

Gross Program Savings

Cadmus used TRM assumed values to determine household energy savings resulting from using items included in the SEWKP kit. This section presents savings analysis details and high-level results for the showerheads, faucet aerators, and pipe wrap included in the kits.

Electric Water Heater Saturation

DEC claims SEWKP electricity savings from the reduction in water use from electric water heaters. Cadmus asked surveyed participants to verify their water heating fuel, and 97.9% indicating having an electric water heater. We applied this percentage to weight each measures' savings to reflect actual electricity program savings.

Energy-Efficient Showerhead

The program kits included either one, two, or three showerheads (based on kit configuration). Survey results indicated that, overall, participants installed 62% of the showerheads provided in the kits. The program achieved realization rates of 168% and 63% for energy savings (kWh) and demand reduction (kW), respectively. This section details equations and survey averages used to determine *ex post* savings, and reports quantities and savings verified.

Equation

The Mid-Atlantic TRM⁸ defines the equation below to calculate energy savings associated with replacing one showerhead with one energy-efficient showerhead, as defined in Table 24 below.

$$\left[\frac{\left(\frac{GPM_{base} - GPM_{low}}{GPM_{base}} \right) * \# \frac{people}{household} * \frac{gallons}{day} * \frac{days}{year}}{\# \frac{showerheads}{household}} \right] * \frac{\rho * (Temp_{SH} - Temp_{IN}) * \left(\frac{Btu}{MMBtu} \right)}{DHW RE / \left(\frac{kWh}{MMBtu} \right)}$$

Cadmus asked survey respondents how many showers are taken per week for each energy-efficient showerhead, as well as how long, on average, these showers last. This information was used to estimate the number of gallons used per year for one showerhead, as referenced in Table 25. Cadmus adapted the Mid-Atlantic TRM to reflect the surveyed variables, resulting in the equation below.

$$\left(\frac{GPM_{base} - GPM_{low}}{GPM_{base}} \right) * \# \frac{showers}{week} * \frac{minutes}{shower} * \frac{weeks}{year} * GPM_{base} * \frac{\rho * (Temp_{SH} - Temp_{IN}) * \left(\frac{Btu}{MMBtu} \right)}{DHW RE / \left(\frac{kWh}{MMBtu} \right)}$$

The Mid-Atlantic TRM calculates summer coincident kW savings using the formula below. The number of hours is defined as “average number of hours per year spent using showerhead” (Mid-Atlantic Technical Reference Manual). Cadmus used the average survey responses for the number of showers taken per

⁸ Northeast Energy Efficiency Partnerships, Inc. *Mid-Atlantic Technical Reference Manual*. 2015. Available online: <http://www.neep.org/mid-atlantic-technical-reference-manual-v5>

week per showerhead and the average number of minutes per shower to determine annual hours of use.

$$\frac{kWh * CF}{hours}$$

Table 23. Variables in the Energy Savings Calculation for Showerheads

Variable	Value		Source	Description
<i>GPMbase</i>	2.2		Mid-Atlantic TRM	Assumed flow rate of original showerhead; gallons/minute
<i>GPMlow</i>	1.5		Program Specification	Flow rate of kit showerhead; gallons/minute
$\frac{showers}{week}$	First Showerhead	11.3	Survey	Average number of showers per week
	Second Showerhead	8.6		
	Third Showerhead	1.0		
$\frac{minutes}{shower}$	First Showerhead	9.1	Survey	Average number of minutes per shower
	Second Showerhead	12.1		
	Third Showerhead	5.0		
$\frac{days}{year}$	365		Convention	Number of days in the year
ρ	8.33		Convention	Density of water; gallons/pound
<i>TempSH</i>	105°F		Mid-Atlantic TRM	Assumed temperature of water used for shower
<i>TempIN</i>	60.9°F		Mid-Atlantic TRM	Assumed temperature of water entering house
$\frac{Btu}{MMBtu}$	1,000,000		Convention	Conversion factor from Btu to MMBtu
<i>DHW RE</i>	0.98		Mid-Atlantic TRM	Recovery efficiency of electric water heater
$\frac{MMBtu}{kWh}$	0.003412		Convention	Conversion factor from MMBtu to kWh
<i>Summer CF</i>	0.00371		Mid-Atlantic TRM	Coincidence Factor
<i>Hours</i>	First Showerhead	89	Survey	Average hours of use per year per showerhead.
	Second Showerhead	90		
	Third Showerhead	4		

Survey-Averaged Values

When possible, Cadmus used averaged survey responses in place of TRM assumed values to provide recent, regional values, tailored to DEC's service territory. While we did not specifically ask surveyed participants for the average number of people per household, average gallons per day consumed per person, or average number of showerheads per household, we asked other questions to determine the gallons consumed per year per showerhead and the average yearly hours-of-use per showerhead.

Specifically, we did ask slightly modified survey questions regarding the number of showers and the average length of showers to produce the necessary values (using more intuitively answered questions). Table 25 shows survey-averaged results for these values.

Table 24. Survey Average Results per Showerhead Installed

Number of Showerheads	Average Showers per Week	Average Minutes per Shower	Average Gallons per Week	Average Gallons per Year	Average Hours-of-Use per Year
First Showerhead	11.3	9.1	225.8	11,741	88.9
Second Showerhead	8.6	12.1	229.3	11,924	90.3
Third Showerhead	1.0	5.0	11.0	572	4.3

Cadmus determined showerhead ISRs for households receiving one showerhead, two showerheads, and three showerheads. Overall, survey respondents installed 62% of the showerheads they received through the SEWKP. This ISR decreased with each additional showerhead provided in the kit. Table 26 presents the specific results.

Table 25. Showerhead In-Service Rates

Showerheads Provided	Total Showerheads Reported*	Total Showerheads Verified	Average Showerheads Installed	Average In-Service Rate
1	58	48	0.83	83%
2	126	75	1.19	60%
3	42	17	1.21	40%
Total	226	140	1.04	62%

* Reported totals based on the number of responses that could be verified (not including “don’t know” responses and responses where the value verified was greater than the value reported), and may not sum to the total number of measures reported in the tracking database.

Cadmus found a number of discrepancies when comparing the reported quantities of showerheads from the SEWKP tracking database to quantities reported by survey respondents. Ten survey respondents verified installing two or three showerheads, while DEC reported sending a kit with only one showerhead. One respondent verified installing three showerheads when DEC reported sending a kit with only two showerheads. To provide the best possible estimate of savings, Cadmus removed these survey respondents from average ISR calculations.

Gross Verified Savings

Cadmus verified 168% of energy savings (kWh) and 63% of demand reduction (kW) from expected savings values. Table 27 shows savings and realization rates by the number of reported showerheads. In addition to the showerhead savings per kit, the table also provides the total aggregate showerhead savings.

Table 26. Showerhead Reported and Gross Verified Savings

Showerheads Provided	Reported Savings (kWh)	Reported Savings (Summer Coincident kW)	Verified Savings (kWh)	Verified Savings (Summer Coincident kW)	Realization Rate (kWh)	Realization Rate (kW)
1	144	0.0164	333	0.0139	232%	85%
2	287	0.0328	482	0.0200	168%	61%
3	431	0.0492	336	0.0204	78%	41%
Average Per Showerhead	143.54	0.01147	240.47	0.0104	168%	63%
All Showerheads	3,384,726	386	5,670,385	245	168%	63%

Faucet Aerators

SEWKP kits included one kitchen faucet aerator and either three, five, or seven bathroom faucet aerators. Survey results indicate that participants installed 51% of kitchen faucet aerators provided in the kits, providing program realization rates of 300% and 390% for energy savings (kWh) and demand reduction (kW), respectively. Participants installed bathroom faucet aerators at a lower rate (25% overall). Realization rates for bathroom aerators were 9% and 76% of energy savings (kWh) and demand reduction (kW), respectively. This section details TRM equations and survey averages used to determine *ex post* savings, and reports quantities and verified gross savings.

Equation

Cadmus used the equation below, from the Illinois TRM,⁹ to find total energy savings per faucet aerator, and to determine results separately for kitchen and bathroom faucet aerators. Table 28 describes the variables in this equation.

$$ElecDHW * \left[\frac{\left((GPM_{base} * L_{base} - GPM_{low} * L_{low}) * \frac{\# \text{ people}}{\text{household}} * \frac{\text{days}}{\text{year}} * DF \right)}{\frac{\# \text{ faucets}}{\text{household}}} \right] * EP_{Gelec} * ISR$$

⁹ Illinois Commerce Commission. *Illinois Technical Reference Manual for Energy Efficiency*. 2015. (Note: equations are the same for the 2014 and 2015 TRM.) Available online: <http://www.icc.illinois.gov/electricity/TRM.aspx>

Table 27. Variables in the Energy Savings Calculation for Faucet Aerators

Variable	Kitchen	Bathroom		Source	Description
<i>ElecDHW</i>	97.9%	97.9%		Survey	Proportion of water heating supplied by electric resistance
<i>GPMbase</i>	2.2	2.2		Illinois TRM	Assumed gallons per minute of the original faucet aerator
<i>Lbase</i>	4.5	1.6		Illinois TRM	Average minutes of daily use per person of original faucet aerator
<i>GPMlow</i>	1.0	1.0		Program Specification	Gallons per minute of faucet aerator provided in kit
<i>Llow</i>	4.5	1.6		Illinois TRM	Average minutes of daily use per person of faucet aerator provided in kit
$\frac{\#people}{household}$	2.56	2.56		Illinois TRM	Average number of people per house, single family
$\frac{days}{year}$	365.25	365.25		Convention	Average number of days in a year
<i>DF</i>	75%	90%		Illinois TRM	Drain factor
$\frac{\#faucets}{household}$	1.0	2.83		Illinois TRM	Average number of faucets per household
<i>EPGelec</i>	0.0969	0.0795		Illinois TRM	Energy per gallon of water used by faucet supplied by electric water heater; kWh/gallon
<i>ISR</i>	51%	Three Aerators	29%	Survey	In-service rate
		Five Aerators	26%		
		Seven Aerators	14%		
<i>Summer CF</i>	0.0220	0.0220		Illinois TRM	Summer coincidence factor

Survey-Averaged Values

Cadmus averaged survey responses to determine kitchen and bathroom faucet aerator ISRs. Table 29 shows the overall rates for kitchen and bathroom faucet aerators separately, with different ISRs for bathroom faucet aerators based on the quantity provided in the kit. Consistent with showerheads, bathroom faucet aerator ISRs decrease as more units are included in the kit.

Table 28. Faucet Aerator In-Service Rates

Faucet Aerators Provided	Total Faucet Aerators Reported*	Total Faucet Aerators Verified	Average Faucet Aerators Installed	Average In-Service Rate
Kitchen Aerator	145	74	0.51	51%
Bathroom Aerators	604	152	0.93	25%
Bathroom Aerator (3)	198	57	0.86	29%
Bathroom Aerator (5)	315	82	1.30	26%
Bathroom Aerator (7)	91	13	1.00	14%

* Reported totals are based on the number of responses that could be verified (totals do not include “don’t know” responses and responses with verified values greater than the value reported), and may not sum to the total number of measures reported in the tracking database.

Cadmus found one discrepancy between the quantity of bathroom faucet aerators in the SEWKP tracking database and the quantity a survey respondent claimed receiving. One participant verified installing four bathroom faucet aerators, while DEC reported sending the participant only three bathroom faucet aerators. To provide the best estimate of savings possible, Cadmus removed this respondent from average ISR calculations.

Gross Verified Savings

Cadmus verified 300% of energy savings (kWh) and 390% of demand reduction (kW) for kitchen faucet aerators compared to expected savings. Bathroom faucet aerators achieved lower realization rates of 9% for energy savings (kWh) and 76% for demand reduction (kW). Table 30 shows savings and realization rates by the number of reported faucet aerators. In addition to the aerators per kit savings, the table also provides the total aggregate kitchen and bathroom aerator savings.

Table 29. Faucet Aerators Reported and Gross Verified Savings

Faucet Aerators Provided	Reported Savings (kWh)	Reported Savings (Summer Coincident kW)	Verified Savings (kWh)	Verified Savings (Summer Coincident kW)*	Realization Rate (kWh)	Realization Rate (kW)
Average per Kitchen Aerator	61.14	0.00489	183.37	0.0272	300%	390%
All Kitchen Aerators	863,129	99	2,588,641	384	300%	390%
Bathroom Aerators (3)*	220	0.0251	22	0.0220	10%	88%
Bathroom Aerators (5)*	367	0.0419	34	0.0332	9%	79%
Bathroom Aerators (7)*	514	0.0586	26	0.0255	5%	43%
Average per Bathroom Aerator	73.37	0.00586	6.45	0.0063	9%	76%
All Bathroom Aerators	4,495,851	513	395,017	388	9%	76%

* Per participant receiving the corresponding number of bathroom faucet aerators.

Pipe Wrap

Every SEWKP kit included 15 feet of pipe wrap (enough to cover five linear feet of pipe). Survey results indicated that participants installed 36% of the pipe wrap provided in the kits, resulting in realization rates of 72% for both energy savings (kWh) and demand reduction (kW). This section details the equations and survey averages used to determine *ex post* savings, and reports quantities and verified savings.

Equation

The Mid-Atlantic TRM provided the pipe wrap equation, which was used to determine the total energy savings for pipe wrap installed. Table 31 describes the equation variables.

$$\frac{\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) * (L * C) * \Delta T * \frac{Hours}{year}}{\eta_{DHW} / (Btu/kWh)}$$

Table 30. Variables in Energy Savings Calculation for Pipe Wrap

Variable	Value	Source	Description
R_{exist}	1.0	Mid-Atlantic TRM	Assumed R-value of existing pipe (no insulation)
R_{new}	3.0	Program Specification	R-value of pipe wrap provided in kit
L	5.0	Program Specification	Length of pipe wrap installed; feet
C	0.176	Survey	Circumference of pipe; feet (2.12 inches)
ΔT	65°F	Mid-Atlantic TRM	Temperature difference between water in pipe and ambient air
$\frac{Hours}{year}$	8,760	Convention	Hours per year
η_{DHW}	0.98	Convention	DHW recovery efficiency
Btu/kWh	3,413	Convention	Conversion factor from Btu to kWh

Survey-Averaged Results

Cadmus used survey averages to determine the ISR for pipe wrap provided in the kit and to verify the diameter of pipes on which pipe wrap was installed. The average ISR for pipe wrap was 36% among survey respondents. Cadmus used the question, “Is any of the pipe insulation from the kit currently installed on your hot water pipes?” to determine the ISR; If a participant answered “yes,” we assumed they installed all 5 feet of pipe wrap; we did not verify the specific amount installed. On average, participants insulated pipes that are 2.12 inches in diameter. Cadmus converted this survey-averaged value to circumference for use in the savings equation. Table 32 shows reported and verified quantities of pipe wrap.

Table 31. Pipe Wrap In-Service Rate and Diameter

Pipe Wrap (feet) Provided	Total Pipe Wrap Reported*	Total Pipe Wrap Verified*	Average In-Service Rate	Average Diameter of Pipe (inches)
5	138	50	36%	2.12

* Count of participants, not feet of pipe wrap.

Gross Verified Savings

Cadmus verified 72% of energy savings (kWh) and 72% of demand reduction (kW) for pipe wrap. Table 33 shows reported and verified savings for pipe wrap across all participants.

Table 32. Pipe Wrap Reported and Verified Savings

Pipe Wrap Provided	Reported Savings (kWh)	Reported Savings (Summer Coincident kW)	Verified Savings (kWh)	Verified Savings (kW)	Realization Rate (kWh)	Realization Rate (kW)
Per Unit of Pipe Wrap (5 feet)	153.95	0.0176	111.52	0.013	72%	72%
All Pipe Wrap	2,173,360	248	1,574,378	180	72%	72%

Total Gross Verified Savings

Table 34 presents reported and gross verified savings and corresponding realization rates. Although individual measure realization rates vary, the program overall realized 94% of energy savings and 96% of demand reduction compared to reported values. Showerheads produced the largest savings, based on the survey-reported information on shower length and frequency, followed by kitchen aerators, which exhibited twice the installation rate of bathroom faucet aerators.¹⁰

Table 33. Program Gross Verified Savings

Measure	Reported		Gross Verified		Realization Rates	
	Energy Savings (kWh)	Demand Reduction (Summer Coincident kW)	Energy Savings (kWh)	Demand Reduction (Summer Coincident kW)	Energy Savings (kWh)	Demand Reduction (kW)
Showerheads	3,384,726	386	5,670,385	245	168%	63%
Kitchen Aerators	863,129	99	2,588,641	384	300%	390%
Bathroom Aerators	4,495,851	513	395,017	388	9%	76%
Pipe Wrap	2,173,360	248	1,574,378	180	72%	72%
Total	10,917,066	1,246	10,228,238	1,197	94%	96%

Net-to-Gross Findings

Freeridership

For energy-efficient showerheads, faucet aerators, and pipe insulation, Cadmus estimated freeridership using participant responses to the survey freeridership questions (shown in Table 35). This section details those freeridership questions, response options, and scoring approach. Cadmus calculated freeridership separately for each program measure, and weighted each measure-level estimate by the

¹⁰ The Illinois TRM assumes three times the hot water usage in a kitchen than in a bathroom.

evaluated *ex post* gross population energy savings to arrive at an overall program freeridership estimate of 7.9%.

Table 34. Freeridership for Program Kit Measures

Measure	Evaluated <i>Ex Post</i> Gross Population kWh Savings	n	Freeridership
Showerheads	5,670,385	62	9.0%*
Kitchen Aerators	2,588,641	34	5.1%*
Bathroom Aerators	395,017	37	2.0%*
Pipe Wrap	1,574,378	46	9.9%*
Overall	10,228,421	N/A	7.9%**

* Weighted by verified measure installations.

** Weighted by evaluated *ex post* gross population energy savings.

Table 36 contains the number of survey respondents by measure who were estimated at a freeridership level greater than zero. Cadmus used these survey respondents' answers to when they would have installed the measure on their own in the absence of the program to determine their final freeridership estimate.

Table 35. Freeriders by Measure

Timing Response	Freeridership	Showerhead (n)	Bathroom Aerator (n)	Kitchen Aerator (n)	Pipe Insulation (n)
At roughly the same time	100%	2	0	0	2
Within a few months	75%	3	1	1	1
Within a year	50%	2	2	2	2
Don't know	25%	1	0	0	0
Total	N/A	8	3	3	5

Spillover

Spillover occurs when participants choose to purchase energy-efficient measures or adopt energy-efficient practices due to participation in an energy efficiency program, but choose not to participate (or otherwise are unable to participate) in an incentive program for those particular measures. These customers' savings are not automatically credited to the program.

Cadmus used the self-report surveys to assess participant spillover. We asked participants about energy-efficient products and if they installed any high-efficiency products in their home since participating in the program. If survey respondents made energy-efficient improvements and/or purchased products, we asked how important the program was in their purchasing decision ("not at all," "not too," "somewhat," or "very" important).

Cadmus estimated¹¹ energy savings for measures the participants' said the program was "very important" in their decision to purchase. We calculated spillover percentage by dividing the sum of additional spillover savings reported by participants across the whole program by the total reported gross program savings achieved by program survey respondents (as reported in the customer survey), as shown in the following equation:

$$Spillover \% = \frac{\sum \text{Spillover Measure Evaluated Gross kWh Savings for All Survey Respondents}}{\sum \text{Program Measure Evaluated Gross kWh Savings for All Survey Respondents}}$$

Table 37 shows the quantities and total calculated spillover savings attributed to the program. We calculated the spillover percentage by dividing survey sample spillover kWh savings by survey sample gross program kWh savings. Cadmus estimated spillover for the program kits as 0.8% of the survey sample gross program savings.

Table 36. Spillover for Program Kit Items

Spillover Measure	Number of Survey Respondents	Total kWh Savings
Air Conditioner	4	792.6
Refrigerator	1	49.1
Total Spillover kWh Savings		841.7
Total Survey Sample Program kWh		108,195
Spillover Percentage Estimate		0.8%

Net Program Savings

Cadmus weighted the overall program NTG estimates of 92.9% for kWh energy savings and 95.2% for kW demand reduction by *ex post* gross population energy savings and demand reduction, respectively, as shown in Table 38 and Table 39. Net electricity savings provided by SEWKP in its first year were 9.5 GWh and 1.1 MW.

¹¹ We estimated savings for non-like program measures using the Mid-Atlantic TRM Manual v5.0.

Table 37. Net Energy Savings for Program Kit Items

Measure	Evaluated <i>Ex Post</i> Gross Population kWh Energy Savings	n	Freeridership	Spillover	NTG	Evaluated <i>Ex Post</i> Net Population kWh Energy Savings
Showerheads	5,670,385	62	9.0%*	0.8%	91.8%	5,267,788
Kitchen Aerators	2,588,641	34	5.1%*		95.7%	2,404,847
Bathroom Aerators	395,017	37	2.0%*		98.8%	366,971
Pipe Wrap	1,574,378	46	9.9%*		90.9%	1,462,597
Overall	10,228,421	N/A	7.9%**	0.8%	92.9%**	9,502,203

* Weighted by verified measure installations.

** Weighted by evaluated *ex post* gross population kWh energy savings.

Table 38. Net Demand Reduction for Program Kit Items

Measure	Evaluated <i>Ex Post</i> Gross Population Summer Coincident kW Demand Reduction	n	Freeridership	Spillover	NTG	Evaluated <i>Ex Post</i> Net Population Summer Coincident kW Demand Reduction
Showerheads	245	62	9.0%*	0.8%	91.8%	225
Kitchen Aerators	384	34	5.1%*		95.7%	367
Bathroom Aerators	388	37	2.0%*		98.8%	384
Pipe Wrap	180	46	9.9%*		90.9%	163
Overall	1,197	N/A	5.6%**	0.8%	95.2%**	1,139

* Weighted by verified measure installations.

** Weighted by evaluated *ex post* gross population kW demand reduction.

Summary Form



OFFICIAL COPY
Mar 09 2016

Save Energy and Water Kit Program

Completed EMV Fact Sheet
2015 Evaluation – Cadmus

Program Description

SEWKP is designed to increase energy efficiency by offering residential customers energy-efficient water fixtures and water pipe insulation to install in high-use fixtures within their homes. Participants in this DIY program receive free measure kits upon mail-in request.

Evaluation Methodology

To estimate net and gross energy savings and demand reduction resulting from installing kit items through participant surveys and TRM-based savings analyses.

Impact Evaluation Details

- Baseline Description: energy usage from electric water heating absent the installation of faucet aerator, low-flow showerhead and/or pipe wrap.
- Eligibility: respondents who have an electric water heater, have not previously participated in SEWKP, and have not previously participated in similar programs, such as Home Energy House Call or related low-income or K-12 program.
- Savings Calculation: Cadmus calculated gross program savings, total gross verified savings, net-to-gross findings, and net program savings. When possible, Cadmus used averaged survey responses in place of TRM assumed values to give recent, regional values tailored to DEC's service territory.

Date	November 18, 2015
Region(s)	NC, SC
Evaluation Period	May 2014 to February 2015
Gross Energy Savings (kWh)	10,228,421
Coincident kW impact	n/a
Measure life	various
Net Energy Savings (kWh)	9,502,203
Process Evaluation	Yes
Previous Evaluation(s)	No

Appendix A. Participant Household Characteristics and Demographics

Table 39. Participant Household Characteristics and Demographics

Household Characteristics	Valid Responses	n value / Percentage
Homeownership Status		n=141
Homeowner	114	81%
Renter	27	19%
Type of Home		n=137
Single-family home, detached construction	75	55%
Single-family home, manufactured or modular	25	18%
Single-family mobile home	18	13%
Two- or three-family attached home	6	4%
Apartment home (4+ families)	9	7%
Condominium	3	2%
Other	1	1%
Home Age		n=124
Built before 1959	9	7%
1960 – 1969	8	6%
1970 – 1979	19	15%
1980 – 1989	24	19%
1990 – 1999	28	23%
2000 – 2005	22	18%
2006 – present	14	11%
Above Ground Living Space		n=126
Less than 1,000 square feet	17	13%
1,001 – 2,000 square feet	69	55%
2,001 – 3,000 square feet	21	17%
3,001 – 4,000 square feet	8	6%
4,001 – 5,000 square feet	0	0%
More than 5,000 square feet	11	9%
Below Ground Finished Living Space		n=109
None	64	59%
Less than 1,000 square feet	29	27%
1,001 – 2,000 square feet	9	83%
2,001 – 3,000 square feet	3	3%
3,001 – 4,000 square feet	1	1%
4,001 – 5,000 square feet	1	1%
More than 5,000 square feet	2	2%

Household Characteristics	Valid Responses	n value / Percentage
Water Heater Age		n=115
0 – 4 years	46	40%
5 – 9 years	30	26%
10 – 14 years	28	24%
15 – 19 years	6	5%
More than 19 years	5	4%
Number of People Living in the Household		n=138
1	27	20%
2	52	38%
3	23	17%
4	19	14%
5	16	12%
6 or more	1	1%
Number of Teenagers (Age 13 to 19) in Household		n=112
Zero	79	71%
1	25	22%
2	3	3%
3	2	2%
4	3	3%
5 or more	0	0%
Age of Respondent		n=131
18 – 34	20	15%
35 – 49	25	19%
50 – 59	33	25%
60 – 64	18	14%
65 – 74	21	16%
75 or older	14	11%
Annual Household Income		n=136
Under \$15,000	9	7%
\$15,000 - \$29,999	15	11%
\$30,000 - \$49,999	33	24%
\$50,000 - \$74,999	16	12%
\$75,000 - \$99,999	7	5%
Over \$100,000	10	7%
Prefer not to answer	46	34%

Appendix B. Save Energy and Water Kit Program Participant Survey

This appendix to be provided separately for draft report.

Appendix C. Participant Survey Frequency Tables

Energy Efficient Showerhead Installations

How many of the low-flow showerheads that you received from the Save Energy and Water Kit are currently installed in your home?

		NC	SC	Total
(One showerhead)	Count	59	23	82
	% within State	56.2%	51.1%	54.7%
(Two showerheads)	Count	25	13	38
	% within State	23.8%	28.9%	25.3%
(Three showerheads)	Count	1	1	2
	% within State	1.0%	2.2%	1.3%
(None have been installed)	Count	17	7	24
	% within State	16.2%	15.6%	16.0%
[DO NOT READ] (Don't Know)	Count	3	1	4
	% within State	2.9%	2.2%	2.7%
Total	Count	105	45	150
	% within State	100.0%	100.0%	100.0%

One showerhead installed: Typically how many showers per week are taken using this showerhead?

		NC	SC	Total
1.00	Count	0	1	1
	% within State	0.0%	4.5%	1.2%
2.00	Count	2	0	2
	% within State	3.4%	0.0%	2.5%
3.00	Count	2	1	3
	% within State	3.4%	4.5%	3.7%
4.00	Count	3	2	5
	% within State	5.1%	9.1%	6.2%
5.00	Count	3	0	3
	% within State	5.1%	0.0%	3.7%
6.00	Count	2	2	4
	% within State	3.4%	9.1%	4.9%
7.00	Count	17	6	23
	% within State	28.8%	27.3%	28.4%
8.00	Count	3	2	5
	% within State	5.1%	9.1%	6.2%
9.00	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
10.00	Count	3	1	4
	% within State	5.1%	4.5%	4.9%
12.00	Count	2	0	2
	% within State	3.4%	0.0%	2.5%
14.00	Count	10	5	15
	% within State	16.9%	22.7%	18.5%
15.00	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
16.00	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
20.00	Count	4	0	4
	% within State	6.8%	0.0%	4.9%
21.00	Count	1	2	3
	% within State	1.7%	9.1%	3.7%
22.00	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
[DO NOT READ] (Don't Know)	Count	3	0	3
	% within State	5.1%	0.0%	3.7%

Total	Count	59	22	81
	% within State	100.0%	100.0%	100.0%

One showerhead installed: Can you give me your best guess on how long the average shower length is for this shower?

		NC	SC	Total
2.00	Count	2	0	2
	% within State	3.4%	0.0%	2.4%
3.00	Count	0	1	1
	% within State	0.0%	4.3%	1.2%
4.00	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
5.00	Count	14	3	17
	% within State	23.7%	13.0%	20.7%
6.00	Count	1	2	3
	% within State	1.7%	8.7%	3.7%
7.00	Count	3	0	3
	% within State	5.1%	0.0%	3.7%
8.00	Count	3	0	3
	% within State	5.1%	0.0%	3.7%
10.00	Count	16	7	23
	% within State	27.1%	30.4%	28.0%
12.00	Count	2	1	3
	% within State	3.4%	4.3%	3.7%
13.00	Count	2	0	2
	% within State	3.4%	0.0%	2.4%
15.00	Count	5	4	9
	% within State	8.5%	17.4%	11.0%
20.00	Count	6	2	8
	% within State	10.2%	8.7%	9.8%
30.00	Count	0	1	1
	% within State	0.0%	4.3%	1.2%
90.00	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
[DO NOT READ] (Don't Know)	Count	3	2	5
	% within State	5.1%	8.7%	6.1%
Total	Count	59	23	82
	% within State	100.0%	100.0%	100.0%

Two or three showerheads installed: Typically how many showers per week are taken using the showerhead that gets used most often in your household?

		NC	SC	Total
2.00	Count	1	1	2
	% within State	3.8%	7.1%	5.0%
5.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
6.00	Count	1	1	2
	% within State	3.8%	7.1%	5.0%
7.00	Count	4	1	5
	% within State	15.4%	7.1%	12.5%
8.00	Count	0	2	2
	% within State	0.0%	14.3%	5.0%
12.00	Count	1	1	2
	% within State	3.8%	7.1%	5.0%
14.00	Count	6	4	10
	% within State	23.1%	28.6%	25.0%
15.00	Count	1	2	3

	% within State	3.8%	14.3%	7.5%
18.00	Count	0	1	1
	% within State	0.0%	7.1%	2.5%
20.00	Count	2	0	2
	% within State	7.7%	0.0%	5.0%
21.00	Count	4	1	5
	% within State	15.4%	7.1%	12.5%
25.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
28.00	Count	2	0	2
	% within State	7.7%	0.0%	5.0%
30.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
35.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
Total	Count	26	14	40
	% within State	100.0%	100.0%	100.0%

Two or three showerheads installed: Can you give me your best guess on how long the average shower length is for this shower? (first shower)

		NC	SC	Total
2.00	Count	0	1	1
	% within State	0.0%	7.1%	2.5%
3.00	Count	0	1	1
	% within State	0.0%	7.1%	2.5%
5.00	Count	3	2	5
	% within State	11.5%	14.3%	12.5%
6.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
7.00	Count	2	1	3
	% within State	7.7%	7.1%	7.5%
8.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
10.00	Count	8	2	10
	% within State	30.8%	14.3%	25.0%
12.00	Count	2	2	4
	% within State	7.7%	14.3%	10.0%
15.00	Count	4	3	7
	% within State	15.4%	21.4%	17.5%
30.00	Count	1	1	2
	% within State	3.8%	7.1%	5.0%
35.00	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
60.00	Count	0	1	1
	% within State	0.0%	7.1%	2.5%
70.00	Count	2	0	2
	% within State	7.7%	0.0%	5.0%
[DO NOT READ] (Don't Know)	Count	1	0	1
	% within State	3.8%	0.0%	2.5%
Total	Count	26	14	40
	% within State	100.0%	100.0%	100.0%

Two or three showerheads installed: How many showers per week are typically taken using the second showerhead?

		NC	SC	Total
1.00	Count	2	0	2
	% within State	9.1%	0.0%	5.7%
2.00	Count	2	0	2
	% within State	9.1%	0.0%	5.7%
4.00	Count	1	1	2
	% within State	4.5%	7.7%	5.7%
5.00	Count	2	2	4
	% within State	9.1%	15.4%	11.4%
7.00	Count	4	4	8
	% within State	18.2%	30.8%	22.9%
14.00	Count	1	3	4
	% within State	4.5%	23.1%	11.4%
15.00	Count	1	0	1
	% within State	4.5%	0.0%	2.9%
20.00	Count	2	0	2
	% within State	9.1%	0.0%	5.7%
21.00	Count	2	1	3
	% within State	9.1%	7.7%	8.6%
30.00	Count	1	0	1
	% within State	4.5%	0.0%	2.9%
[DO NOT READ] (Don't Know)	Count	4	2	6
	% within State	18.2%	15.4%	17.1%
Total	Count	22	13	35
	% within State	100.0%	100.0%	100.0%

Two or three showerheads installed: And again for this shower, can you give me your best guess on how long the average shower length is, in minutes? (second shower)

		NC	SC	Total
2.00	Count	1	0	1
	% within State	4.5%	0.0%	2.9%
5.00	Count	5	3	8
	% within State	22.7%	23.1%	22.9%
7.00	Count	2	1	3
	% within State	9.1%	7.7%	8.6%
9.00	Count	0	1	1
	% within State	0.0%	7.7%	2.9%
10.00	Count	7	3	10
	% within State	31.8%	23.1%	28.6%
12.00	Count	1	0	1
	% within State	4.5%	0.0%	2.9%
15.00	Count	1	2	3
	% within State	4.5%	15.4%	8.6%
30.00	Count	2	0	2
	% within State	9.1%	0.0%	5.7%
48.00	Count	1	0	1
	% within State	4.5%	0.0%	2.9%
49.00	Count	0	1	1
	% within State	0.0%	7.7%	2.9%
60.00	Count	0	1	1
	% within State	0.0%	7.7%	2.9%
[DO NOT READ] (Don't Know)	Count	2	1	3
	% within State	9.1%	7.7%	8.6%
Total	Count	22	13	35
	% within State	100.0%	100.0%	100.0%

Two or three showerheads installed: And how many showers per week are typically taken using the third showerhead?

		NC	SC	Total
2.00	Count	0	1	1
	% within State		100.0%	100.0%
Total	Count	0	1	1
	% within State		100.0%	100.0%

Two or three showerheads installed: And finally for this third shower, can you give me your best guess on how long the average shower length is in minutes?

		NC	SC	Total
10.00	Count	0	1	1
	% within State		100.0%	100.0%
Total	Count	0	1	1
	% within State		100.0%	100.0%

Did the showerhead(s) you installed from the kit replace (an) other low-flow showerhead(s) or (a) regular showerhead(s)?

		NC	SC	Total
(YES - At least one kit item replaced another low-flow showerhead)	Count	42	22	64
	% within State	49.4%	59.5%	52.5%
(No kit items replaced low-flow showerhead(s) / all replaced regular-flow)	Count	39	11	50
	% within State	45.9%	29.7%	41.0%
[DO NOT READ] (Don't Know)	Count	4	4	8
	% within State	4.7%	10.8%	6.6%
Total	Count	85	37	122
	% within State	100.0%	100.0%	100.0%

How many previously-installed low-flow showerheads were replaced by showerheads from the kit?

		NC	SC	Total
(One showerhead)	Count	4	0	4
	% within State	26.7%	0.0%	18.2%
(Two showerheads)	Count	11	6	17
	% within State	73.3%	85.7%	77.3%
[DO NOT READ] (Don't Know)	Count	0	1	1
	% within State	0.0%	14.3%	4.5%
Total	Count	15	7	22
	% within State	100.0%	100.0%	100.0%

For the showerheads that you received with the kit and which are not currently installed, did you try to install them?

		NC	SC	Total
Yes	Count	12	11	23
	% within State	25.5%	47.8%	32.9%
No	Count	32	11	43
	% within State	68.1%	47.8%	61.4%
[DO NOT READ] (Don't Know)	Count	2	1	3
	% within State	4.3%	4.3%	4.3%
[DO NOT READ] (Refused)	Count	1	0	1
	% within State	2.1%	0.0%	1.4%
Total	Count	47	23	70
	% within State	100.0%	100.0%	100.0%

Why (is/are) the showerhead(s) not currently installed?*

Category of Action	Count Mentioning: NC	Count Mentioning: SC	Count Mentioning: Total
Does not fit / would have to change pipes	1	2	3
Does not work with handheld shower fixture	1	1	2
Aesthetics / does not match existing fixture		1	1
Low flow / not enough water pressure	1		1
Gave the item away to another household	1		1

* Although 23 participants reported trying to install showerheads that are not currently installed, when asked to explain why these items are not installed most indicated that they had not tried or did not intend to try installing them. This table only includes responses that indicate that the participant did try to install the showerhead.

Faucet Aerator Installations

Is the kitchen faucet aerator that you received from the kit currently installed in your home?

		NC	SC	Total
Yes	Count	52	22	74
	% within State	49.5%	48.9%	49.3%
No	Count	51	20	71
	% within State	48.6%	44.4%	47.3%
[DO NOT READ] (Don't Know)	Count	2	3	5
	% within State	1.9%	6.7%	3.3%
Total	Count	105	45	150
	% within State	100.0%	100.0%	100.0%

Did the faucet in your kitchen already have an aerator that had to be removed before installing the aerator provided by the kit?

		NC	SC	Total
Yes	Count	24	14	38
	% within State	46.2%	63.6%	51.4%
No	Count	23	7	30
	% within State	44.2%	31.8%	40.5%
[DO NOT READ] (Don't Know)	Count	5	1	6
	% within State	9.6%	4.5%	8.1%

Total	Count	52	22	74
	% within State	100.0%	100.0%	100.0%

Did you try to install the kitchen aerator that you received with the kit?

		NC	SC	Total
Yes	Count	8	4	12
	% within State	15.7%	20.0%	16.9%
No	Count	41	16	57
	% within State	80.4%	80.0%	80.3%
[DO NOT READ] (Don't Know)	Count	1	0	1
	% within State	2.0%	0.0%	1.4%
[DO NOT READ] (Refused)	Count	1	0	1
	% within State	2.0%	0.0%	1.4%
Total	Count	51	20	71
	% within State	100.0%	100.0%	100.0%

Why is the kitchen aerator not currently installed?*

Category of Action	Count Mentioning: NC	Count Mentioning: SC	Count Mentioning: Total
Does not fit on faucet	4	2	6
Does not work with water filter	2		2
Low flow / not enough water pressure	1	1	2
Aerator is not adjustable	1		1
Too complicated to install on my faucet		1	1
Aerator made a loud noise when I used it	1		1

* Although 12 participants reported trying to install kitchen aerators that are not currently installed, 13 responses are shown in this table because one participant gave two reasons why the item is not currently installed (low flow and not adjustable).

How many of the bathroom faucet aerators that you received from the kit are currently installed in your home?

		NC	SC	Total
(One aerator)	Count	29	9	38
	% within State	27.6%	20.0%	25.3%
(Two aerators)	Count	20	11	31
	% within State	19.0%	24.4%	20.7%
(Three aerators)	Count	7	6	13
	% within State	6.7%	13.3%	8.7%
(Four aerators)	Count	2	1	3
	% within State	1.9%	2.2%	2.0%
(Five aerators)	Count	0	1	1
	% within State	0.0%	2.2%	.7%
None have been installed	Count	41	16	57
	% within State	39.0%	35.6%	38.0%
[DO NOT READ] (Don't Know)	Count	5	1	6
	% within State	4.8%	2.2%	4.0%
[DO NOT READ] (Refused)	Count	1	0	1
	% within State	1.0%	0.0%	.7%
Total	Count	105	45	150
	% within State	100.0%	100.0%	100.0%

Did you have to remove any aerators from your bathroom faucets before installing the aerator(s) provided by the kit?

		NC	SC	Total
Yes	Count	33	20	53
	% within State	56.9%	71.4%	61.6%
No	Count	24	8	32
	% within State	41.4%	28.6%	37.2%
[DO NOT READ] (Don't Know)	Count	1	0	1
	% within State	1.7%	0.0%	1.2%
Total	Count	58	28	86
	% within State	100.0%	100.0%	100.0%

How many previously-installed bathroom aerators were replaced by aerators from the kit?

		NC	SC	Total
(One aerator)	Count	3	2	5
	% within State	14.3%	12.5%	13.5%
(Two aerators)	Count	11	6	17
	% within State	52.4%	37.5%	45.9%
(Three aerators)	Count	7	6	13
	% within State	33.3%	37.5%	35.1%
(Four aerators)	Count	0	1	1
	% within State	0.0%	6.3%	2.7%
None have been installed	Count	0	1	1
	% within State	0.0%	6.3%	2.7%
Total	Count	21	16	37
	% within State	100.0%	100.0%	100.0%

For the bathroom aerators that you received with the kit and which are not currently installed, did you try to install them?

		NC	SC	Total
Yes	Count	25	10	35
	% within State	27.5%	25.0%	26.7%
No	Count	55	29	84
	% within State	60.4%	72.5%	64.1%
[DO NOT READ] (Don't Know)	Count	11	1	12
	% within State	12.1%	2.5%	9.2%
Total	Count	91	40	131
	% within State	100.0%	100.0%	100.0%

Why (is/are) the bathroom aerator(s) not currently installed?*

Category of Action	Count Mentioning: NC	Count Mentioning: SC	Count Mentioning: Total
Does not fit on faucet	4	3	7
Low flow / not enough water pressure	2	1	3
Aerator does not work	2		2

* Although 35 participants reported trying to install bathroom aerators that are not currently installed, when asked to explain why these items are not installed most indicated that they had not tried or did not intend to try installing them. This table only includes responses that indicate that the participant did try to install a bathroom aerator.

Pipe Insulation

Is any of the pipe insulation from the kit currently installed on your hot water pipes?

		NC	SC	Total
Yes	Count	30	20	50
	% within State	28.6%	44.4%	33.3%
No	Count	68	20	88
	% within State	64.8%	44.4%	58.7%
[DO NOT READ] (Don't Know)	Count	7	5	12
	% within State	6.7%	11.1%	8.0%
Total	Count	105	45	150
	% within State	100.0%	100.0%	100.0%

How much of the pipe insulation that you received from the kit is currently installed? Would you say...

		NC	SC	Total
All, or almost all, of it;	Count	18	9	27
	% within State	60.0%	45.0%	54.0%
About 75% of it;	Count	5	2	7
	% within State	16.7%	10.0%	14.0%
About half of it;	Count	4	5	9
	% within State	13.3%	25.0%	18.0%
or about 25% of it?	Count	1	2	3
	% within State	3.3%	10.0%	6.0%
[DO NOT READ] (Don't Know)	Count	2	2	4
	% within State	6.7%	10.0%	8.0%
Total	Count	30	20	50
	% within State	100.0%	100.0%	100.0%

When you installed the pipe insulation that you received with the kit, did you replace old insulation that was already there, or add insulation where there previously wasn't any, or both?

		NC	SC	Total
(Just replaced old insulation)	Count	8	6	14
	% within State	26.7%	30.0%	28.0%
(Just installed new insulation)	Count	15	8	23
	% within State	50.0%	40.0%	46.0%

Total	(Both - some kit insulation replaced old insulation AND some was installed where there wasn't previously insulation)	Count	5	5	10
		% within State	16.7%	25.0%	20.0%
	[DO NOT READ] (Don't Know)	Count	2	1	3
		% within State	6.7%	5.0%	6.0%
		Count	30	20	50
		% within State	100.0%	100.0%	100.0%

What is the diameter of the pipe that you insulated?

		NC	SC	Total
1.00	Count	8	4	12
	% within State	26.7%	20.0%	24.0%
2.00	Count	4	1	5
	% within State	13.3%	5.0%	10.0%
3.00	Count	4	2	6
	% within State	13.3%	10.0%	12.0%
5.00	Count	0	3	3
	% within State	0.0%	15.0%	6.0%
[DO NOT READ] (Don't Know)	Count	14	8	22
	% within State	46.7%	40.0%	44.0%
[DO NOT READ] (Refused)	Count	0	2	2
	% within State	0.0%	10.0%	4.0%
Total	Count	30	20	50
	% within State	100.0%	100.0%	100.0%

Did you try to install any of the pipe insulation that you received with the kit?

		NC	SC	Total
Yes	Count	4	4	8
	% within State	5.8%	20.0%	9.0%
No	Count	62	16	78
	% within State	89.9%	80.0%	87.6%
[DO NOT READ] (Don't Know)	Count	3	0	3
	% within State	4.3%	0.0%	3.4%
Total	Count	69	20	89
	% within State	100.0%	100.0%	100.0%



Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

OFFICIAL COPY

Mar 09 2016



Duke Energy Carolinas and Duke Energy Progress

Appliance Recycling Program Final Evaluation Report

November 25, 2015

Contributors

Lisa Obear
Senior Consultant, EMI Consulting

Jeremy Kraft
Associate Director, EMI Consulting

Sean Ong
Senior Consultant, EMI Consulting

Erik Lyon
Consultant, EMI Consulting

Michael Blonsky
Consultant, EMI Consulting

Antje Flanders
Project Director, Opinion Dynamics

Table of Contents

1. Evaluation Summary.....	1
1.1 Program Summary.....	1
1.2 Evaluation Objectives and High Level Findings.....	1
1.3 Evaluation Recommendations	4
2. Program Description	6
2.1 Program Design	6
2.2 Program Implementation	6
2.3 Program Performance.....	6
3. Key Research Objectives.....	7
4. Overview of Evaluation Activities	8
5. Impact Evaluation	14
5.1 Methodology	14
5.2 Gross Impact Results.....	24
5.3 References.....	26
6. Net-to-Gross Analysis.....	27
6.1 Methodology	27
6.2 Net Impact Results and NTGR.....	32
7. Process Evaluation	33
7.1 Methodology	33
7.2 Notable Findings	33
8. Conclusions and Recommendations.....	48
9. Summary Form.....	51
10. DSMore Table.....	52

Table of Tables

Table 1-1. Program Projected/Claimed and Evaluated Gross Energy Impacts	2
Table 1-2. Program Projected/Claimed and Evaluated Gross Summer Peak Demand Impacts.....	3
Table 1-3. Program Net Energy Impacts.....	3
Table 1-4. Program Net Summer Peak Demand Impacts	3
Table 1-5. Evaluated Parameters with Precision and Confidence.....	4
Table 2-1. Summary of Program Tracking Data for Program Period	6
Table 4-1. Overview of Evaluation Research Activities	8
Table 4-2. Participant Survey Sample Sizes and Number of Completed Interviews by Sample Frame.....	9
Table 4-3. Participant Survey Disposition Summary.....	10
Table 4-4. Participant Survey Response Rate.....	10
Table 4-5. Precision and Margins of Error at 90% Confidence for Participant Survey Results	11
Table 4-6. Nonparticipant and General Population Survey Sample Sizes and Number of Completed Interviews.....	12
Table 4-7. General Population Survey Disposition Summary.....	12
Table 4-8. General Population Survey Response Rates	13
Table 4-9. Nonparticipant Survey Precision at 90% Confidence	13
Table 5-1. Regression Literature Review: Models Used	15
Table 5-2. Regression Literature Review: Parameters Used.....	16
Table 5-3. UEC Regression Model Coefficients and Inputs	18
Table 5-4. Peak-to-Average Ratio	22
Table 5-5: Estimates of Survey-Derived Variables with 90% Confidence Intervals.....	22
Table 5-6. Gross kWh Results	25
Table 5-7. Gross kW Results	25
Table 6-1. Participant and Nonparticipant Results, Weighted by Inverse of Variance.....	30
Table 6-2. Induced Replacement Rates and Per-Unit kWh	31
Table 6-3. Energy (kWh) NTGR and Net Savings.....	32
Table 7-1: Participant Initial Source of Awareness (n=284)	38
Table 7-2: Nonparticipant Initial Source of Awareness (DEC) (n=123)	38
Table 7-3: Participant and Nonparticipant Respondent Demographics.....	39
Table 7-4: Percentage of Refrigerators that are Primary.....	41
Table 7-5: Average Age of Disposed Appliance by Type and Service Territory.....	41

Table 7-6: Appointment Cancellations.....	47
Table 8-1. Projected/Claimed and Evaluated Per Unit Gross Energy Savings (kWh)	48
Table 8-2. Projected/Claimed and Evaluated Per Unit Gross Demand Savings (kW)	48
Table 8-3. NTGR and Per Unit Net Energy Savings (kWh and kW).....	49
Table 10-1. Measure-level inputs for Duke Energy Analytics.....	52

Table of Figures

Figure 5-1. Adjusted Gross Energy Savings	17
Figure 5-2. Part-Use Impact Adjustment.....	19
Figure 5-3. Adjusted Gross Demand Savings.....	20
Figure 5-4. Summer Peak Adjustment Factor	21
Figure 5-5: Change in Average Refrigerator Energy Use	23
Figure 6-1. Calculation of Net-To-Gross Ratios	27
Figure 6-2. Appliance Recycling UMP Methodology Schematic	28
Figure 7-1: Participant Satisfaction with ARP and Duke Energy	34
Figure 7-2: Satisfaction with Program Components	35
Figure 7-3: Time from Scheduling To Appointment (to nearest week) (n=194)	36
Figure 7-4: Number of Weeks From Pick-up Appointment To Receiving Rebate (n=160).....	37
Figure 7-5: Energy Savings Relative To Expectations (n=104)	37
Figure 7-6: Recycled Appliance Characterization by Service Territory (n=284).....	40
Figure 7-7: Refrigerators Disposed Of By Nonparticipants (n=80).....	40
Figure 7-8: General Population Secondary (Spare) Appliances (DEC, n=502)	42
Figure 7-9: Participant Motivations for Disposing of Appliances (n=284)	43
Figure 7-10: Nonparticipant Motivations for Disposing of Appliances (DEC) (n=94)	43
Figure 7-11: Primary Reason for Recycling the Appliance through the Duke ARP (n=279)	44
Figure 7-12: Percentage of Participants Who Would Have Recycled Appliance If Rebate Were Lower (Left) or Not Offered At All (Right) (n=284)	45
Figure 7-13: Participant Actions in Absence of the Program (n=245)	46
Figure 7-14: Percentage of Nonparticipants Who Have Considered Getting Rid of a Spare Appliance by Propensity to Participate in the ARP (n=234)	47

1. Evaluation Summary

1.1 Program Summary

Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) launched the Appliance Recycling program in 2012 with the goal of reducing energy consumption and peak demand through reducing the number of old, inefficient refrigerators and freezers operating on the grid. Customers can schedule a time with the program's implementer (currently JACO; for DEP the program had previously been implemented by ARCA) to pick-up their old appliance. The appliance is then dismantled and its appropriate parts are recycled. JACO is responsible for managing all aspects of the customer pick-up process, from scheduling customers to have their appliance picked up to sending pick-up crews out on site to gather the appliance.

While previously handled by the implementation contractors, DEC and DEP currently market the program in-house. The Appliance Recycling program has been marketed to customers using bill inserts, mass emails, advertisement collateral such as flyers and point of sale materials, social media posts, online advertisements, school media events, television commercials, and newspaper advertisements (North Carolina only).

1.2 Evaluation Objectives and High Level Findings

This evaluation of the Appliance Recycling program includes process and impact assessments, and addresses several major research objectives:

- Assess program performance and estimate gross and net annual energy (kWh) and peak demand (kW) savings associated with program activity
- Assess program implementation processes and marketing strategies and identify opportunities for improvement
- Understand customer motivations for recycling or disposing of their appliance

To achieve these research objectives, the evaluation team completed a range of data collection and analytical activities, including interviews with program staff, participant and general population surveys, program tracking data analysis, deemed savings review, impact analysis, and analysis of the survey results. Through the primary data collection, the evaluation team developed estimates of a per-unit average gross consumption and peak demand savings, as well as net-to-gross ratios (NTGR). For the purposes of this evaluation, we used customer data from the following time periods:

- DEC: September 1, 2013 to approx. May 2015¹
- DEP: January 1, 2014 to December 31, 2014

¹ For the gross impacts evaluation, the evaluation team used all data provided up to the date of data pull (late May 2015). However, to minimize confusion during the participant survey, customers who had not yet received their rebate (i.e., those who had participated within a few weeks prior to the data pull) were not included in the sample frame. This accounts for any discrepancies in population sizes reported between the gross impact analysis and the participant survey.

High Level Evaluation Findings

While the DEC program fell short of its participation goals in 2014, the DEP program met its goals (see also Section 2.3), and overall the program has been quite successful. Results from the participant survey indicate that the program has few process issues, and customers are extremely satisfied with their experiences with the program. Additionally, findings from the nonparticipant survey indicate that the program still has a considerable available market in North Carolina and South Carolina. As will be discussed in more detail in Section 7, the process evaluation revealed several key insights into customer motivations to participate as well as identified which types of customers may be most likely to have the oldest, least efficient appliances.

In terms of impacts, the program is continuing to achieve relatively consistent gross and net savings compared to previous years' evaluations. However, as time goes on, it will become more challenging for the program to continue to achieve the same level of energy and demand savings, as appliances become more and more efficient. Continuing to leverage targeted marketing at populations with older, less efficient appliances will be important in attempting to keep energy and demand savings high.

Energy gross impact results are relatively consistent with past evaluations conducted for the program; slightly higher results stem from higher part-use factors and other regression inputs. Additional details on the increase in energy savings are discussed in more detail in Section 5. Gross energy impacts are detailed in Table 1-1 below.

Table 1-1. Program Projected/Claimed and Evaluated Gross Energy Impacts

Jurisdiction	Type of Appliance	Projected/Claimed Savings (kWh/per unit)	2015 Evaluated Gross Savings (kWh/per unit)
DEC	Refrigerator	952	1,182
	Freezer	869	923
DEP	Refrigerator	1,138	1,123
	Freezer	763	888

Similarly, energy demand impact results for refrigerators are relatively consistent with past evaluations. It should be noted that past evaluations only calculated average demand; for this evaluation, the evaluation team calculated both average and summer peak demand. The higher results for summer peak demand are due to the evaluation team calculating peak summer demand savings using an adjustment factor which more heavily impacts freezers. Table 1-2 shows the gross average and summer peak demand savings; additional details about the calculation of demand savings are discussed in Section 5.

Table 1-2. Program Projected/Claimed and Evaluated Gross Summer Peak Demand Impacts

Jurisdiction	Type of Appliance	Projected/Claimed Savings (kW/per unit)	2015 Evaluated Gross Average Demand Savings (kW/unit)	2015 Evaluated Gross Summer Peak Demand Savings (kW/per unit)
DEC	Refrigerator	0.136	0.135	0.147
	Freezer	0.104	0.105	0.144
DEP	Refrigerator	0.130	0.128	0.139
	Freezer	0.087	0.101	0.137

The evaluation team found that net-to-gross results continue to remain relatively consistent with past evaluations. Table 1-3 and Table 1-4 detail the net energy and summer peak demand savings resulting from this evaluation.

Table 1-3. Program Net Energy Impacts

Jurisdiction	Type of Appliance	NTGR	Per Unit Net Energy Savings (kWh/unit)
DEC	Refrigerator	0.52	619
	Freezer	0.51	470
DEP	Refrigerator	0.52	583
	Freezer	0.60	533

Table 1-4. Program Net Summer Peak Demand Impacts

Jurisdiction	Type of Appliance	NTGR	Per Unit Net Summer Peak Demand Savings (kW/unit)
DEC	Refrigerator	0.52	0.077
	Freezer	0.51	0.073
DEP	Refrigerator	0.52	0.072
	Freezer	0.60	0.082

Table 1-5 below shows some of the key parameters for this evaluation, along with their associated relative precision and confidence.² All primary data collection activities achieved +/- 10% precision at 90% confidence. In addition to the precision associated with the data collection efforts, the prediction error associated with the gross impacts model selected from secondary research was calculated as 9% for refrigerators and 23% for freezers with 90% confidence. Additional details on the margin of error associated with the gross impacts results are presented in Section 5.

² These results refer to the precision associated with the data collection overall, and not the final net savings value, which combines the errors associated with nonparticipant data and other gross impacts parameters.

Table 1-5. Evaluated Parameters with Precision and Confidence

Data Collection Effort	Relative Precision at 90% confidence			
	DEC		DEP	
	Refrigerators	Freezers	Refrigerators	Freezers
Participant Results	9.8%	9.7%	9.8%	9.4%
Nonparticipant Results	4.5%		N/A	N/A

1.3 Evaluation Recommendations

Based on the findings from this evaluation, the evaluation team presents the following recommendations for Duke Energy's consideration.

- *Use tailored marketing messages to encourage customers to recycle older, less efficient appliances.* The results from the evaluation research with participants revealed a number of interesting findings that could be leveraged in marketing materials to encourage customer participation (specifically, those with older, less efficient appliances). One finding is that customers are generally unaware of the age of their appliances. The evaluation team asked participants to self-report how old they thought their appliance was when they recycled it, and then compared that to the actual recorded age of the appliance from the tracking data. On average, participants underestimated the age of their appliance by 5-7 years, indicating that customers think their appliance is younger and may therefore think that it is more efficient than it is. This information could be used in marketing and outreach campaigns, to educate customers on how old their appliance truly may be, and encourage them to recycle their old appliances.

Additionally, the evaluation research found that participants highly value the convenience of the free pick-up – as much, if not more, than the rebate. Duke Energy should continue to highlight the ease and convenience of the free pick-up in their marketing materials, perhaps contrasting against other available options in local communities that involve more hassle and cost.

- *Continue to target older populations (55 years and older) in marketing and outreach campaigns.* From research with participants, customers who were 55 years or older tended to have older refrigerators, and were more likely to say they would have kept them (as opposed to disposed or transferred) in the absence of the program. Duke Energy does currently target this demographic in their marketing and outreach strategies. Increasing participation from this demographic could help decrease free-ridership and increase gross savings.
- *Duke Energy may be able to cost-effectively increase marketing reach by including additional leave-behinds with customers when the appliance is picked up.* Per Duke Energy, pick-up crews are currently leaving behind materials about other residential Duke Energy energy efficiency programs at the time of appliance pick-up, to encourage cross-participation. The evaluation team plans to assess participant recall and action on these leave-behinds in the next round of evaluations. Additionally, the evaluation team found that word-of-mouth was the second most common means of program awareness for the program. Therefore, in addition to cross-promotion leave-behinds, the program may be able to gain additional traction cost-effectively for the Appliance Recycling program by including marketing materials in this packet, and encourage customers to provide these to any interested friends or family.

- *For future evaluations, certain gross impact inputs, such as primary/secondary status and conditioned/unconditioned space, should be confirmed during evaluation surveys prior to analysis.* The evaluation team found some inconsistencies in the tracking data compared to the survey data, specifically related to the location of the appliance at the time of pick-up. Specifically, the evaluation team found that a considerable number of refrigerators recorded as “secondary” in the tracking data were actually used as a primary refrigerator for the 12 months prior to pick-up. This situation typically occurs when a customer moves an appliance prior to pick-up, and either is not asked or does not inform the pick-up crew. As the classifications of primary/secondary and conditioned/unconditioned space impact the gross savings regression model, it is recommended that these values be carefully confirmed during evaluation surveys to ensure the most accurate results. Duke Energy should also confirm with the program implementer the steps taken to gather this information on-site, to ensure that the proper data is being collected during the pick-up process and increase the accuracy of the data tracked in the tracking database.

2. Program Description

2.1 Program Design

Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) launched the Appliance Recycling program in 2012 with the goal of reducing energy consumption and peak demand through reducing the number of old, inefficient refrigerators and freezers operating on the grid. Customers can schedule a time with the program's implementer (currently JACO) to pick-up and remove their old appliance. Pick-up crews confirm a number of appliance characteristics with the customer while on-site, and also leave behind cross-promotion marketing materials for other Duke Energy programs. The appliance is then removed from the home, and dismantled and appropriate parts are recycled. Once the appliance is picked up, the customer is sent a \$50 check in the mail.

2.2 Program Implementation

The program implementer (currently JACO) is responsible for managing all aspects of the customer pick-up process, from scheduling customers to have their appliance picked up to sending pick-up crews out to gather the appliance. The program implementer also handles arranging for the appliance to be dismantled and recycled. Customers interested in participating may either call into the program (a customer service line operated by JACO) or utilize the online portal via the Duke Energy program website to sign up. JACO then schedules a pick-up at their convenience with the goal of scheduling pick-ups within two weeks of sign-up. JACO pick-up crews also call customers immediately before their appointment to confirm. After a customer's appliance is picked up, they are mailed an incentive check. The goal is for customers to receive the check within 6 weeks of the appliance being picked up.

While previously handled by the implementation contractors, Duke Energy currently markets the program in-house. During the evaluation period, the Appliance Recycling program was marketed to customers using bill inserts, mass emails, advertisement collateral such as flyers and point of sale materials, social media posts, online advertisements, school media events, television commercials, and newspaper advertisements (North Carolina only).

2.3 Program Performance

For 2014, DEC had considerably higher participation goals than DEP. DEP met its goals in 2014, while DEC fell short. Duke Energy staff noted that the DEC goals were based on an older market penetration study which may have been overly optimistic/aggressive. Table 2-1 provides a summary of participation goals, actuals, and percent of goal achieved.

Table 2-1. Summary of Program Tracking Data for Program Period

Jurisdiction	Appliance Type	2014		
		Participation Goals	Participation Actuals	Percent of Goal
DEC	Refrigerator	17,205	7,857	46%
	Freezer	3,608	1,896	53%
DEP	Refrigerator	6,440	6,902	107%
	Freezer	2,310	1,874	81%

3. Key Research Objectives

This evaluation of the Appliance Recycling program includes process and impact assessments, and addresses several major research objectives:

- Assess program performance and estimate gross and net annual energy (kWh) and summer peak demand (kW) savings associated with program activity
- Assess program implementation processes and marketing strategies and identify opportunities for improvement
- Understand customer motivations for recycling or disposing their appliance

This evaluation provides DEC and DEP with results required by the North Carolina Utilities Commission and the Public Service Commission of South Carolina. The results also provide inputs for future program design and delivery.

As part of the process assessment, we explored the following research questions:

- What are the sources of program information? What are the program's most effective marketing and outreach tactics?
- What are participants' motivations to participate in the program and recycle their appliance? How does that compare to why nonparticipants are getting rid of their appliances?
- Are there particular customer segments that the program should target to minimize free-ridership?
- Is the program leading to participation in other energy efficiency programs offered by Duke Energy?
- What are participants' experiences with the appliance pick-up process? Are there any issues?
- Are participants satisfied with their program experiences?
- How well is the program implementer achieving its metrics, such as delivering rebates in a timely manner?

4. Overview of Evaluation Activities

To answer the research questions discussed in the previous section, the evaluation team performed a range of data collection and analytic activities. Table 4-1 provides a summary of evaluation activities and associated areas of inquiry. Following the table, we provide detail on each activity's scope, sampling approach (if applicable), and timing of the activity.

Table 4-1. Overview of Evaluation Research Activities

#	Evaluation Activity	Impact	Process/ Market	Purpose of Activity
1	Program staff interviews		X	<ul style="list-style-type: none"> Provide insight into program design and delivery Support process assessment
2	Materials review	X	X	<ul style="list-style-type: none"> Provide insight into program design and delivery Inform previously used savings assumptions
3	Deemed savings review	X		<ul style="list-style-type: none"> Review accuracy and appropriateness of energy savings assumptions
4	Impact analysis	X		<ul style="list-style-type: none"> Calculate gross and net energy and demand savings
5	Participant survey	X	X	<ul style="list-style-type: none"> Estimate gross impact adjustment factors Estimate net-to-gross ratio Support process assessment
6	Nonparticipant survey		X	<ul style="list-style-type: none"> Support process assessment Support net-to-gross analysis Assess appliance recycling market

4.1.1 Program Staff Interviews

The evaluation team completed one interview with program staff at Duke Energy in January 2015. The interview explored changes in program design and implementation, overview of program performance, and data tracking and communication processes, among other topics.

4.1.2 Materials Review

In support of the impact and process evaluations, the evaluation team reviewed program materials and data, including marketing materials, plans, and past evaluation reports. This information informed our research design, provided insight into program design and delivery, and supported the assessment of program impacts.

4.1.3 Deemed Savings Review

In support of the impact evaluation, the evaluation team reviewed program tracking databases and energy savings assumptions. The objectives of the review were to identify the deemed savings values DEC and DEP used to calculate impacts, review the deemed savings values for reasonableness, verify their accurate application, and identify data gaps, omissions, inconsistencies, and errors. We reviewed evaluation reports from previous DEC and DEP evaluations, and develop recommendations for changes where appropriate. Finally, as part of the review process, we also checked the program tracking data for accuracy, consistency, and completeness.

4.1.4 Participant Survey

The evaluation team completed a telephone survey with a sample of DEC and DEP Appliance Recycling program participants in July 2015. Our key goals were to gather information to support the assessment of gross impacts, program attribution, and program processes.

Sample Design and Fielding

In order to inform both process and impact objectives, the DEC and DEP samples were stratified by both jurisdiction (DEC and DEP) as well as appliance type (refrigerator or freezer). As defined by the program design, customers could recycle up to two appliances per year. Therefore, customers that recycled more than one appliance were first randomly selected for one appliance type stratum. Once each participant was assigned to a stratum, the evaluation team drew random samples from each. In order to reach the desired precision and confidence for freezers, this group was oversampled and later accounted for in the process findings by applying sample weights (discussed below). Table 4-2 presents participant survey sample sizes and the number of completed interviews.

Table 4-2. Participant Survey Sample Sizes and Number of Completed Interviews by Sample Frame

Jurisdiction	Type of Appliance	Participant Population ³	Surveys Completed
DEC	Refrigerator	13,489	70
	Freezer	3,684	71
	Total	17,173	141
DEP	Refrigerator	6,901	70
	Freezer	1,874	73
	Total	8,775	143

³ Note that only participants who had received their rebate were included in the population for the participant survey; all participants within the evaluation period were included in the population for the gross impacts regression.

Survey Dispositions and Response Rate

Table 4-3 provides the final survey dispositions, by jurisdiction.

Table 4-3. Participant Survey Disposition Summary

Disposition	DEC	DEP
Completed Interviews	141	143
Partial Interviews	14	14
Eligible Non-interviews		
Answering machine	44	83
No answer	59	77
Not available	45	33
Non-specific callback/secretary/NTG	32	34
Disconnected phone/bad number	50	52
Other	2	4
Language Barrier	7	4
Refused	112	119
Total Participants in Sample	506	563

Table 4-4 below provides the survey response and cooperation rates, by jurisdiction.

Table 4-4. Participant Survey Response Rate

AAPOR Rate	DEC	DEP
Response rate	29%	26%
Cooperation rate	50%	49%

Survey Data Weighting

As discussed above, the evaluation team oversampled freezers in order to achieve the desired confidence and precision at the appliance type level during analysis. However, as refrigerators considerably outnumber freezers in the program population, the evaluation team weighted survey data to more accurately represent the actual distribution of appliance types when reporting process results at the overall jurisdiction level.

Targeted and Achieved Confidence and Precision

For the participant survey, the evaluation team exceeded the 10% precision target at 90% confidence at the jurisdiction and appliance type level, as shown in Table 4-5. It should be noted that as net-to-gross results combine both participant and nonparticipant data, weighted by the inverse of variance, precision and confidence levels are provided for each data collection effort separately. Nonparticipant precision and confidence is discussed in the next section.

Table 4-5. Precision and Margins of Error at 90% Confidence for Participant Survey Results

Jurisdiction	Type of Appliance	Participant Population ^a	Total surveys completed	Relative Precision at 90% Confidence
DEC	Refrigerator	13,489	70	9.8%
	Freezer	3,684	71	9.7%
	Total	17,173	141	6.9%
DEP	Refrigerator	6,901	70	9.8%
	Freezer	1,874	73	9.4%
	Total	8,775	143	6.9%

a. Note that only participants who had received their rebate were included in the population for the participant survey; all participants within the evaluation period were included in the population for the gross impacts regression.

4.1.5 Nonparticipant Survey

The evaluation team completed a survey with a sample of DEC nonparticipating customers.⁴ The survey served two primary goals for the Appliance Recycling program evaluation: 1) gather information from customers who recently discarded an appliance to support the net-to-gross and process evaluation, and 2) gather information from customers who currently have a secondary appliance to understand program awareness and market attitudes. In addition, the survey included brief batteries to gather information for the Residential Lighting program as well as general population program awareness of and attitudes toward energy efficiency.

Sample Design and Fielding

The survey was fielded via telephone and online. Duke Energy provided a random sample of 50,000 DEC customers. The evaluation team emailed customers invitations to complete the survey online and sent up to two email reminders. We called customers without email addresses and completed the survey over the telephone. The general population survey was fielded in June and July of 2015.

Nonparticipant Completes

The evaluation team contacted 3,960 customers as part of the Appliance Recycling non-participant survey, 331 completed survey modules regarding recently discarded appliances or secondary appliances. An additional 266 customers completed the lighting and general awareness and attitudes parts of survey for a total of 597 survey completes (Table 4-6).

⁴ Nonparticipant surveys were not completed with DEP customers for this evaluation period. For the nonparticipant surveys, customer characteristics were assumed to be similar between the two territories and all results were also applied to DEP.

Table 4-6. Nonparticipant and General Population Survey Sample Sizes and Number of Completed Interviews

Strata	Planned	Completed	Response Rate
	DEC	DEC	
Discarded an appliance in past 3 years	70	94	17% CATI, 16% CAWI
Currently have a secondary appliance	N/A	237	
General Population (screened out of ARP-specific sections; completed lighting module only)	N/A	266	

Survey Dispositions and Response Rate

Table 4-7 provides the final survey dispositions.

Table 4-7. General Population Survey Disposition Summary

Disposition	Count
Completed Interviews (I)	597
Web, complete	322
Phone, complete	275
Partial Interviews (P)	108
Eligible Non-interviews (NC)	835
Phone, answering machine	314
Phone, business/residential phone	22
Phone, busy	10
Phone, callback to complete	20
Phone, cell phone callback	4
Phone, computer tone	10
Phone, customer indicated called already	3
Phone, customer said wrong number	47
Phone, language problems	11
Phone, no answer	106
Phone, non-specific callback/secretary/NTG	139
Phone, not available	119
Phone, scheduled appointment	27
Phone, terminate - not DEC customer	1
Web, terminate - not DEC customer	2
Unknown Eligibility, Non-interviews (UH)	256
Phone, open sample not called	251
Phone, privacy line/number blocked	5
Not Eligible (NE)	255
Web, email bounced	39

Disposition	Count
Phone, disconnected phone	216
Refused (R)	1,909
Phone, add to do not call list	14
Phone, refusal because of cell phone	4
Phone, hard refusal	13
Phone, Initial refusal	303
Web, do not contact	1
Web, no response	1,574
Total Participants in Sample	3,960

Table 4-8 provides the survey response rate. We do not report a cooperation rate for the email sample, because it is difficult to estimate it accurately with emailed survey invitations. We do, however, report a cooperation rate for the sample targeted through outbound phone calls.

Table 4-8. General Population Survey Response Rates

AAPOR Rate	Rate
Response rate	17%
Cooperation rate (outbound phone calls only)	41%

Survey Weighting

To inform the Appliance Recycling evaluation, the nonparticipant survey specifically sought to screen only for respondents in two populations: 1) those who currently have a spare/secondary appliance, and 2) those who have recently gotten rid of an appliance. However, the survey also collected data for the Residential Lighting evaluation and included some questions asked of the general population. For any questions reported within this report that were asked of the general population, responses were weighted by survey mode and by home ownership status (using census data) to correct for potential biases observed there. For questions asked of the Appliance Recycling specific analysis groups (those had recently gotten rid of an appliance (including net-to-gross), or those who currently have a spare appliance) results are unweighted.

Targeted and Achieved Confidence and Precision

The evaluation targeted 10% precision at a 90% confidence level for all data collection tasks that involved sampling at the overall level. These precision goals were met (Table 4-9).

Table 4-9. Nonparticipant Survey Precision at 90% Confidence

Metric of Interest	Relative Precision
Overall Nonparticipant Process data	4.5%

5. Impact Evaluation

This section describes the methodology for conducting the gross impact analysis and the results of the analysis. The evaluation team completed the following activities:

- Reviewed program tracking data and savings assumptions for accuracy, completeness, and consistency
- Reviewed other regression models developed for appliance recycling programs to determine an appropriate model to use
- Using the selected model, conducted regression modeling of energy and demand savings and developed evaluated savings estimates

5.1 Methodology

This section summarizes the methodology used for the impact evaluation of the Appliance Recycling program.

5.1.1 Deemed Savings Review

In support of the impact evaluation, the evaluation team reviewed program tracking databases and energy savings assumptions. The objectives of the review were to identify the deemed savings values DEC and DEP used to calculate impacts, review the deemed savings values for reasonableness, verify their accurate application, and identify data gaps, omissions, inconsistencies, and errors. We reviewed evaluation reports from previous DEC and DEP evaluations and developed recommendations for changes where appropriate. Finally, as part of the review process, we also checked the program tracking data for accuracy, consistency, and completeness.

5.1.2 Review of Existing Regression Models

In order to estimate gross savings for the DEC and DEP Appliance Recycling program, the evaluation team used a regression model to calculate gross energy and demand savings. The first step of this research was to conduct a secondary review of available regression models developed for other appliance recycling programs. The evaluation team reviewed these models, including their inputs and factors, and determined which model would be most appropriate to estimate consumption and demand savings for this program. This review is outlined in Table 5-1 below.

Table 5-1. Regression Literature Review: Models Used

Source	Regressions used ^a	Metering Data Information	Other Information
DEP 2011-2013 ARP Evaluation	UEC only	Metering in CA and MI (n=564+ between May 2009 and April 2011)	Same regression model in all evaluation years; follows UMP methods. This is the same regression model example used in the UMP.
DEC 2014 ARP Evaluation	None – used billing data	Carolinas, 2013 (n=48)	Vast majority secondary units; in-service rate = part-use factor; includes replacement appliance metering for NTG.
CPUC 2010-2012 ARP Evaluation	None – used nameplate capacity	CA, 2010-2012 (n=112)	Determined nameplate capacity per unit and adjusted based on metering data.
California 2002 RARP Evaluation	UEC only	Adjusted from 1998 model (n=1,378); Metering done 1992-1995, 1998, and 2003	Taken from 2004 ACEEE Paper, “Cold Hard Facts About Metering Refrigerators That Aren’t There.”
AEP Ohio 2013 ARP Evaluation	UEC and UDC	Conducted by EMI Consulting in OH, 2013 (n = 132)	UDC regression based on peak demand – CDD is based on peak temperature
Consumers Energy 2010 ARP Evaluation	UEC only	MI, 2010 (n=135), Refrigerators only	Averaged TMY weather data from multiple stations
RMP UT 2009-10 ARP Evaluation	UEC only	CA, MI (n > 400) 2009-2011	Similar sample to DEP 2011-13

a. UEC = Unit Energy Consumption Regression (annual kWh); UDC = Unit Demand Consumption Regression (peak kW)

Table 5-2 details which parameters are needed as inputs for the models reviewed. Additionally, the table shows whether the parameter was used in the energy consumption (UEC) or demand (UDC) model. Fields not populated indicate that parameter was not used in that particular model.

Table 5-2. Regression Literature Review: Parameters Used

Parameter	DEP 2011-2013 ARP Evaluations	California 2002 RARP	AEP OH 2013	CE 2010	RMP UT 2009-10
Intercept	UEC	UEC	UEC, UDC	UEC, UDC	UEC
Age	UEC	UEC	UDC	UDC	UEC
Pre-1990	UEC	-	-	UEC	UEC
Pre-1993	-	-	UEC		-
Size	UEC	UEC	UEC, UDC	UEC, UDC	UEC
Single Door Refrigerator	UEC	UEC	UDC	UEC	UEC
Side-by-Side Refrigerator	UEC	UEC	UEC, UDC	UEC	UEC
Frost-Free Defrost	-	UEC	-	-	-
Top Freezer Refrigerator	-	UEC	-	-	-
Chest Freezer	UEC	-	UDC	-	UEC
Primary Appliance	UEC RF only	-	UEC RF only	UEC	UEC RF only
HDD ^a * unconditioned space	UEC	-	-	-	-
CDD ^b * unconditioned space	UEC	-	UDC	-	UEC
Average Outdoor Temp	-	-	-	UEC, UDC	-
Label Amperage	-	UEC	-	-	-
Additional Interaction Terms	-	UEC	UDC	-	-

a. Heating degree days

b. Cooling degree days

Model Selected for the Appliance Recycling Program Evaluation

Based on the literature review, the evaluation team selected the regression model from the DEP 2011-2013 evaluations—this is the same model that is referenced by the UMP. This was selected for multiple reasons:

- The model's parameters are in-line with many other regression models from the literature review.
- The model is from a recent study.
- The model was derived from a study with a large sample size.
- The model accounts for temperature variations, allowing it to be used across multiple territories.
- The model closely follows the UMP protocols for appliance recycling evaluation (this model is recommended for use by the UMP if no other models are available).
- The model uses parameters that are available in the program's tracking data, from customer surveys, or from credible secondary sources.

The evaluation team made several adjustments to the approach used by the DEP 2011-2013 evaluation; these are discussed in more detail in the following sections.

5.1.3 Gross Energy and Demand Regression

To calculate gross energy savings, the evaluation team calculated the unit energy consumption (UEC) of each refrigerator and freezer in the program tracking database using regression analysis.

The evaluation team then calculated total energy savings using the estimated UEC and a part-use factor (PUF), which accounts for appliances that are only in use for part of the year. Figure 5-1 shows the full calculation of the adjusted gross energy savings. Energy savings were calculated for each refrigerator and freezer.

Figure 5-1. Adjusted Gross Energy Savings

$$\text{Adjusted Gross Energy Savings} = PUF * \sum UEC_i$$

Explanations of the calculations for the UEC and the part-use adjustment factor are discussed below.

UEC Calculation

The UEC was calculated using the program tracking data and a regression model based on metered consumption of refrigerators and freezers. Regression equations calculate UEC as a function of key appliance characteristics, which are characteristics that drove statistically significant changes in UEC for the metered appliances. The evaluation team used the regression model from the 2011-2013 DEP evaluations as discussed above. This regression equation calculates full-year energy savings as a function of unit age, size, configuration, usage, location, and temperature data. The models and coefficients as well as average inputs for refrigerators and freezers are shown in Table 5-3. Note that coefficients shown are based on daily energy usage; annual UEC will be calculated by multiplying the daily energy usage by 365 days per year.

Table 5-3. UEC Regression Model Coefficients and Inputs

Appliance	Variable	Model Coefficient ^a	DEC Mean Value	DEP Mean Value
Refrigerator	Intercept	0.580	1.00	1.00
	Age (years)	0.027	20.80	18.96
	Dummy: Unit manufactured pre-1990	1.060	0.31	0.20
	Size (ft ³)	0.067	19.39	19.28
	Dummy: Single Door	-1.980	0.02	0.02
	Dummy: Side by side	1.071	0.32	0.32
	Dummy: Primary Appliance	0.610	0.52	0.64
	Interaction: HDD x Dummy: Unconditioned Space	-0.045	3.43	2.42
	Interaction: CDD x Dummy: Unconditioned Space	0.020	1.69	1.13
Freezer	Intercept	-0.892	1.00	1.00
	Age (years)	0.040	26.64	23.34
	Dummy: Unit manufactured pre-1990	0.695	0.57	0.42
	Size (ft ³)	0.130	16.74	16.29
	Dummy: Chest Freezer	0.350	0.31	0.35
	Interaction: HDD x Dummy: Unconditioned Space	-0.030	6.38	5.43
	Interaction: CDD x Dummy: Unconditioned Space	0.070	3.14	2.55

a. Annual UEC is calculated by multiplying the daily energy usage by 365 days per year.

To calculate the UEC for each appliance in the program tracking database, the evaluation team used the coefficients listed in Table 5-3, program tracking data, participant survey data, and local weather data.⁵ To determine heating (HDD) and cooling (CDD) degree days, the evaluation team used NOAA weather data from the program period from at least one source per utility territory and per state. The participant survey was used to determine whether the appliance was a primary or secondary unit and if it was in a conditioned or unconditioned space, as this data was not considered accurate in the program tracking data. For these values, the evaluation team used the average values from the participant survey for the entire population when calculating the UEC.

⁵ <http://www.nws.noaa.gov>

Part-Use Adjustment for Energy Savings

To accurately calculate energy savings, an adjustment is needed to account for the fact that secondary appliances are often non-operational during portions of the year. For example, appliances may not be used during the winter months or may only be used for special occasions. The evaluation team determined a part-use factor to adjust the annualized UEC estimates to better reflect the proportion of the year that the recycled unit would have actually operated had it not been removed by the program. In addition to adjusting the UEC estimates, the part-use factor was also used to adjust the reported average demand savings, as it represents usage over the full year.

Following the UMP protocol,⁶ the evaluation team calculated part-use factors by appliance type and by appliance use (primary vs. secondary appliance), and took into consideration the appliance's future use had it been kept. The evaluation team also calculated the part-use factor separately for each service territory. The part-use factor is based on self-reported program participant survey data based on the following questions:

- In the past year, how often would you estimate your appliance was plugged in and running? (in days, weeks, or months)
- Before hearing about Duke Energy's Appliance Recycling program, were you already considering getting rid of your appliance?
- [Asked for primary refrigerators only:] If you had kept your refrigerator, would you have left it in your kitchen or moved it to another location in your home?⁷

The calculations to determine the overall part-use factor directly follow the UMP protocols. The evaluation team used the equation in Figure 5-2 to determine part-use values. This methodology allows for increased granularity in the data and smaller levels of uncertainty.

Figure 5-2. Part-Use Impact Adjustment

$$PUF = \frac{Months_{In\ Use}}{12} \text{ OR } \frac{Weeks_{In\ Use}}{52} \text{ OR } \frac{Days_{In\ Use}}{365}$$

Following the UMP protocol, all freezers were assumed to be secondary units. The part-use factor analysis for freezers reflects this assumption.

5.1.4 Ex-post (Adjusted) Gross Demand Savings

The evaluation team performed independent research to calculate *ex-post* adjusted gross average and summer peak demand savings. This analysis used models for the unit demand consumption (UDC) of each

⁶ Chapter 7: Refrigerator Recycling Evaluation Protocol. The Uniform Methods Project. NREL.
<http://energy.gov/sites/prod/files/2013/11/f5/53827-7.pdf>

⁷ These questions are asked to determine whether the appliance would have been discarded in the absence of the program and, if it was kept, whether a primary refrigerator would remain a primary use appliance or become a secondary appliance. Other questions and wording were used to further identify these appliances. See the Participant Survey Instrument for more information.

refrigerator and freezer that are similar to the UEC models shown above. Note that the UMP protocols for appliance recycling do not address demand savings.

The evaluation team calculated total demand savings using the UDC and a summer-use adjustment factor (SUAF), which accounts for appliances that are only in use for part of the summer peak time. Figure 5-3 shows the full calculation of the *ex-post* gross demand savings from the UDC and the SUAF.

Figure 5-3. Adjusted Gross Demand Savings

$$\text{Adjusted Gross Demand Savings} = \text{SUAF} * \sum \text{UDC}_i$$

More information follows on the calculation of the UDC and SUAF.

Demand Consumption Calculation

The UDC was calculated using the program tracking data and a regression model based on metered consumption of refrigerators and freezers, similar to the UEC model. The regression estimates the demand of an appliance that is on for the entire peak period (e.g., a primary appliance). For secondary units that are not plugged in continuously, the SUAF accounts for reductions in demand.

Again, the evaluation team used a regression model from the 2011-2013 DEP evaluations to calculate average demand. The analysis includes an additional peak-to-average ratio factor for summer peak demand (discussed in more detail below). The models and coefficients for refrigerators and freezers for demand savings are the same as those shown in Table 5-3. Note that coefficients shown are based on daily energy usage; UDC will be calculated by dividing the daily energy usage by 24 hours per day.

To calculate the UDC for each appliance in the program tracking database, the evaluation team used the coefficients listed in Table 5-3, program tracking data, participant survey data, and local weather data.⁸ To determine peak temperature, the evaluation team used NOAA weather data from the program period from at least one source per utility territory and per state.

Summer Peak Adjustment for Demand Savings

Similar to the part-use factor discussed above, which is used for consumption and average demand savings calculations, the SUAF accounts for appliances that are not operational during portions of the peak summer period. The evaluation team determined a SUAF to adjust the UDC estimates for summer peak demand to better reflect the proportion of the summer that the recycled unit would have actually operated had it not been removed by the program.

The evaluation team calculated separate SUAFs by appliance type and by appliance use (primary vs. secondary appliance). The SUAFs are based on participant responses to the following survey questions:

- Thinking about just the three month summer period of June, July, and August, what percent of the time was your appliance plugged in or running during the summer?

⁸ <http://www.nws.noaa.gov>

- Before hearing about Duke Energy's Appliance Recycling program, were you already considering getting rid of your appliance?
- [Asked for primary refrigerators only:] If you had kept your refrigerator, would you have left it in your kitchen or moved it to another location in your home?⁹

There is no protocol for a SUAF in the UMP.¹⁰ However, the calculations to determine the overall SUAF directly follows the UMP protocols for calculating the part-use factor, except there is no assumption for part-time usage. Instead of assuming that part-use appliances will be on for 50% of the summer, the evaluation team used the equation in Figure 5-4 to determine part-time values. This methodology allows for increased granularity in the data and smaller levels of uncertainty.

Figure 5-4. Summer Peak Adjustment Factor

$$SUAF = \frac{\sum \text{Percent of Time Appliance is On During the Summer}_i}{\text{Total Survey Respondents}}$$

Following the UMP protocol, all freezers were assumed to be secondary units. The SUAF analysis for freezers reflects this assumption.

As noted above, the SUAF is applied only to summer peak demand savings. Average demand savings, also reported in this section, were adjusted by the part-use factor described above as the part-use factor represents appliance usage over the full year, not just during the summer.

Peak-to-Average Ratio

In past evaluations, a flat load-shape was assumed and only average demand values calculated (as opposed to peak demand values). This allowed the same value to be used for both summer and winter peak demand. For this evaluation, the evaluation team calculated both average demand as well as summer peak demand, using an additional factor described below. To more accurately represent the demand used by both refrigerators and freezers during the summer peak times, the evaluation team applied an adjustment called the Peak-to-Average Ratio, which was developed in the 2013 AEP Ohio Appliance Recycling program evaluation as part of an in-situ metering effort.¹¹

This adjustment factor accounts for the additional demand appliances place on the grid during summer peak times. As shown in Table 5-4 below, this adjustment factor is more impactful for freezers than refrigerators. This is because freezers are: a) more likely to be in an unconditioned space such as a garage, which can reach high temperatures during a summer peak event, and b) cooling to a lower temperature than refrigerators, which requires more demand.

⁹ These questions were asked to determine whether the appliance would have been discarded in the absence of the program and, if it was kept, whether a primary refrigerator would remain a primary use appliance or become a secondary appliance. Other questions and wording were used to further identify these appliances. See the Participant Survey Instrument for more information.

¹⁰ Chapter 7: Refrigerator Recycling Evaluation Protocol. The Uniform Methods Project. NREL.
<http://energy.gov/sites/prod/files/2013/11/f5/53827-7.pdf>

¹¹ Navigant Consulting, AEP Ohio Appliance Recycling Program 2013 Evaluation Report.

Table 5-4. Peak-to-Average Ratio

Appliance	Peak-to-Average Ratio
Refrigerators	1.08
Freezers	1.36

Error and Bias Associated with the Regression Model

The evaluated savings for the Appliance Recycling program are calculated by a prediction method which uses a regression model generated from metered data from a prior evaluation to predict the savings for the current units. This is the most common method for estimating savings for appliance recycling programs and is suggested in the UMP Protocol. Prediction is assumed to be “good enough” for estimating savings from these programs as precise measurement of the demand before and after removal of the unit would be cost-prohibitive. The tradeoff accepts errors and biases that are presented here.

- *Prediction error:* The variance in energy savings due to the regression model. This error is calculated as 9% for refrigerators and 23% for freezers with 90% confidence.
- *Peak factor error:* The variance in demand savings due to the peak demand factor. For metered units, the peak factor ranges from 0 to 2.36 with a mean of 1.08 for refrigerators and from 0 to 3.40 with a mean of 1.36 for freezers. This variability is large because peak demand usage varies significantly by unit; some units are outside and use much more demand than average; some units are in conditioned spaces; and some units are not running at all during peak hours. Despite the variability, the evaluation team considers the average value as representative of the metered sample and of the current population.
- *Survey error:* the variance in the input terms to the model based on the survey responses, as shown in Table 5-5 below.

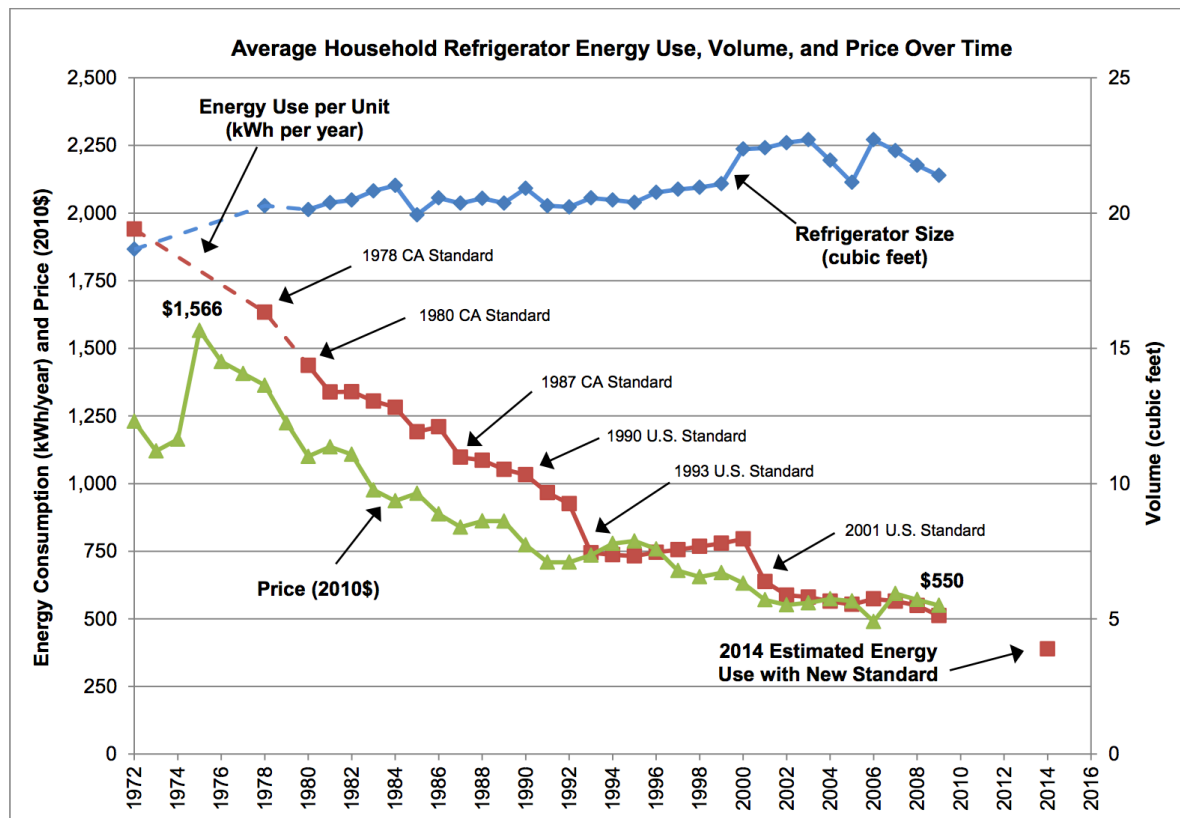
Table 5-5: Estimates of Survey-Derived Variables with 90% Confidence Intervals

Jurisdiction	Appliance	Survey Counts	Conditioned	Primary Use	PUF	SUAF
DEC	Refrigerator	70	0.63±0.10	0.52±0.1	0.99±0.02	1.00±0.00
	Freezer	71	0.31±0.09	N/A	0.90±0.06	0.91±0.06
DEP	Refrigerator	70	0.75±0.09	0.64±0.1	0.96±0.04	0.96±0.04
	Freezer	73	0.44±0.10	N/A	0.97±0.03	0.96±0.04

- *Bias:* The population from which the equations were developed is mostly consistent with the characteristics of the population of units collected by Duke Energy in the evaluation periods. However, a major difference is the vintage of appliances. The mean year of manufacture for the units collected in 2014 was 1994 for refrigerators and 1988 for freezers, while the metered sample vintages were nearly a decade older (1986 and 1978, respectively). Appliance efficiency standards increased in 2001 and again in 2011, but very few units from the metered sample were manufactured after these standards were put in effect. The standards reduced the energy usage of

appliances as shown Figure 5-5 but the regression cannot account for this effect. Therefore, while the model was still determined to be the best fit for the current evaluation, the model will likely overestimate energy savings for newer units and this effect is likely to intensify in future program years as the model becomes more outdated. Therefore, for future evaluations, the evaluation team recommends continuing to review available regression models for more recent robust models to use. In the absence of more recent robust studies, DEC and DEP should consider conducting an in-situ study, perhaps through a regional partnership such as the Southeast Energy Efficiency Alliance (SEEA).

Figure 5-5: Change in Average Refrigerator Energy Use¹²



Sources: Association of Home Appliance Manufacturers (AHAM) for energy consumption and volume; U.S. Census Bureau for price

- Notes:
- a. Data includes standard-size and compact refrigerators.
 - b. Energy consumption and volume reflect the DOE test procedure published in 2010.
 - c. Volume is adjusted volume, which is equal to the fresh food volume + 1.76 * freezer volume.
 - d. Prices represent the manufacturer selling price (e.g. excluding retailer markups) and reflect products manufactured in the U.S.

¹² Source: http://www.appliance-standards.org/sites/default/files/Refrigerator%20Graph_July_2011.PDF

5.2 Gross Impact Results

The evaluation team received program tracking data for both DEC and DEP, which included information from both the JACO and ARCA tracking databases. These files were merged together and key fields identified. Upon merging the program tracking data files, the evaluation team analyzed the data for any gaps and inconsistencies. As part of the analysis, we performed the following steps:

- Checked the core data fields for missing values
- Checked the data for reasonableness and accuracy in certain fields (discussed more below)

In general, we found that necessary data fields were clean, fully populated, and contained most of the necessary information to proceed with the impact analysis. However, the evaluation team noted two fields that contained potential for inaccurate information: conditioned/unconditioned space and primary/secondary appliance indicator. Based on the evaluation team's past experience with appliance recycling programs, both of these fields have the potential to be inaccurately recorded by pick-up crews. This inaccuracy stems from customers who are replacing their primary appliance, and move their old appliance to a different location (such as the garage) while waiting for it to be picked up and recycled by the program. While the pick-up crews are supposed to be recording the use of the appliance for the majority of year prior to it being picked up, for various reasons sometimes this information is not collected. Instead, the appliance is documented as a secondary appliance in an unconditioned space, when it really had been used as a primary appliance in a conditioned space.

Due to the potential for these inaccuracies, the evaluation team gathered this information during the participant surveys to use as inputs into the regression model. Ultimately, when compared to the tracking data, the evaluation team did note some considerable discrepancies between what was reported in the survey and what was tracked by the program, specifically for the primary/secondary indicator (see Section 7 for additional detail). Therefore, these parameters were taken directly from the survey results for the gross impacts analysis and applied as an average value to all data in the tracking data files.

Using the equations and inputs discussed in the Methodology section of this chapter, we calculated gross energy and average and summer peak demand savings achieved by the program during the evaluation period. Table 5-6 presents the energy (kWh) impacts of the DEC/DEP Appliance Recycling program. Compared to previous years' evaluations, the evaluated gross savings were relatively consistent. For three of the four reported energy consumption values, the estimated gross savings were slightly higher than in previous years. This change is driven mostly by higher part-use factors, meaning that the sample of program participants interviewed this year reported using their appliances for a higher proportion of the year than in past years. Additionally, several key regression inputs were slightly higher this year than in previous years, such as age for DEC refrigerators and freezers, and size for DEP freezers.¹³

¹³ It should be noted that while it is somewhat straightforward to compare impact results year to year for DEP, as a consistent regression model has been used for the past three years, it is somewhat more difficult to address key drivers of changes to impact results for DEC, as previous evaluations used a different regression model.

Table 5-6. Gross kWh Results

Jurisdiction	Type of Appliance	Projected/Claimed Savings (kWh/per unit)	2015 Evaluated Gross Savings (kWh/per unit)
DEC	Refrigerator	952	1,182
	Freezer	869	923
DEP	Refrigerator	1,138	1,123
	Freezer	763	888

Table 5-7 presents the demand (kW) impacts of the Appliance Recycling program, including both average and summer peak demand. It should be noted that previous evaluations only calculated average demand, not summer peak demand, which was previously used for both winter and summer peak demand estimates. The 2015 average demand savings findings are consistent with average demand findings from previous evaluations. However, as is expected, summer peak demand values are somewhat higher than average demand savings; this is due to the inclusion of the Peak-to-Average Ratio discussed previously to more accurately represent summer peak demand. This ratio, which accounts for the increased demand used by appliances in unconditioned spaces in summer peak months, more heavily impacts freezers. Thus, while refrigerator summer peak demand savings only increase slightly from average demand savings, freezer summer peak demand savings for both DEC and DEP increase considerably.

Table 5-7. Gross kW Results

Jurisdiction	Type of Appliance	Projected/Claimed Savings (kW/per unit)	2015 Evaluated Average Demand Savings (PUF applied) (kW/unit)	2015 Evaluated Gross Summer Peak Demand Savings (SUAF applied) (kW/per unit)
DEC	Refrigerator	0.136	0.135	0.147
	Freezer	0.104	0.105	0.144
DEP	Refrigerator	0.130	0.128	0.139
	Freezer	0.087	0.101	0.137

Remaining Useful Life

As part of their review of previous evaluations, the evaluation team assessed the previous work done to estimate remaining useful life (RUL) of recycled appliances. Based on a review of the past research, UMP recommendations, and the current parameters of the tracking data, the evaluation team recommends Duke Energy continue to use the previously determine RUL value of six years. However, if the average age of the program's recycled appliances continues to decrease, an additional assessment of this value would be desirable.

5.3 References

TecMarket Works. *Appliance Recycling - Final Process and Impact Evaluation Report*. Prepared for Duke Energy Carolinas. April 25, 2014.

Navigant Consulting, Inc. and The Cadmus Group. *2013 EM&V Report for the Appliance Recycling Program*. Prepared for Duke Energy Progress. February, 2015.

6. Net-to-Gross Analysis

This section describes our approach for estimating the net-to-gross ratio (NTGR) for the Appliance Recycling program and presents the resulting NTGR and the program net impacts.

6.1 Methodology

The evaluation team closely followed the methodology laid out in the Uniform Methods Project (UMP) for calculating net savings for appliance recycling programs.¹⁴ For appliance recycling programs, free-ridership captures the degree to which customers who recycled appliances through the Appliance Recycling program would have removed these appliances from the grid even in the absence of the program—these participants are considered to be free-riders. This approach uses both participant and nonparticipant results to determine what would have realistically happened to the appliance in the absence of the program. The evaluation team used data from the “Consideration of Alternatives” questions in the participant survey to calculate net savings (see Appendix D for the participant and nonparticipant surveys). This was supplemented with information from the nonparticipant surveys and weighted by the inverse of variance of each analysis group, described in more detail below.

Two additional analyses – would-be acquirer and induced replacement – are also applied within the analysis to determine an average net per-unit energy consumption (kWh) by jurisdiction and appliance type. Once this per-unit estimate is calculated, a net-to-gross ratio is determined by dividing the net savings by the gross energy savings, as detailed in Figure 6-1 below. As the final step to this analysis, the net-to-gross ratios are applied to the per-unit gross demand impact estimates, to determine the per-unit net demand savings, also by jurisdiction and appliance type.

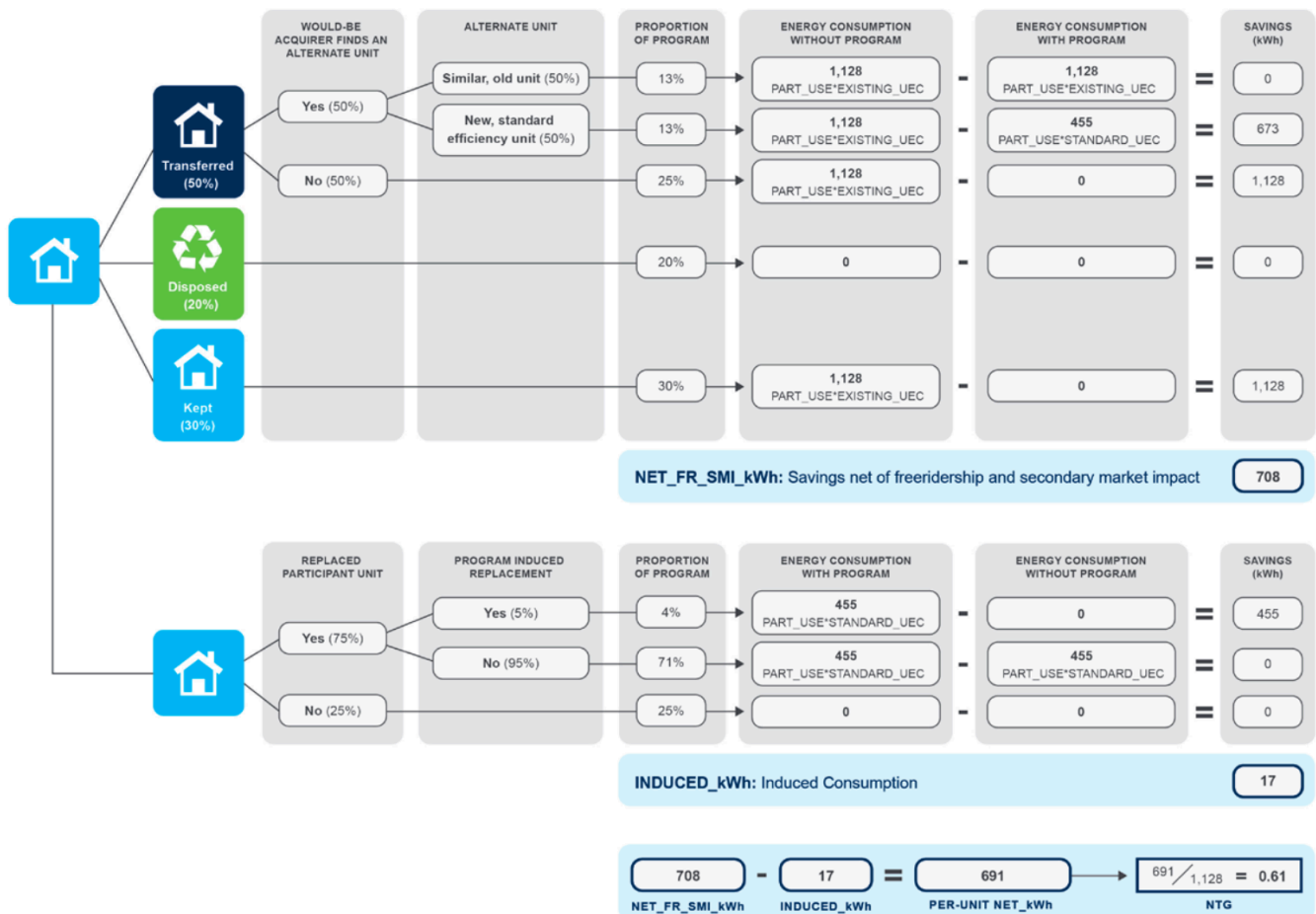
Figure 6-1. Calculation of Net-To-Gross Ratios

$$NTGR = Net_kWh / Gross_kWh$$

¹⁴ Chapter 7: Refrigerator Recycling Evaluation Protocol. The Uniform Methods Project. NREL.
<http://energy.gov/sites/prod/files/2013/11/f5/53827-7.pdf>

The following schematic is directly taken from the UMP, which details how net savings are derived. Each step will be described in more detail below.

Figure 6-2. Appliance Recycling UMP Methodology Schematic



6.1.1 Calculating Net-To-Gross Ratios and Net Savings

When disposing of an appliance, customers have multiple choices regarding what to do with the appliance. Some options, such as selling the appliance or giving it away, mean the appliance will continue using energy, while other options, such as recycling the appliance or taking it to the dump, will guarantee that the appliance is taken off the electrical grid. Since the goal of the Appliance Recycling program is to get these appliances off the grid, the program is considered successful if it causes an appliance to be recycled that otherwise would have stayed on the grid in some way. For this reason, a customer is only considered to be a free-rider if, in the absence of the program, they would have disposed of the appliance in a way that would have taken it off the grid.

The net-to-gross analysis for appliance recycling programs relies on assigning customer responses into three groups depending on what would have happened to the appliance:

- *Transferred.* Appliances grouped as “transferred” are those that would have been given to someone else – sold, donated, or otherwise given away – and would have stayed on the grid in the absence of the program.
- *Disposed.* Appliances that would have been “disposed” are those that would have been scrapped or recycled in the absence of the program and ultimately removed from the grid.
- *Kept.* Appliances that would have been “kept” would have stayed in the home and continued to be used.

The determination of these analysis groups is discussed in more detail in the following section. To further illustrate this process, the evaluation team has included the calculation tables of the full net-to-gross analysis in Appendix C. For both participant and nonparticipant analyses, responses were reviewed for consistency; any respondent who replied to the key net-to-gross questions with “don’t know,” “refused,” or for which an analysis group was unable to be determined was dropped from the analysis.

Assigning Analysis Groups

As noted above, in many cases it is clear-cut to determine if an appliance would have been transferred or disposed in the absence of the program. However, in some cases, in order to accurately group customers into one of the three analysis groups, some options for appliance disposal required additional assessment from the evaluation team to determine whether or not it was ultimately removed from the grid. One common way in which customers dispose of appliances is by having it removed by the retailer from whom they purchase a new or replacement appliance. Based on research conducted for other evaluations, the evaluation team has found that the treatment of appliances that are picked up by retailers is not consistent; often appliances are recycled, although others are sometimes sold into secondary markets. Therefore the evaluation team assumed that any appliance picked up by a retailer was recycled or otherwise taken off the grid (i.e., “disposed”).

Similarly, some participants reported that in the absence of the program they would have sold their appliance to a used appliance dealer. A review of market research along with the evaluation team’s previous experience indicated that used appliance dealers seek out younger, more modern appliances and often do not accept “old” appliances (and if they are accepted, dealers may not resell them in the secondary market but rather sell them for scrap). Therefore, for this evaluation, appliances older than 15 years were assumed to have been taken off the grid (i.e., disposed) in the absence of the program, while appliances younger than 15 years were assumed to have remained on the grid (i.e., transferred).

Finally, the evaluation team asked one consistency check question to participants who said they would have transferred or disposed of their appliance, to confirm the timeframe within which this would have occurred. While not explicitly discussed in the UMP, this is a common consistency check question asked in net-to-gross batteries for other measures and allows the evaluation team to adjust for participant responses that are very uncertain. If a participant indicated that they would have transferred or disposed of their appliance but that it would have occurred more than 12 months later, this participant was classified as “kept” and the program received full credit for their appliance. This adjustment is made because not only did the participant confirm that the appliance would have stayed on the grid for at least an additional year, but the participant’s plans are uncertain to the point that they could realistically change over the next year.

In addition to using participant data, the evaluation team supplemented this information with findings from the nonparticipant research. The nonparticipant research was conducted with Duke Energy customers who had recently disposed of a refrigerator or freezer in some way (including having given it away or sold it), but

did not participate in the program. While the participant survey asks customers to state what they would have done hypothetically in the absence of the program, the nonparticipant survey gathers information on what customers *actually* did in the absence of the program. The reason nonparticipant data is included in this analysis is because of the many factors that may impact a participant's choice in transferring or disposing of their appliance, some of which participants may not have fully considered. For example, participants may assume that they could have simply placed their appliance out on the curb for garbage pick-up, and respond in this manner in the participant survey. However, in reality, in many communities, garbage collectors do not accept large appliances, or may charge a "white goods" or "bulky goods" fee along with a special appointment to pick them up. Including the nonparticipant responses in the analysis ensures that any erroneous assumptions made by participants are countered within the results.

The evaluation team combined the findings and weighted the results using the inverse of the variance of participant and nonparticipant data which places more weight on the more robust estimates (additional details on the proportions by participants and nonparticipants and the weighting scheme are included in Appendix C). It should be noted that nonparticipant data is only used for customers who said they would have transferred or disposed of their appliance; participant self-report for those who would have kept their appliances is considered more reliable as there are few barriers to this option. Table 6-1 shows the combined participant and nonparticipant results by appliance type and jurisdiction.

Table 6-1. Participant and Nonparticipant Results, Weighted by Inverse of Variance

Jurisdiction	Type of Appliance	Transferred	Disposed	Kept
DEC	Refrigerator	39%	33%	28%
	Freezer	31%	38%	31%
DEP	Refrigerator	38%	34%	28%
	Freezer	36%	24%	40%

Would-Be Acquirer Algorithm

As part of the net-to-gross analysis, the UMP recommends including an assessment of the effect of the program on the secondary market. This means that for those participants who would have transferred their appliance to someone else in the absence of the program, the evaluation team must determine whether that individual would have been able to find a different new or used appliance in its place. This can be approached two ways: 1) through market research within the secondary appliance market, or 2) by making conservative assumptions based on a pre-determined algorithm. As noted in the UMP, market research with the secondary appliance market is often extremely difficult and costly. More concerning, research with secondary appliance market actors often does not result in the level of detail needed to produce quantitative impact results, as few are able or willing to provide quantitative information. For this reason, the evaluation team used the conservative prescriptive algorithm approach outlined in the UMP for estimating the effect of the program on the secondary appliance market.

This approach assumes that of the participants who would have transferred their appliance to someone else in the absence of the program, half of the would-be acquirers went on to find a replacement appliance (and half did not). Of those that found a replacement appliance, half purchased a new standard appliance, and half purchased a similar used appliance. The program gets full credit for those would-be-acquirers who did not find a new appliance, but does not get credit for would-be acquirers who were able to find a used appliance, as this does not result in a change to the grid. For those would-be acquirers who are assumed to find a new, standard efficiency appliance, the program gets credit for the difference between an old,

inefficient appliance and a new standard efficiency one (average standard efficiency values are pulled from the ENERGY STAR website).

Induced Replacement

Finally, the UMP recommends calculating the savings associated with participants who replaced their recycled appliance, *but otherwise would not have in the absence of the program*. This situation is typically rare within appliance recycling programs, as the relatively small program incentive is usually not enough to incentivize a participant to purchase an expensive replacement appliance that they otherwise would not have purchased. An example of this would be a customer who is getting rid of an old secondary refrigerator. This customer was planning on simply living without their secondary refrigerator, but upon learning of the \$50 incentive available through the recycling program, decides instead to purchase a new refrigerator to replace the one they had recycled. This means that the customer is currently using *more* energy than they would have in the absence of the program; therefore, any energy use associated with this induced replacement reduces the program's overall net savings.

As expected, the evaluation team found this situation to be quite rare among program participants. The evaluation team calculated the overall induced replacement rate for each jurisdiction and appliance type, along with the associated kWh per unit, which is detailed in Table 6-2. It should be noted that only customers who recycled secondary refrigerators or freezers are included in this analysis; it is not reasonable that customers who are recycling their primary refrigerator would live without one, so it is assumed that all primary refrigerators would have been replaced regardless of the program.

Table 6-2. Induced Replacement Rates and Per-Unit kWh

Jurisdiction	Type of Appliance	Induced Replacement Rate	Per-Unit Induced Replacement kWh
DEC	Refrigerator	1%	7
	Freezer	1%	5
DEP	Refrigerator	1%	7
	Freezer	5%	23

6.2 Net Impact Results and NTGR

Across jurisdictions and appliance types, the net-to-gross ratios fall between 51% and 60%. This is relatively consistent with net-to-gross results from previous evaluations. Table 6-3 details the net energy and summer peak demand savings resulting from this evaluation.

Table 6-3. Energy (kWh) NTGR and Net Savings

Jurisdiction	Type of Appliance	NTGR	Per Unit Net Energy (kWh) Savings	Per Unit Summer Peak Net (kW) Savings
DEC	Refrigerator	0.52	619	0.077
	Freezer	0.51	470	0.073
DEP	Refrigerator	0.52	583	0.072
	Freezer	0.60	533	0.082

7. Process Evaluation

This section presents the findings from the process evaluation of the Appliance Recycling program for DEC and DEP. The section contains a description of the process evaluation methodology, followed by detailed findings. The process evaluation was designed to answer the following research questions:

- What are the sources of program information? What are the program's most effective marketing and outreach tactics?
- What are participants' motivations to participate in the program and recycle their appliance? How does that compare to why nonparticipants are getting rid of their appliances?
- Are there particular customer segments that the program should target to minimize free-ridership?
- Is the program leading to participation in other energy efficiency programs offered by Duke Energy?
- What are participants' experiences with the appliance pick-up process? Are there any issues?
- Are participants satisfied with their program experiences?
- How well is the program implementer achieving its metrics, such as delivering rebates in a timely manner?

7.1 Methodology

As discussed in detail in Section 4, the process evaluation was based primarily on primary data collected from participant and nonparticipant surveys with DEC and DEP customers. These data were also supplemented with interviews with Duke Energy program staff, a review of marketing materials and plans, and a review of the program tracking databases, including cancellation data.

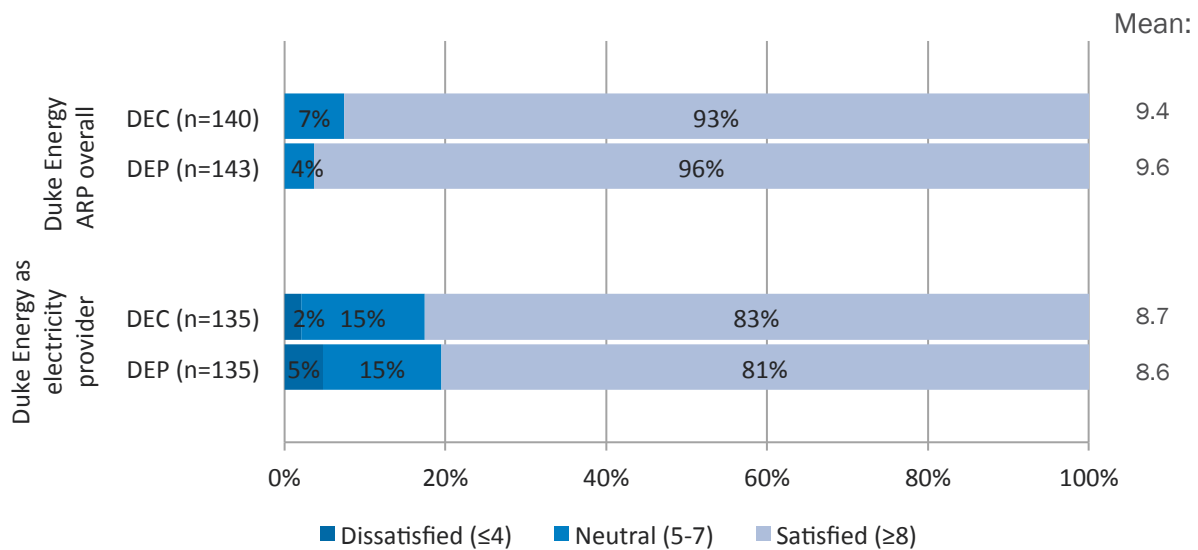
7.2 Notable Findings

The following presents significant process-related findings related to the Appliance Recycling program. Topics include participant satisfaction, program processes, program marketing, who the program is reaching (with respect to participant demographics and the characteristics of their appliances), participation influences, program potential and marketing opportunities, and appointment cancellations. Additional detailed results can be found in Appendix B.

7.2.1 Participant Satisfaction

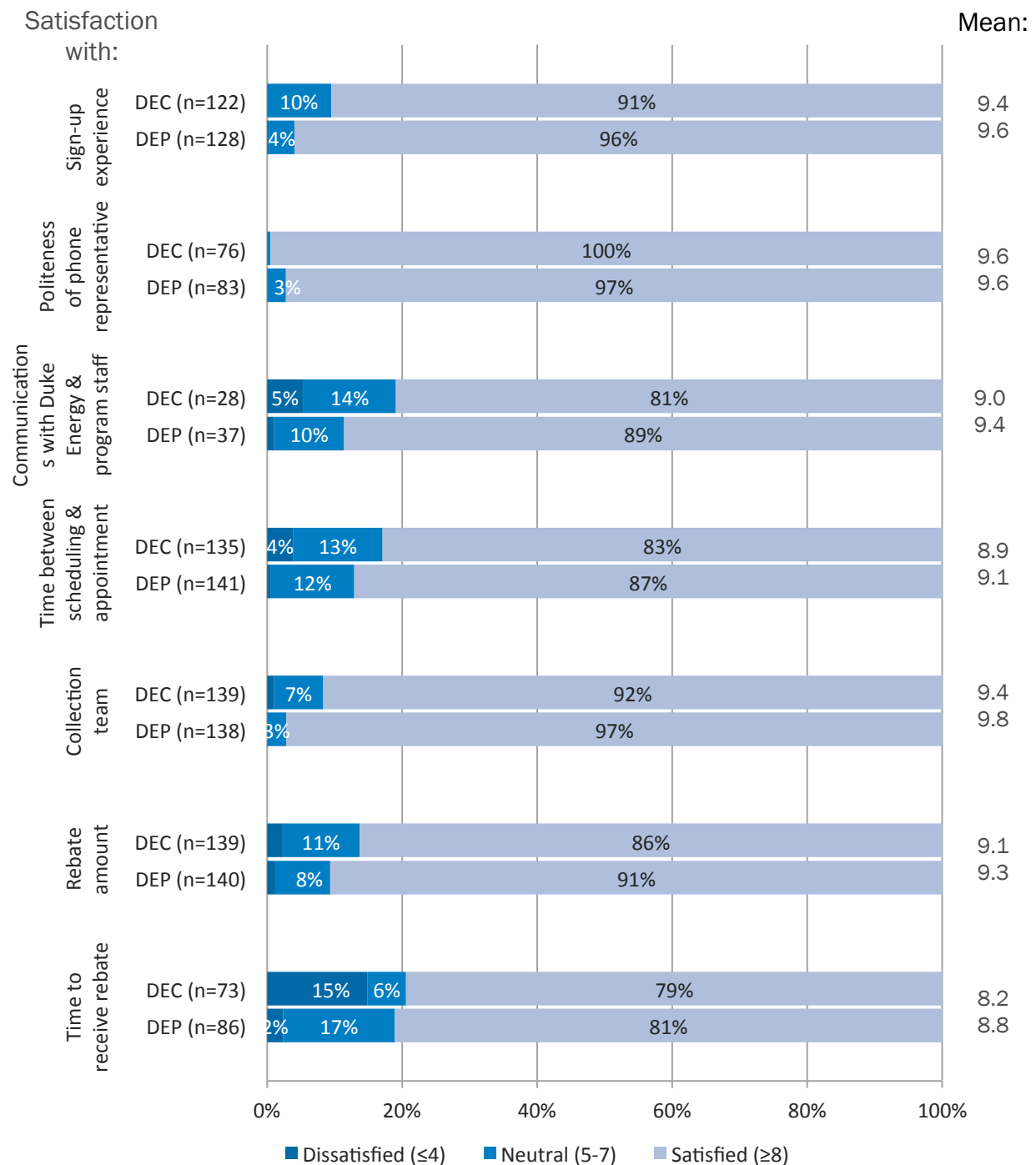
Overall, participants were highly satisfied with the Duke Energy Appliance Recycling program. Figure 7-1 details participant satisfaction with the program overall, as well as with Duke Energy as an energy provider. The high overall level of participant satisfaction is an indication that the program is running effectively. Additionally, while participants' overall satisfaction with Duke Energy is somewhat lower than satisfaction with the program, satisfaction with Duke Energy is higher for participants than the general population, who rated their satisfaction 7.8 on average on a scale from 0 to 10. This finding indicates that the program is positively affecting customers attitudes toward Duke Energy.

Figure 7-1: Participant Satisfaction with ARP and Duke Energy



Participants were also satisfied with individual aspects of the program. Figure 7-2 shows average participant satisfaction with program components, which included various program processes. In both service territories, almost every program component was rated on average as 9 or above on a scale of 0 to 10. One notable exception was the time to receive rebate, which was rated an average of below 9 in both service territories. The program components in Figure 7-2 are discussed in further detail in the following section.

Figure 7-2: Satisfaction with Program Components

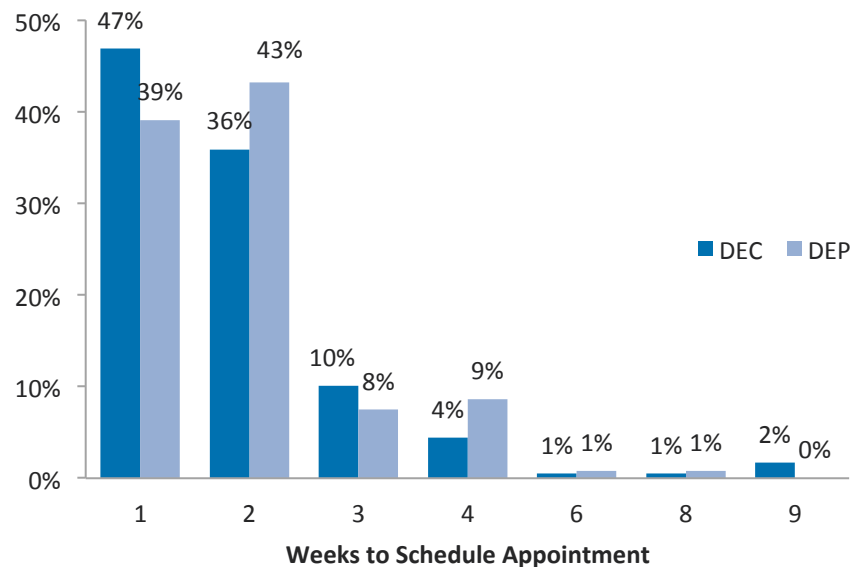


7.2.2 Program Processes

A key component of the process evaluation is to ensure there are no roadblocks or issues for customers progressing through the program from start to finish. The participant survey results indicate that program processes are functioning well and meeting customer expectations, with very few reported issues or concerns.

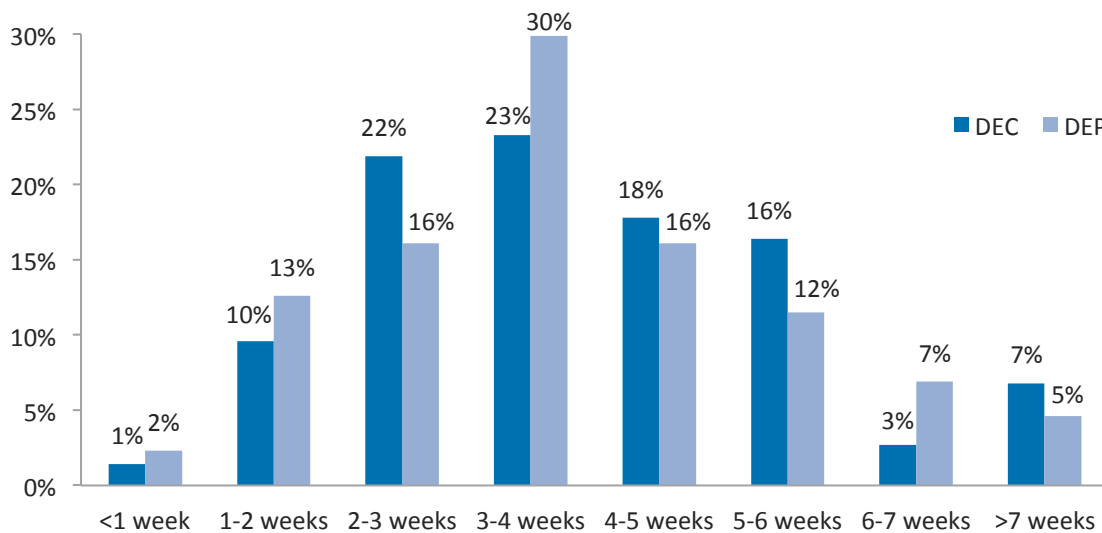
Approximately three-quarters of all participants signed up for the program by phone. A very small number of these participants mentioned that they attempted signing up online, but completed the enrollment by phone. These participants did not note any dissatisfaction with the overall sign-up process, however. Additionally, the majority of participants were able to schedule their pick-up within two weeks or less of scheduling the appointment. Figure 7-3 shows the distribution of the length of time in weeks between scheduling the appointment and the actual pick-up to the nearest week. Over 80% of respondents in both service territories were able to schedule an appointment within approximately two weeks of calling. For a small number of participants, it took longer than 6 weeks to schedule; however, program staff noted that these cases are usually attributable to customer preferences, rather than low availability of appointments. Given the high satisfaction ratings with this program component, appointment scheduling does not appear to be an issue for program participants.

Figure 7-3: Time from Scheduling To Appointment (to nearest week) (n=194)



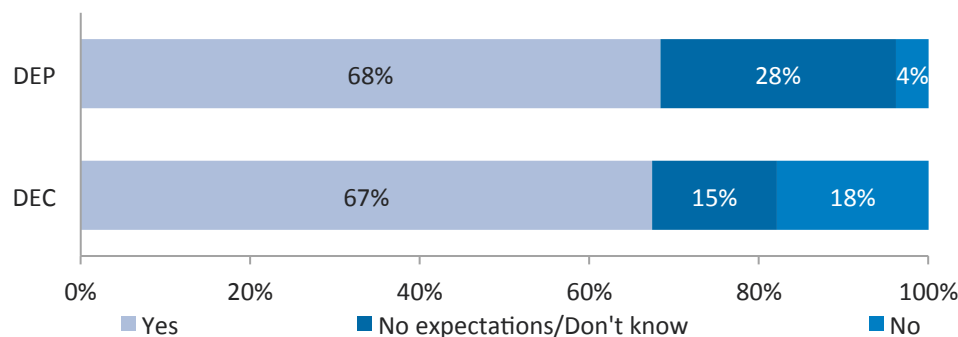
The evaluation team also examined the timeline for participants to receive their rebate check. The vast majority of participants received their rebate checks within six weeks of the appliance pick-up appointment. Figure 7-4 shows that 90% of DEC participants and 88% of DEP participants received the rebate within six weeks. The program strives to achieve 98% of all rebates processed and mailed within 6 weeks.

Figure 7-4: Number of Weeks From Pick-up Appointment To Receiving Rebate (n=160)



Participants were also asked whether they had noticed savings on their electric bill since recycling the appliance. Approximately one-third of participants in each service territory noticed bill savings. These participants were asked whether these energy savings met their expectations. Figure 7-5 shows that slightly over two-thirds of participants in each service territory felt the energy savings met their expectations. However, in DEC, 18% of respondents said that the energy savings did not meet their expectations, compared with only 4% in DEP. Conversely, nearly twice as many DEP respondents said that they did not have specific expectations on their energy savings compared to DEC respondents.

Figure 7-5: Energy Savings Relative To Expectations (n=104)



7.2.3 Program Marketing

The Appliance Recycling program is marketed with bill inserts, mass emails, advertisement collateral such as flyers and point of sale materials, social media posts, online advertisements, school media events, television commercials, and newspaper advertisements (North Carolina only).

The evaluation team asked participants to name their first source of awareness, as well as any secondary ways they heard of the program. Participants overwhelmingly found out about the program through Duke Energy bill inserts, with no other marketing activity responsible for a significant proportion of program

awareness. Table 7-1 shows nearly two-thirds of participants in both DEC and DEP first learned about the program from a Duke Energy bill insert. An additional 5% of respondents in each service territory reported the bill insert as a secondary source of information. The second most common source of awareness, word of mouth, was reported as a primary source by 12% of DEC participants and 20% of DEP participants, and a secondary source by an additional 6% of participants across service territories. Television advertisements were the next most mentioned marketing effort, with only around 5% of respondents.

Table 7-1: Participant Initial Source of Awareness (n=284)

Initial Source of Awareness	DEC	DEP
Duke Energy Bill Insert	63%	61%
Word of Mouth	12%	20%
TV Ad	6%	5%
Duke Energy Website	4%	2%
Retailer	3%	5%
Other Duke Energy	9%	3%
Newspaper Ad	3%	<1%
Some other way	0%	4%
Social Media: Facebook, Twitter, etc.	<1%	<1%

Similarly, nearly three-quarters of nonparticipants who were aware of the Appliance Recycling program cited Duke Energy as the source of awareness, as shown in Table 7-2. Again, word of mouth was the second most common source of awareness.

Table 7-2: Nonparticipant Initial Source of Awareness (DEC) (n=123)

Initial Source of Awareness	Percent
Duke Energy	74%
Word of Mouth	11%
TV Advertisements	8%
Some other way	3%
Newspaper ad	2%
Website	2%
Radio Advertisement	1%
Retailer	1%

7.2.4 Participant and Appliance Characteristics

Demographics

The evaluation team gathered information on respondent characteristics to understand the types of customers the program is reaching, as summarized in Table 7-3. Overall, the demographic characteristics of DEC and DEP are very similar: respondents are over 60 years of age on average, and nearly 60% have a bachelor degree or higher.

Income, however, is slightly lower in DEC than DEP. Nearly one-third of DEC respondents had an annual income of \$50,000 or less, compared with less than one-fourth of DEP respondents. Nearly 95% of all participants own their own home, as expected for a program for which participants must own the recycled appliance. Over 80% live in a single-family detached home.

Table 7-3: Participant and Nonparticipant Respondent Demographics

	Participants		Nonparticipants (DEC)	
	DEC	DEP	Got rid of appliance	Own secondary appliance
Average Respondent Age	64	63	60	58
Education: Bachelors or Higher	59%	57%	44%	41%
Income Less than \$50K	31%	23%	35%	33%
Own Residence	94%	94%	96%	95%
Single-family Detached Home	82%	82%	90%	87%

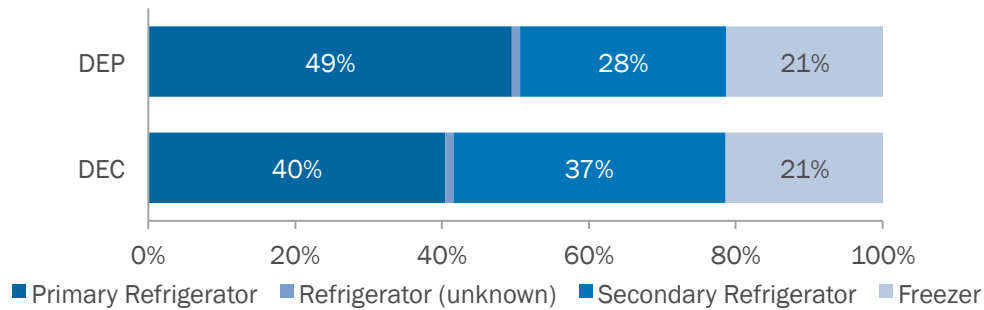
While differences in participant characteristics between service territories were relatively small, a few differences existed between participants and nonparticipants. Participants are slightly older and completed more education than nonparticipants; income was also slightly higher for participants. The evaluation team explored differences in responses by demographic variables throughout this analysis; any pertinent findings are highlighted in the following detailed findings.

However, it should be noted that with any primary data collection effort, it is possible there are response biases introduced by the sample of customers who reply. In terms of mode, telephone surveys tend to skew towards older respondents and those that own their home, whereas surveys with a web option tend to include younger respondents. While the program is targeted towards older populations, response bias may also be responsible for higher average ages among the participant sample which was phone-only (nonparticipant surveys included a web option). For any questions reported that were asked of the general population within the nonparticipant survey, responses were weighted by survey mode and by home ownership status (using census data). For questions asked of the specific analysis groups (those who had recently gotten rid of an appliance, or those who currently have a spare appliance) results are unweighted.

Appliance Characteristics

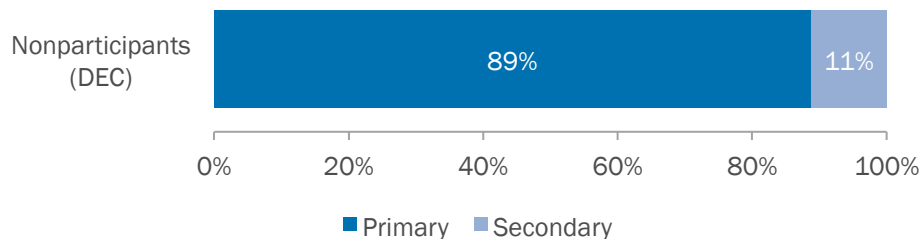
The Duke Energy Appliance Recycling program accepts working refrigerators and freezers of 10-30 cubic feet. Refrigerators may be the home's primary refrigerator, or a secondary (i.e., "spare") refrigerator. All freezers are considered secondary. Across both service territories, primary and secondary refrigerators made up nearly 80% of appliances recycled through the programs. However, a higher proportion of DEP refrigerators were primary in DEP (49% of all appliances, compared with 40% in DEC). The remaining 21% of appliances were freezers.

Figure 7-6: Recycled Appliance Characterization by Service Territory (n=284)



The evaluation team also asked nonparticipants who had disposed of a refrigerator or freezer to characterize those appliances. About 16% of the general population reported getting rid of an appliance over the last three years, those who had most frequently mentioning just a refrigerator (87%). Figure 7-7 shows the composition of refrigerators which were disposed of by nonparticipants. Primary refrigerators were notably more common.

Figure 7-7: Refrigerators Disposed Of By Nonparticipants (n=80)



One possible explanation for this difference in appliance composition is that the replacement of primary refrigerators may happen more frequently than the removal or replacement of secondary appliances in the general population. The convenience of the program and the rebate may be motivating secondary appliance owners to participate in the program when compared to the general population, who may not be as motivated to move or get rid of a secondary appliance.

Over half of the refrigerators recycled by the program in both service territories were primary refrigerators according to survey respondents. Notably, however, program tracking data showed a lower proportion of primary refrigerators, as shown in Table 7-4. In particular, survey respondents reported a percentage of primary refrigerators recycled in the DEP service territory over three times greater than the percentage based on tracking data provided by ARCA.

One common explanation for this type of systematic underreporting of primary refrigerators is that participants may move their old refrigerator out of the kitchen after purchasing the replacement, often into the garage. Participants will plug the refrigerator in per program guidelines, making the refrigerator appear to be a spare. If pick-up crews do not verify where these refrigerators were used for the preceding twelve months or if participant misunderstand the question, they may incorrectly categorize them as secondary refrigerators. While program implementers appear to consistently underreport the number of primary

refrigerators, tracking data shows that data collected by JACO is more consistent with participant survey responses.

Table 7-4: Percentage of Refrigerators that are Primary

Source	DEC	DEP	
	JACO	JACO	ARCA
Overall program tracking data	43%	56%	17%
Participant survey	51%	63%	

Across both service territories, respondents' tracking data showed that freezers were older than refrigerators on average – 25 years old on average – as shown in Table 7-5.¹⁵ For those sampled for the participant survey, refrigerators in DEC were slightly older on average than those in DEP. While unit energy savings from refrigerators and freezers were found to be fairly comparable for the evaluation period, focusing on older appliances such as freezers may contribute to higher unit energy savings if average appliance age decreases over time.

Table 7-5: Average Age of Disposed Appliance by Type and Service Territory

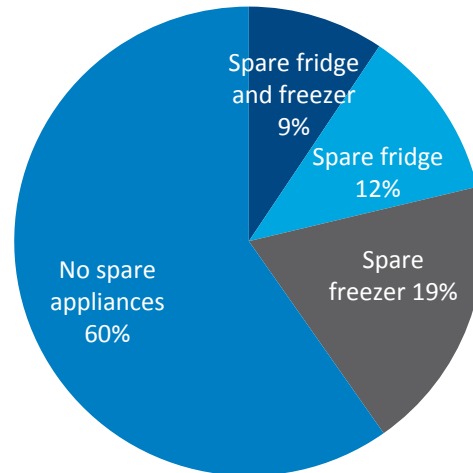
		Participant		Nonparticipant
Appliance	Jurisdiction	Actual Age of Appliance (respondent tracking data)	Perceived Age of Appliance (survey)	Perceived Age of Discarded Appliance (Survey)
Refrigerator	DEC	21	16	12 (DEC only)
	DEP	20	13	
Freezer	DEC	25	20	
	DEP	25	20	

Respondents consistently estimated both refrigerators and freezers age as younger than program tracking data indicated. Table 7-5 (above) shows that respondents consistently estimated appliances to be five or more years younger, on average, than program tracking data. Because appliance age can be determined directly from appliances, tracking data is expected to be more accurate than self-reports. The systematic disparity suggests that many customers have appliances that are older and less efficient than they believe.

Through the nonparticipant survey, the evaluation team also investigated secondary appliances that are still on the grid to better understand why customers choose to keep spare appliances, and the likelihood of these customers to participate. Of the general population who had not recently discarded an appliance, 40% had at least one secondary or spare appliance. Figure 7-8 shows the types of secondary appliances owned by nonparticipants. Spare freezers were more common than refrigerators, but 9% had both a spare refrigerator and freezer.

¹⁵ The evaluation team used sampled participants' tracking data to determine appliance age instead of survey data.

Figure 7-8: General Population Secondary (Spare) Appliances (DEC, n=502)

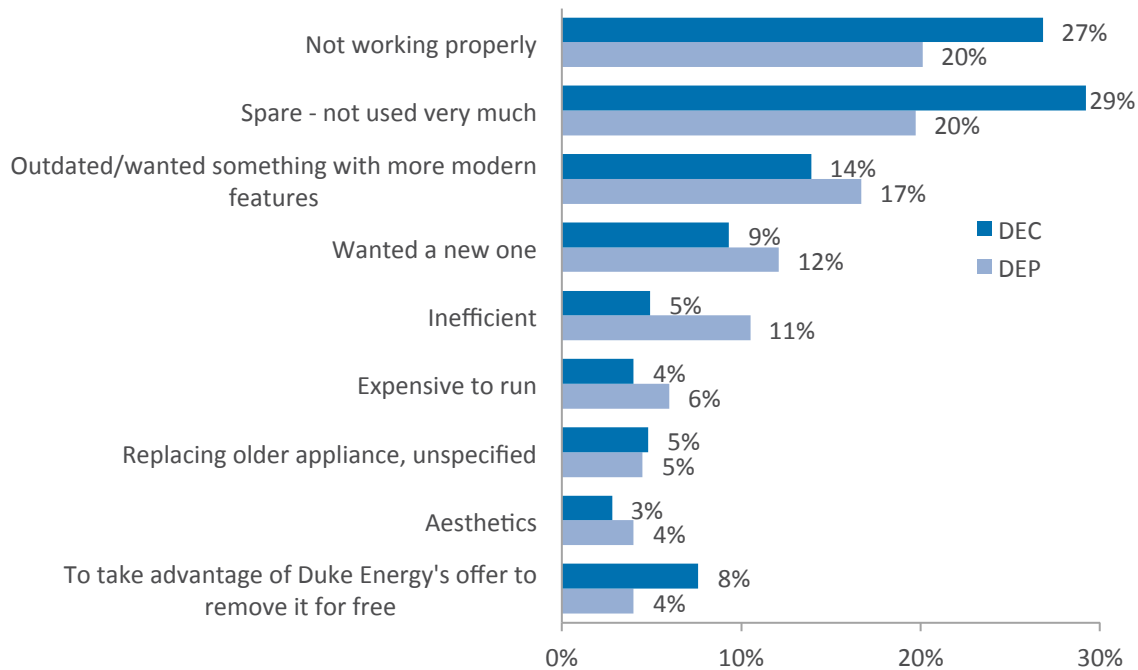


7.2.5 Participation Influences

The evaluation team asked a number of questions to participants and nonparticipants to better understand what motivates customers to recycle an appliance through the Appliance Recycling program, and to dispose of or get rid of the appliance in the first place. Both participants and nonparticipants were most commonly motivated to get rid of appliances that are not fully working properly or are not frequently used. When asked to describe their motivation to get rid of the appliance, 29% of DEC and 20% of DEP participants reported the refrigerator was a spare that was not used very much, and 27% of DEC and 20% of DEP participants said the appliance was not working properly, as shown in Figure 7-9.

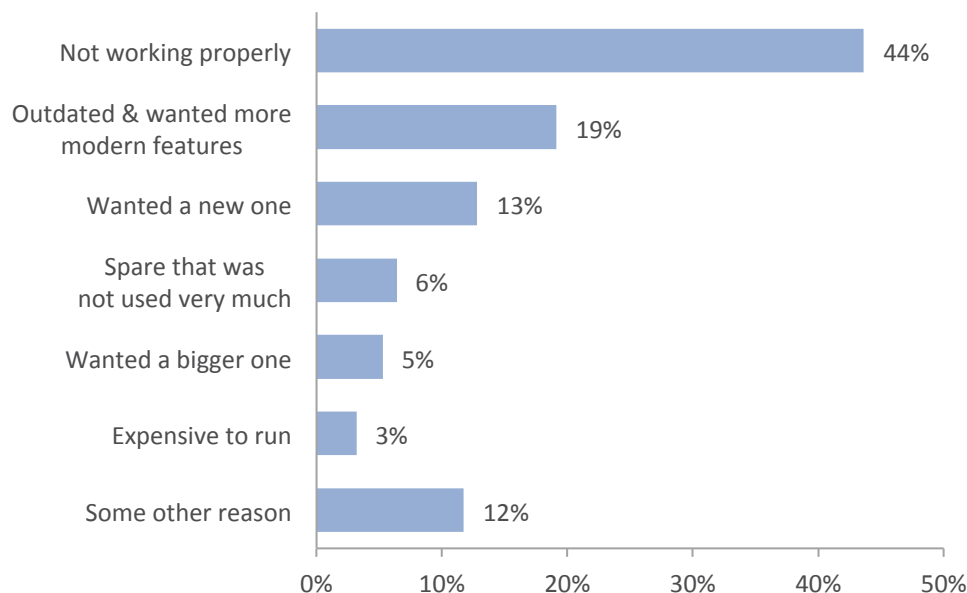
While these two categories were the most frequently chosen in both service territories, they were noticeably more common in the DEC service territory. Accordingly, motivations like wanting more modern features or a new appliance generally, or concerns with the efficiency or cost of running the appliance, were relatively more common in the DEP service territory. Differences in income may explain the greater proportion of DEC respondents that cited that the appliance was not working properly or was a spare. The median income in DEP was higher than in DEC, and respondents were more likely to respond that they wanted to upgrade the refrigerator in some way, whether for modern features, a newer refrigerator generally, or because the old one was inefficient. Regardless of why, replacing a large appliance is costly, and customers with lower incomes may be more likely to run the appliance until it needs to be replaced, rather than elect to replace it sooner.

Figure 7-9: Participant Motivations for Disposing of Appliances (n=284)



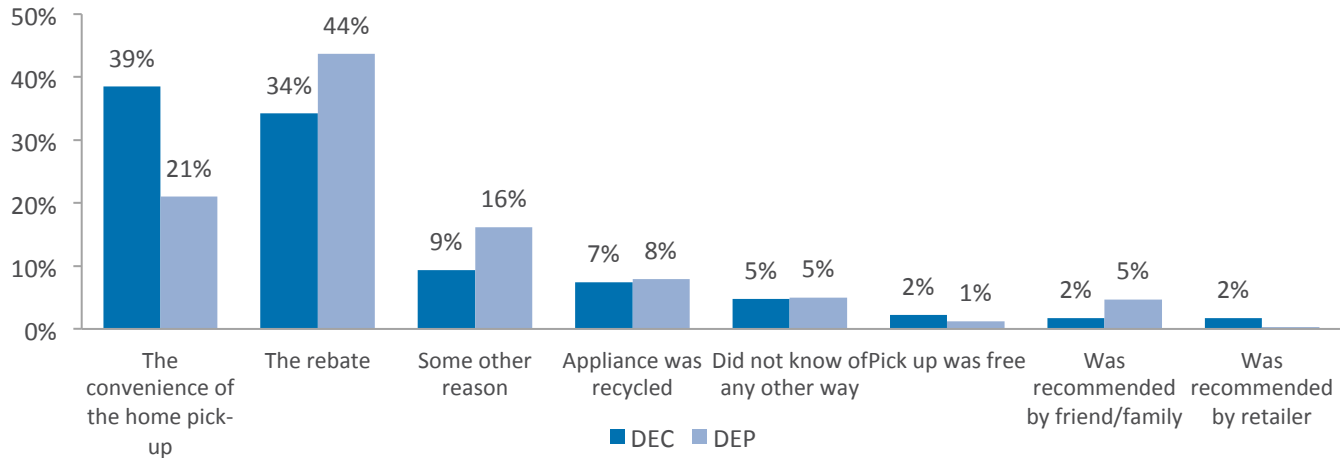
Similarly, nonparticipants who recently disposed of an appliance reported that their appliances were either not working properly, outdated, or generally wanted a new one, as shown in Figure 7-10. While nonparticipants reported disposing of a spare much less frequently than participants, this is explained by the higher proportion of nonparticipants who disposed of a primary refrigerator.

Figure 7-10: Nonparticipant Motivations for Disposing of Appliances (DEC) (n=94)



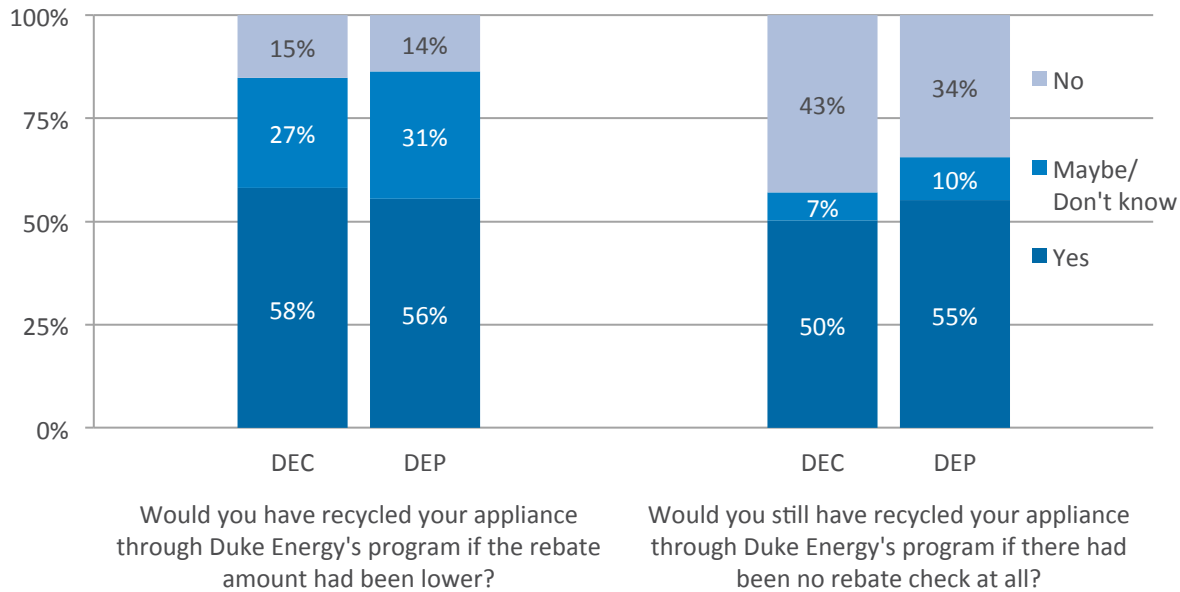
When asked to describe their motivation to participate in the program, customers across both service territories mentioned both the rebate and convenience of the program. However, the rebate appeared to be a greater influence in DEP, where respondents mentioned the rebate twice as frequently as the convenience of the pick-up (44% and 21%, respectively). In contrast, DEC respondents mentioned the rebate slightly less than convenience (34% and 39%, respectively).

Figure 7-11: Primary Reason for Recycling the Appliance through the Duke ARP (n=279)



The evaluation team further evaluated the influence of the rebate in participants' decisions by asking whether they would have participated if the rebate were lower or not offered at all. Figure 7-12 shows that at least half of respondents said they still would have participated with smaller or no rebate. These results indicate that the convenience of the home pick-up is ultimately an equal if not greater influence on customer decisions to participate than the rebate itself.

Figure 7-12: Percentage of Participants Who Would Have Recycled Appliance If Rebate Were Lower (Left) or Not Offered At All (Right) (n=284)

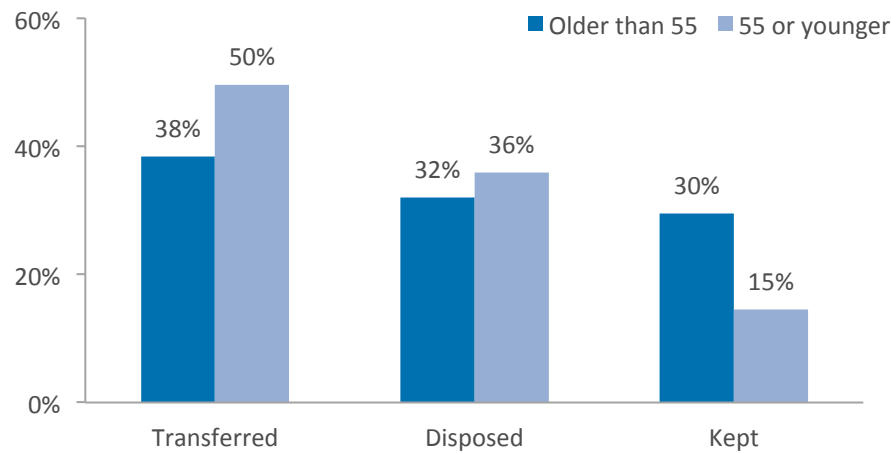


7.2.6 Program Potential and Marketing Opportunities

The evaluation team examined differences in appliances, preferences, and motivations of participants by a number of demographic factors to understand which demographics participate more frequently or are more likely to participate, which demographics recycle appliances with higher unit energy savings, and which demographics had lower free-ridership.

Participants over 55 years old were more likely than younger participants to keep their appliance in the absence of the program. Figure 7-13 shows what participants older than 55 would have done with their appliance in absence of the program, compared to those 55 and younger. Twice as many older participants said they would have kept their refrigerators.

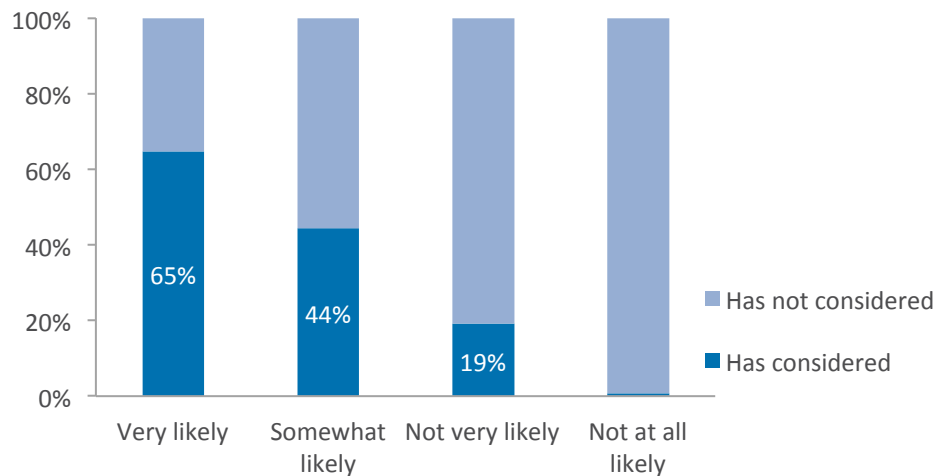
Figure 7-13: Participant Actions in Absence of the Program (n=245)



The average appliance recycled by participants over the age of 55 was also older than those recycled by younger participants. According to program tracking data, their refrigerators were 22 years old on average, compared with 17 years old among younger participants. Together, these results suggest that older customers, on average, will both recycle appliances with higher gross savings and exhibit a higher net-to-gross ratio, resulting in overall greater net savings.

Nonparticipants with secondary appliances were also asked about their propensity to recycle those appliances through the program. About 7% said they would be very likely to participate, and 8% said they would be somewhat likely. A number of factors were examined for correlation with propensity to participate. Demographic factors such as age, income, employment, and years living at the current residence appeared to have no effect on this. Not surprisingly, however, whether a customer had already considered getting rid of the appliance is correlated with their likelihood to participate in the program. Figure 7-14 shows that nearly two-thirds of those who were “very likely” to participate, and nearly half of those who were “somewhat likely” to participate said they had already considered getting rid of the appliance. In comparison, less than 20% of those who were “not very likely” and less than 1% of those who were “not at all likely” to participate reported that they had considered getting rid of the appliance before.

Figure 7-14: Percentage of Nonparticipants Who Have Considered Getting Rid of a Spare Appliance by Propensity to Participate in the ARP (n=234)



These results are intuitive, as those who have previously considered getting rid of an appliance were more frequently amenable to recycling it, whereas those who use and value their secondary appliance – and are unlikely to be persuaded by a rebate to recycle it – never considered getting rid of it. However, these findings also suggest that the people most likely to participate have already considered getting rid of the appliance, but may not have gotten around to it, or even begun to take steps toward getting rid of it but gave up during the process. This segment may only need to be made aware of the convenience offered by the program to be motivated to participate in the program; nearly two-thirds of these respondents had never heard of the program.

7.2.7 Cancellation Data

In addition to examining other process factors, the evaluation team reviewed the cancellation data associated with the program. Table 7-6 shows the reasons appointments were cancelled. Nearly one-third of all appointment cancellations were simply to reschedule the appointment; these customers generally continued on to participate in the program. However, approximately one-fifth of appointments were cancelled because the customer decided to either keep or give away the appliance. A small number of appointments were cancelled because the unit stopped working, which would make the appliances ineligible to participate in the program.

Table 7-6: Appointment Cancellations

Reason for Cancellation	DEC	DEP
Customer Rescheduled Appointment	30%	32%
Customer Decided to Keep/Give Away Unit	23%	20%
Customer Missed Appointment	19%	18%
Unit Stopped Working	7%	7%
Other	21%	23%

8. Conclusions and Recommendations

This section presents conclusions and recommendations resulting from the process and impact evaluation of the Appliance Recycling program.

Conclusions

Despite falling short of meeting the DEC 2014 participation goals, the Appliance Recycling program has been successful in removing old and inefficient appliances from the grid. The process evaluation revealed that the program is running smoothly, with few customer concerns and very high customer satisfaction. In addition, research with program nonparticipants indicates that there is a considerable pool of customers with secondary appliances who have not yet participated in the program, and a number of those customers are currently interested in participating in the program. This indicates that there is likely still an available market for the program in the Carolinas.

In terms of impacts, the program is continuing to achieve relatively consistent gross and net per unit savings, compared to previous years' evaluations. However, as time goes on, it will become more challenging for the program to continue to achieve high energy and demand savings, as appliances become more and more efficient. Continuing to leverage targeted marketing at populations with older, less efficient appliances will be important in attempting to keep energy and demand savings high.

Table 8-1 and Table 8-2 present the gross energy and demand impacts.

Table 8-1. Projected/Claimed and Evaluated Per Unit Gross Energy Savings (kWh)

Jurisdiction	Type of Appliance	Projected/Claimed Savings (kWh/per unit)	2015 Evaluated Gross Savings (kWh/per unit)
DEC	Refrigerator	952	1,182
	Freezer	869	923
DEP	Refrigerator	1,138	1,123
	Freezer	763	888

Table 8-2. Projected/Claimed and Evaluated Per Unit Gross Demand Savings (kW)

Jurisdiction	Type of Appliance	Projected/Claimed Savings (kW/per unit)	2015 Evaluated Gross Average Demand Savings (PUF applied) (kW/unit)	2015 Evaluated Gross Summer Peak Demand Savings (SUAF applied) (kW/per unit)
DEC	Refrigerator	0.136	0.135	0.147
	Freezer	0.104	0.105	0.144
DEP	Refrigerator	0.130	0.128	0.139
	Freezer	0.087	0.101	0.137

Table 8-3 presents the net energy and demand savings.

Table 8-3. NTGR and Per Unit Net Energy Savings (kWh and kW)

Jurisdiction	Type of Appliance	NTGR	Per Unit Net Energy Savings (kWh/unit)	Per Unit Net Summer Peak Demand Savings (kW/unit)
DEC	Refrigerator	0.52	619	0.077
	Freezer	0.51	470	0.073
DEP	Refrigerator	0.52	583	0.072
	Freezer	0.60	533	0.082

Recommendations

Based on the findings from this evaluation, the evaluation team presents the following recommendations for Duke Energy's consideration.

- *Use tailored marketing messages to encourage customers to recycle older, less efficient appliances.* The results from the evaluation research with participants revealed a number of interesting findings that could be leveraged in marketing materials to encourage customer participation (specifically, those with older, less efficient appliances). One finding is that customers are generally unaware of the age of their appliances. The evaluation team asked participants to self-report how old they thought their appliance was when they recycled it, and then compared that to the actual recorded age of the appliance from the tracking data. On average, participants underestimated the age of their appliance by 5-7 years, indicating that customers think their appliance is younger and may therefore think that it is more efficient than it is. This information could be used in marketing and outreach campaigns, to educate customers on how old their appliance truly may be, and encourage them to recycle their old appliances.

Additionally, the evaluation research found that participants highly value the convenience of the free pick-up – as much, if not more, than the rebate. Duke Energy should continue to highlight the ease and convenience of the free pick-up in their marketing materials, perhaps contrasting against other available options in local communities that involve more hassle and cost.

- *Continue to target older populations (55 years and older) in marketing and outreach campaigns.* From research with participants, customers who were 55 years or older tended to have older refrigerators, and were more likely to say they would have kept them (as opposed to disposed or transferred) in the absence of the program. Duke Energy does currently target this demographic in their marketing and outreach strategies. Increasing participation from this demographic could help decrease free-ridership and increase gross savings.
- *Duke Energy may be able to cost-effectively increase marketing reach by including additional leave-behinds with customers when the appliance is picked up.* Per Duke Energy, pick-up crews are currently leaving behind materials about other residential Duke Energy energy efficiency programs at the time of appliance pick-up, to encourage cross-participation. The evaluation team plans to assess participant recall and action on these leave-behinds in the next round of evaluations. Additionally, the evaluation team found that word-of-mouth was the second most common means of program

awareness for the program. Therefore, in addition to cross-promotion leave-behinds, the program may be able to gain additional traction cost-effectively for the Appliance Recycling program by including marketing materials in this packet, and encourage customers to provide these to any interested friends or family.

- *For future evaluations, certain gross impact inputs, such as primary/secondary status and conditioned/unconditioned space, should be confirmed during evaluation surveys prior to analysis.* The evaluation team found some inconsistencies in the tracking data compared to the survey data, specifically related to the location of the appliance at the time of pick-up. Specifically, the evaluation team found that a considerable number of refrigerators recorded as “secondary” in the tracking data were actually used as a primary refrigerator for the 12 months prior to pick-up. This situation typically occurs when a customer moves an appliance prior to pick-up, and either is not asked or does not inform the pick-up crew. As the classifications of primary/secondary and conditioned/unconditioned space impact the gross savings regression model, it is recommended that these values be carefully confirmed during evaluation surveys to ensure the most accurate results. Duke Energy should also confirm with the program implementer the steps taken to gather this information on-site, to ensure that the proper data is being collected during the pick-up process and increase the accuracy of the data tracked in the tracking database.

9. Summary Form



Appliance Recycling Program

Completed EMV Fact Sheet

The Appliance Recycling program is offered to residential customers to pick up and recycle their old refrigerators and freezers, removing inefficient appliances from the grid.

Date	9/30/2015
Region(s)	NC and SC
Evaluation Period	DEC: 9/2013 – 5/2015 DEP: 1/2014 – 12/2014
Annual kWh impact/per unit	DEC: Refrigerator: 1,182 Freezer: 923 DEP: Refrigerator: 1,123 Freezer: 888
Average kW impact/per unit	DEC: Refrigerator: 0.135 Freezer: 0.105 DEP: Refrigerator: 0.128 Freezer: 0.101
Summer Peak kW impact/per unit	DEC: Refrigerator: 0.147 Freezer: 0.144 DEP: Refrigerator: 0.139 Freezer: 0.137
Measure life	6 years (Remaining useful life; based on past DEC research)
Net to Gross	51-60% NTGR
Process Evaluation	Yes
Previous Evaluation(s)	Completed in 2014 for both DEP/DEC

The evaluation team reviewed seven regression models from other appliance recycling evaluations, and selected a model to use for the DEC/DEP evaluation based on a number of criteria. The evaluation team then applied the most current program tracking data to the model to determine per-unit gross impact savings. For net savings, the evaluation team used both participant and nonparticipant self-reports to assess what would have happened to appliances in the absence of the program. The evaluation team also completed a process evaluation to assess if the Appliance Recycling program is functioning well.

Impact Evaluation Details

- Both gross and net impact evaluations closely followed the Uniform Methods Project (UMP) recommended protocols for appliance recycling programs.
- The evaluation team conducted a secondary literature review of other appliance recycling regression models, and chose the most appropriate to be used in the DEC/DEP evaluation.
- The regression model used current DEC/DEP tracking data, with some key inputs and factors calculated from the participant data.
- The net-to-gross analysis used both participant and nonparticipant data to determine what would have happened to the appliance in the absence of the program.

10. DSMore Table

The table below contains measure-level inputs for Duke Energy Analytics. Per-measure savings values in the table are based on the engineering estimates reported above. Measure life estimates are based on previous evaluations and review of relevant TRMs.

Table 10-1. Measure-level inputs for Duke Energy Analytics

Measure Name	Prod Code	State	EM&V Gross Target Annual kWh Savings/ Unit	EM&V Gross Target Annual Non-Coincident kW/Unit	EM&V Gross Target Annual Summer Coincident kW/Unit	EM&V Gross Target Annual Winter Coincident kW/Unit	Unit of Measure	Combined Free Rider% - Spillover%	EM&V Net Target Annual kWh Savings/ Unit	EM&V Net Target Annual Non-Coincident kW/Unit	EM&V Net Target Annual Summer Coincident kW/Unit	EM&V Net Target Annual Winter Coincident kW/unit	Load/ savings shape details provided (yes/no)	Measure Life (Whole Years)	SRC_PGM_MEAS_ID	MEAS_ID
Freezer Recycle Program	FRCYCL	NC	923.12	0.105379	0.144429	9,999	per freezer	49.1%	470	0.0536	0.0735	9,999	no	6	5106	2082
Refrigerator Recycle Program	RRCYCL	NC	1,181.11	0.134830	0.147334	9,999	per refrigerator	47.6%	619	0.0707	0.0772	9,999	no	6	5117	2073
Freezer Recycle Program	FRCYCL	SC	923.12	0.105379	0.144429	9,999	per freezer	49.1%	470	0.0536	0.0735	9,999	no	6	5107	2082
Refrigerator Recycle Program	RRCYCL	SC	1,181.11	0.134830	0.147334	9,999	per refrigerator	47.6%	619	0.0707	0.0772	9,999	no	6	5118	2073
Freezer Recycle Program	FRCYCL	PN	888.49	0.101426	0.136961	9,999	per freezer	40.1%	533	0.0608	0.0821	9,999	no	6	8120	4450
Refrigerator Recycle Program	RRCYCL	PN	1,122.20	0.128105	0.138736	9,999	per refrigerator	48.1%	583	0.0665	0.0720	9,999	no	6	8119	4449
Freezer Recycle Program	FRCYCL	PS	888.49	0.101426	0.136961	9,999	per freezer	40.1%	533	0.0608	0.0821	9,999	no	6	8252	4450
Refrigerator Recycle Program	RRCYCL	PS	1,122.20	0.128105	0.138736	9,999	per refrigerator	48.1%	583	0.0665	0.0720	9,999	no	6	8251	4449

For more information, please contact:

Lisa Obear
Project Manager

206 388 0961 tel
lobear@emiconsulting.com

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Carolinas, LLC's Application for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider and Supporting Testimony and Exhibits, in Docket No. E-7, Sub 1105, has been served by electronic mail, hand delivery or by depositing a copy in the United States mail, postage prepaid properly addressed to parties of record.

This the 9th day of March, 2016.



Brian L. Franklin
Associate General Counsel
Duke Energy Corporation
550 S. Tryon St.
DEC 45A/P.O. Box 1321
Charlotte, North Carolina 28201
Tel: 980.373.4465
brian.franklin@duke-energy.com
North Carolina State Bar No. 35075

ATTORNEY FOR DUKE ENERGY
CAROLINAS, LLC