DUKE ENERGY.

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VIA OVERNIGHT DELIVERY

RECEIVED

AUG 15 2013

PUBLIC SERVICE
COMMISSION

August 14, 2013

Mr. Jeff Derouen
Executive Director
Kentucky Public Service Commission
211 Sower Boulevard, P.O. Box 615
Frankfort, Kentucky 40602-0615

Re: ***Case No. 2013-_________***
In the Matter of the Application of Duke Energy Kentucky, Inc., to Amend its Demand Side Management Programs

Dear Mr. Derouen:

Enclosed please find an original and twelve copies of *The Application of Duke Energy Kentucky, Inc. to Amend its Demand Side Management Programs* for filing in the above referenced matter.

Please date-stamp the two copies of the letter and the filing and return to me in the enclosed envelope.

Sincerely,

Kristen Ryan

Kristen Ryan
Senior Paralegal
kristen.ryan@duke-energy.com

cc: Larry Cook
Richard Raff
Florence W. Tandy
Carl Melcher

562047

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF DUKE ENERGY KENTUCKY, INC. TO AMEND ITS DEMAND SIDE MANAGEMENT PROGRAMS	**))) CASE NO. 2013-__________)**

APPLICATION OF DUKE ENERGY KENTUCKY, INC. TO AMEND ITS DEMAND SIDE MANAGEMENT PROGRAMS

Comes now Duke Energy Kentucky, Inc. ("Duke Energy Kentucky" or the "Company"), pursuant to KRS 278.285, and other applicable law, and does hereby request the Commission to approve an amendment of the Demand Side Management ("DSM") programs as Ordered by this Commission.[1] In support of its Application, Duke Energy Kentucky respectfully states as follows:

Introduction

1. Duke Energy Kentucky is a Kentucky corporation and, as a public utility as that term is defined in KRS 278.010(3), is subject to the Commission's jurisdiction. Duke Energy Kentucky is engaged in the business of furnishing gas and electric services to various municipalities and unincorporated areas in Boone, Campbell, Gallatin, Grant, Kenton and Pendleton Counties in the Commonwealth of Kentucky.

2. Duke Energy Kentucky's business address is 139 East Fourth Street, Cincinnati, Ohio 45202. The Company's local office in Kentucky is Duke Energy Envision Center, 4580 Olympic Boulevard, Erlanger, Kentucky 41018.

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[1] *In the Matter of the Application of Duke Energy Kentucky, Inc. for the Annual Cost Recovery Filing for Demand Side Management,* Case No. 2012-00495, *(Order)(April 11, 2013).*

3. Duke Energy Kentucky's articles of incorporation are on file with the Commission in Case No. 2013-00097 and are incorporated by reference herein pursuant to 807 KAR 5:001, Section 14(2)(a).

4. On November 15, 2012, Duke Energy Kentucky filed its most recent application for the cost recovery of demand side management. The Company's application was docketed as Case No. 2012-00495. On April 11, 2013, this Commission approved that application and Ordered Duke Energy Kentucky to file an application requesting any further program expansion(s) and to include: (1) an Appendix A, setting forth the Cost Effectiveness Test Results of all DSM programs, (2) an Appendix B, setting forth the recovery of program costs, lost revenues, and shared savings that are used in determining the true-up of proposed DSM factors; (3) a signed and dated proposed Rider DSMR, Demand Side Management rate, for both electric and natural gas customers; and (4) all program evaluations, by August 15, 2013[2].

Current DSM Programs

5. Duke Energy Kentucky has a long history of successful DSM implementation and has been a leader in the industry with respect to energy efficiency (EE) and peak demand reduction (DR) programs, having offered such programs since the mid-90's. Its existing portfolio of DSM programs was approved by the Commission in Case No. 2012-00085,[3] by Order dated June 29, 2012. These programs are as follows:

- Program 1: Low Income Services Program
- Program 2: Residential Energy Assessments Program
- Program 3: Energy Education Programs for Schools Program
- Program 4: Residential Smart Saver Efficient Residences Program

[2] See *Order, para. 4.*
[3] *In the Matter of the Application of Duke Energy Kentucky, Inc. for an Energy Efficiency Cost Recovery Mechanism and for Approval of Additional Programs for Inclusion in its Existing Portfolio,* Case No. 2012-00085.

- Program 5: Residential Smart Saver Energy Efficient Products Program[4]
- Program 6: Smart Saver Prescriptive Program
- Program 7: Smart Saver Custom Program
- Program 8: Smart Saver Energy Assessments Program
- Program 9: Power Manager Program
- Program 10: PowerShare
- Program 11: Low Income Neighbor
- Program 12: My Home Energy Report
- Program 13: Appliance Recycling Program

6. The above-referenced portfolio of programs is approved to continue through December 31, 2016.

Expansion of DSM Programs

7. This Application proposes to expand the scope of the Residential Smart Saver Program and Smart Saver Prescriptive Program for Non-Residential Customers by increasing the available measures within each program to enhance the robustness of the Company's offerings[5]. The Residential Collaborative[6] and the Commercial and Industrial Collaborative[7] have reviewed

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[4] The Smart $aver® Residential Energy Efficient Products Program and the Energy Efficient Residences Program are individual measures that are part of a single and larger program referred to and marketed as Residential Smart $aver.® For ease of administration and communication with customers the two measures have been divided into separate tariffs even though they are a single program.

[5] Exhibit J lists the complete set of proposed measures for inclusion.

[6] The Residential Collaborative members receiving the information: Jennifer Black Hans and Heather Napier (Office of the Kentucky Attorney General), Jock Pitts and Nina Creech (People Working Cooperatively), Florence Tandy (Northern Kentucky Community Action Commission), Laura Pleiman (Boone County), Carl Melcher (Northern Kentucky Legal Aid), Karen Reagor and Pam Proctor (Kentucky NEED Project), Lee Colten, John Davies, and Greg Guess (Department of Energy Development and Independence), Jeremy Faust, Andy Holzhauser and Chris Jones (Greater Cincinnati Energy Alliance), Pat Dressman (Campbell County) and Tim Duff and Trisha Haemmerle (Duke Energy).

[7] The Commercial & Industrial Collaborative members in attendance were: Jennifer Black Hans and Heather Napier (Office of the Kentucky Attorney General), Jock Pitts (People Working Cooperatively), Karen Reagor and Pam Proctor (Kentucky NEED Project), Lee Colten, John Davies, and Greg Guess (Department of Energy Development and Independence), Pat Dressman (Campbell County), Chris Baker (Kenton County Schools) and Tim Duff and Trisha Haemmerle (Duke Energy).

the Company's proposed new measures. With the exception of the Office of the Kentucky Attorney General, which will indicate its opinion at a later date, the voting members of both the Residential Collaborative and the Commercial & Industrial Collaborative agreed with this Application.

8. The proposed new Residential Smart Saver[8] measures are as follows:

Heat Pump Water Heaters

The Heat Pump Water Heater Program is a new prescriptive measure to be added to the Smart $aver Residential Program. Program participants will include single-family, owner occupied residential customers with electric water heating. Eligible customers who purchase and install a qualified Energy Star electric heat pump water heater will receive a prescriptive incentive up to $300. The electric heat pump water heater must be installed by a contractor approved by Duke Energy. The Company may elect to provide a dealer incentive of $50 directly to the contractor to encourage promotion and installation of a qualified heat pump water heater. The total incentive provided to either or both the customer and dealer is not to exceed $350 per installation.

The purpose of this incentive is to build awareness of energy efficient water heating options and encourage the adoption of high efficiency electric water heaters. This offer is intended to motivate homeowners to replace less efficient or non-operational electric water heaters with Energy Star qualified equipment (Energy Factor >= 2.0) with the goal to reduce electric usage for water heating.

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[8] The new measures are individual measures that are part of a single and larger program referred to and marketed as Residential Smart $aver®. For ease of administration and communication with customers the new measures will have a separate name even though they are a single program.

Pool Energy Efficiency Program

The Pool Energy Efficiency Program (PEEP) is a Smart $aver residential incentive that will encourage the purchase and installation of energy efficient equipment and controls. Initially the program will focus on variable speed pumps, but the pool equipment offering may evolve with the marketplace to include additional equipment options and control devices that reduce energy consumption and/or demand.

Program participants will include single-family, owner occupied residential customers with an in-ground pool. Eligible customers will receive a maximum customer incentive of up to $400 for the purchase, professional installation and programming of a variable speed pump. Approved contractors will be eligible to receive a $50 dealer incentive. The total incentive provided to either or both the customer and dealer is not to exceed $450 per installation.

Water Measures

Duke Energy's Water Measures will be available to single and multi-family homes. This measure encourages the adoption of low flow devices.

Single-family Water Measures

- Program participants will include residential customers with electric water heating.
- Eligible customers will receive discounted or free water saving devices, including faucet aerators, low flow showerheads and insulation (pipe wrap). Depending on market conditions, these product measures may utilize a number of marketing channels.

Multi-family Water Measures

- Program participants will include residential customers with electric water heating.

- Duke Energy will coordinate with multi-family property owners and managers to install energy saving discounted or free devices (faucet aerators, low flow showerheads and pipe wrap) in qualified apartments.

Smart Saver Prescriptive Program for Non-residential customers is proposing the inclusion of new measures to the following technologies:

Lighting Measures

- Sub-categories for exterior LEDs
- Exterior motion sensor control for LEDs
- Interior LED fixtures replacing HID or T8
- LED task, track, display cases
- Daylight Sensors
- Addition of 2 lamp T8 high bay

Energy Star Food Service Products

- Energy Star Vending Machines
    - Replace standard vending machines with Energy Star vending machines. Energy Star units have more efficient compressors, fan motors, and lighting systems than standard units.
- Dishwashers
    - Energy Star dishwashers are 25% more efficient than standard models.
- Walk-in Coolers and Freezer Automatic Door Closer Retrofit
    - Auto-closers ensure that door is fully closed after each access.

HVAC Measures

- Ductless Mini-Split AC or HP

- These systems are used most commonly in existing buildings for small area cooling and where it would be impractical and/or cost-prohibitive to run new duct work.
- It is assumed that the baseline heating system is a room air conditioner (RAC), packaged terminal air conditioner (PTAC), or a low-efficiency ductless mini-split AC.

- Chilled Water Reset
  - Raise chilled water temperature during light cooling loads.
- Faucet Aerators and Showerheads
  - Remove existing standard flow aerators / showerheads and replace them with a low-flow aerator in non-residential and multi-family applications.
- Cool Roofs
  - Cool roofs have surfaces that reflect sunlight and emit heat more efficiently than "hot" or "dark" roofs, keeping them cooler in the sun. Eligible Cool Roofs must have initial Solar Reflectance greater than or equal to 0.7.
- DCV Retrofit
  - Instead of ventilating at a fixed rate based on the maximum design occupancy and zone area, the Demand Controlled Ventilation system only provides the minimum ventilation air necessary to meet IAQ requirements based on a measurement of IAQ. Less outdoor air entering the building means that less air must be conditioned, resulting in reduced heating and cooling energy consumption.
- Water Heater Pipe Insulation
  - Installation of insulation on existing, uninsulated, domestic hot water heater inlet and outlet piping.

Process Measures

- VSD Air Compressors
  - Expand VSD Air Compressors offering to replacing load no load or variable displacement compressors.

Information Technology Measures

- Information Technology (IT) Measures is a new category developed to meet the market needs associated with growing loads related to information technologies and the ability to replace the less efficient high-tech equipment with energy efficiency equipment.
  - Controlled Plug Strip
  - Installation of power strip which turns office equipment off outside of regular business hours.
- Energy Star 2.0 Server
  - Installation of Energy Star qualified server.
- Energy Star 6.0 Desktop Server
  - Installation of Energy Star qualified desktop computer.
- Energy Star 6.0 Small Scale Server (Data Storage)
  - Installation of 6.0 Energy Star qualified small scale server.
- PC Power Management from Network
  - Control of computer and monitor provided by software meeting Networked Computer Power Management Control Software Specifications.
- VFDs on Chilled Water Pumps
  - Installation of variable frequency drives (VFDs) on chilled water pumps serving data centers. Chilled water pumps without VFDs operate at constant speed. The VFD will lower the pump speed to better match the system loads.

- VFDs on CRAC/CRAH/AHU Fans
  - Installation of variable frequency drives (VFDs) on Computer Room AC (CRAC), Computer Room Air Handler Unit (CRAH) or AirHandler Unit (AHU) fans serving Data Centers. Supply air fan motors without VFDs operate at constant speed. The VFD will lower the fans speed to better match the system loads.

9. Pursuant to KRS 278.285(1)(b) and the Commission's Order, Exhibit A includes the Cost Effectiveness Test Results of the programs.

10. Pursuant to KRS 278.285(1)(c) and the Commission's Order, Exhibit B includes the calculations to recover program costs, lost revenues, and shared shavings, that are used in determining the true-up of proposed DSM factor(s).

11. A signed and dated proposed Rider DSMR, Demand Side Management Rider, for both electric and natural gas customers, is attached hereto as Exhibit C.

12. Pursuant to KRS 278.285(1)(c) and the Commission's Order, Exhibits D - J includes program evaluations and list of measures available at this time.

WHEREFORE, Duke Energy Kentucky respectfully requests that the Commission grant the relief requested herein.

Respectfully submitted,

Rocco D'Ascenzo
Associate General Counsel
Duke Energy Kentucky, Inc.
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(513) 287-4385 (f)
Rocco.D'ascenzo@duke-energy.com
Counsel for Duke Energy Kentucky, Inc.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing filing was served on the following via ordinary mail, postage prepaid, this 14th day of August 2013:

Larry Cook
Assistant Attorney General
The Kentucky Office of the Attorney General
1024 Capital Center Drive
Frankfort, Kentucky 40602-2000

Richard Raff
Public Service Commission
730 Schenkel Lane
Frankfort, Kentucky 40602

Florence W. Tandy
Northern Kentucky Community Action Commission
P.O. Box 193
Covington, Kentucky 41012

Carl Melcher
Northern Kentucky Legal Aid, Inc.
302 Greenup
Covington, Kentucky 41011

Rocco O. D'Ascenzo

	Program Cost Effectiveness Test Results**			
	Utility Test	TRC Test	RIM Test	Participant Test
RESIDENTIAL CUSTOMER PROGRAMS				
Energy Education Program for Schools	0.56	0.63	0.42	NA
Low Income Services	0.55	1.83	0.43	NA
Residential Energy Assessments	1.86	1.93	1.17	NA
Residential Smart $aver® Products and Services	4.09	4.20	1.36	5.10
Power Manager	5.16	6.39	5.16	NA
Appliance Recycling Program	3.52	4.07	1.37	NA
Low Income Neighborhood	1.09	1.62	0.73	NA
My Home Energy Report	2.22	2.22	1.04	NA
Residential Smart $aver® (New Measures)	1.86	2.12	0.95	5.88
NON-RESIDENTIAL CUSTOMER PROGRAMS				
Smart $aver® Non Residential Prescriptive	9.29	3.90	1.86	3.20
Smart $aver® Non Residential Custom	7.65	1.43	1.45	1.45
Power Share®	4.59	29.62	4.59	NA
Smart $aver® Prescriptive (New Measures)	5.77	2.60	1.44	2.61

**Cost Effectiveness is calculated on NPV for life of measure

Cost Effectiveness scores for current programs are from Case No. 2012-00085 and will be updated with the annual status update filing filed November 15, 2013.

Kentucky DSM Rider

Comparison of Revenue Requirement to Rider Recovery

Residential Programs	(1) Projected Program Costs 7/2011 to 6/2012 (A)	(2) Projected Lost Revenues 7/2011 to 6/2012 (A)	(3) Projected Shared Savings 7/2011 to 6/2012 (A)	(4) Program Expenditures 7/11 through 6/12 (B)	(5) Program Expenditures (C) Gas	(6) Program Expenditures (C) Electric	(7) Lost Revenues 7/11 through 6/12 (B)	(8) Shared Savings 7/11 through 6/12 (B)	(9) 2011 Reconciliation Gas (D)	(10) 2011 Reconciliation Electric (E)	(11) Rider Collection (F) Gas	(12) Rider Collection (F) Electric	(13) (Over)/Under Collection Gas (G)	(14) (Over)/Under Collection Electric (H)
Res. Conservation & Energy Education	$ 499,800	$ 16,525	$ (3,499)	$ 636,469	$ 400,338	$ 236,131	$ 16,137	$ (8,911)			NA	NA	NA	NA
Refrigerator Replacement	$ 100,000	$ 6,145	$ 300	$ 123,427		$ 123,427	$ 10,211	$ (7,899)						
Residential Home Energy House Call	$ 150,000	$ 49,810	$ 35,700	$ 283,352	$ 178,226	$ 105,124	$ 24,435	$ (10,858)			NA	NA	NA	NA
Res. Comprehensive Energy Education	$ 81,500	$ -	$ -	$ 168,376	$ 105,908	$ 62,468	$ -	$ -			NA	NA	NA	NA
Payment Plus	$ 150,000	$ -	$ -	$ 206,678		$ 206,678	$ -	$ -						
Power Manager	$ 875,000	$ -	$ 174,000	$ 262,609		$ 262,609	$ -	$ 125,796						
Program Development Funds	$ 140,000	$ -	$ -	$ 228,171	$ 143,519	$ 84,652	$ -	$ -			NA	NA	NA	NA
Energy Star Products	$ 243,000	$ 690,225	$ 63,450	$ 103,863		$ 103,863	$ 133,881	$ 9,139			NA	NA	NA	NA
Energy Efficiency Website	$ 31,110	$ 26,781	$ 2,955	$ 7,628	$ 4,797	$ 2,831	$ 40,474	$ 25,303			NA	NA	NA	NA
Personalized Energy Report Program	$ 153,000	$ 121,547	$ 73,134	$ 265,043	$ 166,712	$ 98,331	$ 211,452	$ 26,231			NA	NA	NA	NA
Residential SmartSaver	$ 448,520	$ 50,150	$ 53,822	$ 237,949	$ 149,670	$ 88,279	$ 12,492	$ 16,419						
Home Energy Assistance Pilot Program (I)	$ 247,283	$ -	$ -	$ 203,013	$ 85,351	$ 117,662	$ -	$ -			$ 105,091	$ 144,875	NA	NA
Revenues collected except for HEA											$ 621,205	$ 2,149,748		
Total	$ 3,119,213	$ 961,183	$ 399,862	$ 2,726,579	$ 1,234,523	$ 1,492,056	$ 449,082	$ 175,219	$ (4,408,808)	$ (1,277,849)	$ 726,296	$ 2,294,622	$ (3,900,580)	$ (1,456,115)

(A) Amounts identified in report filed on November 15, 2011
(B) Actual program expenditures, lost revenues, and shared savings for the period July 1, 2011 through June 30, 2012 and lost revenues for this period and from prior period DSM measure installations
(C) Allocation of program expenditures to gas and electric. Uses 62.9% gas based upon saturation of gas space heating.
(D) Recovery allowed in accordance with the Commission's Order in Case No. 2011-00448.
(E) Recovery allowed in accordance with the Commission's Order in Case No. 2011-00448.
(F) Revenues collected through the DSM Rider between July 1, 2011 and June 30, 2012.
(G) Column (5) + Column (9) - Column(11).
(H) Column (6) + Column (7) + Column (8) + Column (10) - Column(12).
(I) Revenues and expenses for the Home Energy Assistance Pilot Program.

Commercial Programs	(1) Projected Program Costs 7/2011 to 6/2012 (A)	(2) Projected Lost Revenues 7/2011 to 6/2012 (A)	(3) Projected Shared Savings 7/2011 to 6/2012 (A)	(4) Program Expenditures 7/11 through 6/12 (B)	(5) Lost Revenues 7/11 through 6/12 (B)	(6) Shared Savings 7/11 through 6/12 (B)	(7) 2011 Reconciliation (C)	(8) Rider Collection (D)	(9) ((Over)/Under Collection (E)
High Efficiency Program									
Lighting	$ 209,520	$ 308,352	$ 10,698	$ 373,264	$ 167,928	$ 202,379			
HVAC	$ 142,760	$ 29,247	$ 14,588	$ 89,463	$ 15,721	$ 17,354			
Motors	$ 100,678	$ 21,031	$ 25,718	$ 18,812	$ 10,196	$ 19,996			
Other	$ 450,814	$ 298,836	$ 448,830	$ -	$ 49,305	$ -			
Program Development Funds	$ 60,000	$ -	$ -	$ 38,066	$ -	$ -			
Smart $aver Custom Energy Eff. Incentive Program (Pilot)	$ 658,799	$ 151,730	$ 249,680	$ 37,612	$ 148	$ 13,762			
Total for High Efficiency Program	$ 1,622,571	$ 809,196	$ 749,514	$ 557,416	$ 243,299	$ 253,490	$ (660,831)	$ 2,896,596	$ (2,503,221)
PowerShare®	$ 265,000	$ -	$ 107,641	$ 661,286	$ -	$ 296,256	$ 716,852	$ 62,703	$ 1,611,691

(A) Amounts identified in report filed on November 15, 2011
(B) Actual program expenditures, lost revenues, and shared savings for the period July 1, 2011 through June 30, 2012 and lost revenues for this period and from prior period DSM measure installations
(C) Recovery allowed in accordance with the Commission's Order in Case No. 2011-00448
(D) Revenues collected through the DSM Rider between July 1, 2011 and June 30, 2012
(E) Column (4) + Column (5) + Column (6) + Column (7) - Column (8)

Kentucky DSM Rider

2013-2014 Projected Program Costs, Lost Revenues, and Shared Savings (A)

Residential Program Summary (A), (B)

	Costs	Lost Revenues	Shared Savings	Total	Allocation of Costs Electric	Allocation of Costs Gas	Electric Costs	Budget (Costs, Lost Revenues, & Shared Savings) Electric	Budget (Costs, Lost Revenues, & Shared Savings) Gas Costs
Residential - Current Programs/Measures									
Appliance Recycling Program	$ 254,905	$ 25,383	$ 51,900	$ 332,188	100.0%	0.0%	$ 254,905	$ 332,188	$ -
Energy Efficiency Education Program for Schools	$ 160,841	$ 13,197	$ (7,028)	$ 167,011	36.5%	63.5%	$ 58,707	$ 64,876	$ 102,134
My Home Energy Report	$ 375,038	$ 402,499	$ 40,663	$ 818,200	100.0%	0.0%	$ 375,038	$ 818,200	$ -
Low Income Neighborhood	$ 297,422	$ 40,038	$ 7,460	$ 344,920	100.0%	0.0%	$ 297,422	$ 344,920	$ -
Low Income Services	$ 669,888	$ 19,932	$ (29,790)	$ 660,030	36.5%	63.5%	$ 244,509	$ 234,651	$ 425,379
Residential Energy Assessments	$ 167,774	$ 14,909	$ 12,819	$ 195,503	36.5%	63.5%	$ 61,238	$ 88,966	$ 106,537
Residential Smart $aver®	$ 1,170,194	$ 1,376,347	$ 319,133	$ 2,865,675	36.5%	63.5%	$ 427,121	$ 2,122,601	$ 743,073
Power Manager	$ 308,742	$ -	$ 138,807	$ 447,549	100.0%	0.0%	$ 308,742	$ 447,549	$ -
Residential Smart $aver® (New Measures)*	$ 48,300	$ 2,347	$ 3,027	$ 53,674	36.5%	63.5%	$ 17,629	$ 23,003	$ 30,670
Total Costs, Net Lost Revenues, Shared Savings	$ 3,453,105	$ 1,894,651	$ 536,992	$ 5,884,748			$ 2,045,312	$ 4,476,954	$ 1,407,794
Home Energy Assistance Pilot Program	$ 249,560							$ 144,950	$ 104,610

* Costs, Lost Revenues and Shared Savings are estimates for January 1, 2014 - June 30, 2014 to align with the current program period.

NonResidential Program Summary (A), (B)

	Costs	Lost Revenues	Shared Savings	Total	Allocations Electric	Allocations Gas	Electric Costs	Budget (Costs, Lost Revenues, & Shared Savings) Electric	Budget (Costs, Lost Revenues, & Shared Savings) Gas
Smart $aver® Custom	$ 363,445	$ 91,416	$ 229,707	$ 684,568	100.0%	0.0%	$ 363,445	$ 684,568	NA
Smart $aver® Prescriptive - Energy Star Food Service Proc	$ 14,706	$ 8,866	$ 14,459	$ 38,031	100.0%	0.0%	$ 14,706	$ 38,031	NA
Smart $aver® Prescriptive - HVAC	$ 177,989	$ 66,300	$ 137,729	$ 382,018	100.0%	0.0%	$ 177,989	$ 382,018	NA
Smart $aver® Prescriptive - Lighting	$ 587,516	$ 311,187	$ 390,588	$ 1,289,291	100.0%	0.0%	$ 587,516	$ 1,289,291	NA
Smart $aver® Prescriptive - Motors/Pumps/VFD	$ 68,636	$ 59,009	$ 70,546	$ 198,192	100.0%	0.0%	$ 68,636	$ 198,192	NA
Smart $aver® Prescriptive - Process Equipment	$ 56	$ 119	$ 75	$ 251	100.0%	0.0%	$ 56	$ 251	NA
Power Share®	$ 815,415	$ -	$ 261,322	$ 1,076,737	100.0%	0.0%	$ 815,415	$ 1,076,737	NA
Smart $aver® Prescriptive - New Measures*	$ 44,649	$ 5,554	$ 17,625	$ 67,828	100.0%	0.0%	$ 44,649	$ 67,828	NA
Total Costs, Net Lost Revenues, Shared Savings	$ 2,072,411	$ 542,453	$ 1,122,053	$ 3,736,916			$ 2,072,411	$ 3,736,916	$ -

* Costs, Lost Revenues and Shared Savings are estimates for January 1, 2014 - June 30, 2014 to align with the current program period.

	Costs	Lost Revenues	Shared Savings	Total
Total Program	$ 5,525,516	$ 2,437,104	$ 1,659,044	$ 9,621,664

(A) Please see Appendix C
(B)Costs, Lost Revenues, and Shared Savings for Year 2 of portfolio approved in Case No. 2012-00085

Kentucky DSM Rider

Duke Energy Kentucky
Demand Side Management Cost Recovery Rider (DSMR)
Summary of Calculations for Programs

July 2013 to June 2014

	Program Costs (A)
<u>Electric Rider DSM</u>	
Residential Rate RS	$ 4,476,954
Distribution Level Rates Part A DS, DP, DT, GS-FL, EH & SP	$ 2,660,179
Transmission Level Rates & Distribution Level Rates Part B	$ 1,076,737
<u>Gas Rider DSM</u>	
Residential Rate RS	$ 1,407,794

(A) See Appendix B, page 2 of 6.

Kentucky DSM Rider

Duke Energy Kentucky
Demand Side Management Cost Recovery Rider (DSMR)
Summary of Billing Determinants

Year	2013
Projected Annual Electric Sales kWH	
Rates RS	1,506,591,479
Rates DS, DP, DT, GS-FL, EH, & SP	2,463,381,525
Rates DS, DP, DT, GS-FL, EH, SP, & TT	2,516,707,056
Projected Annual Gas Sales CCF	
Rate RS	64,261,240

Kentucky DSM Rider

Duke Energy Kentucky
Demand Side Management Cost Recovery Rider (DSMR)
Summary of Calculations

July 2013 to June 2014

Rate Schedule Riders	True-Up Amount (A)	Expected Program Costs (B)	Total DSM Revenue Requirements	Estimated Billing Determinants (C)		NEW DSM Cost Recovery Rider (DSMR)	CURRENT DSM Cost Recovery Rider (DSMR)
Electric Rider DSM							
Residential Rate RS	$ (1,459,173)	$ 4,476,954	$ 3,017,782	1,506,591,479	kWh	$ 0.002003 $/kWh	$ 0.001988 $/kWh
Distribution Level Rates Part A DS, DP, DT, GS-FL, EH & SP	$ (2,508,478)	$ 2,660,179	$ 151,701	2,463,381,525	kWh	$ 0.000062 $/kWh	$ 0.000034 $/kWh
Transmission Level Rates & Distribution Level Rates Part B TT	$ 1,615,075	$ 1,076,737	$ 2,691,812	2,516,707,056	kWh	$ 0.001070 $/kWh	$ 0.001070 $/kWh
Distribution Level Rates Total DS, DP, DT, GS-FL, EH & SP						$ 0.001131 $/kWh	$ 0.001104 $/kWh
Gas Rider DSM							
Residential Rate RS	$ (3,908,771)	$ 1,407,794	$ (2,500,978)	64,261,240	CCF	$ (0.038919) $/CCF	$ (0.039396) $/CCF
Total Rider Recovery			$ 3,360,317				

Customer Charge for HEA Program	Annual Revenues	Number of Customers	Monthly Customer Charge
Electric No.4			
Residential Rate RS	$ 144,950	120,792	$ 0.10
Gas No. 5			
Residential Rate RS	$ 104,610	87,175	$ 0.10
Total Customer Charge Revenues	$ 249,560		
Total Recovery	$ 3,609,878		

(A) (Over)/Under of Appendix B page 1 multiplied by the average three-month commercial paper rate for 2012 to include interest on over or under-recovery in accordance with the Commission's order in Case No. 95- 1.002100
(B) Appendix B, page 2.
(C) Appendix B, page 4.

Kentucky DSM Rider

Appendix B

Estimate of Remaining Load Reduction Under Current Portfolio

The lost revenue rate over the next three years under portfolio beginning July 1, 2012 (Order in Case No. 2012-00085) will be applied to load reductions below to recover remaining years of lost revenues for measures recorded under portfolio ending June 30, 2012.

	kWh for Lost Revenues Under Portfolio Thru 6/30/12		
Residential	2012/13	2013/14	2014/15
Res. Conservation & Energy Education	337,292	210,178	84,063
Refrigerator Replacement	201,522	111,743	40,430
Residential Home Energy House Call	499,565	297,799	108,462
Power Manager	-	-	-
Energy Star Products	1,642,113	1,267,362	202,189
Energy Efficiency Website	1,546,280	1,406,096	598,341
Personalized Energy Report Program	5,215,983	5,075,798	648,671
Residential Smart Saver®	725,440	725,440	425,909

	kWh for Lost Revenues Under Portfolio Thru 6/30/12		
NonResidential	2012/13	2013/14	2014/15
High Efficiency Program			
Lighting	11,648,659	8,279,252	484,387
HVAC	1,103,853	775,596	42,426
Motors	987,055	628,169	41,096
Other	904,897	26,116	-
Smart Saver Custom Energy Eff. Incentive Program (Pilot)	212,315	212,315	194,758
PowerShare®	-	-	-

Duke Energy Kentucky
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KY.P.S.C. Gas No. 2
Twelfth Revised Sheet No. 62
Cancels and Supersedes
Eleventh Revised Sheet No. 62
Page 1 of 1

RIDER DSMR

DEMAND SIDE MANAGEMENT RATE

The Demand Side Management Rate (DSMR) shall be determined in accordance with the provisions of Rider DSM, Demand Side Management Cost Recovery Rider, Sheet No. 61 of this Tariff.

The DSMR to be applied to residential customer bills is ($0.038919) per hundred cubic feet. (I)

A Home Energy Assistance Program (HEA) charge of $0.10 will be applied monthly to residential customer bills through September 2014.

The DSMR to be applied to non-residential service customer bills is $0.00 per hundred cubic feet.

Issued by authority of an Order by the Kentucky Public Service Commission in Case No. __ dated ________

Issued: August 15, 2013
Effective: January 1, 2014

Issued by James P. Henning, President James P. Henning

Duke Energy Kentucky
4580 Olympic Blvd.
Erlanger, KY 41018

RIDER DSMR

DEMAND SIDE MANAGEMENT RATE

The Demand Side Management Rate (DSMR) shall be determined in accordance with the provisions of Rider DSM, Demand Side Management Cost Recovery Rider, Sheet No. 75 of this Tariff.

The DSMR to be applied to residential customer bills is $0.002003 per kilowatt-hour. (I)

A Home Energy Assistance Program (HEA) charge of $0.10 will be applied monthly to residential customer bills through September 2014.

The DSMR to be applied to non-residential distribution service customer bills is $0.001131 per kilowatt-hour. (I)

The DSMR to be applied for transmission service customer bills is $0.001070 per kilowatt-hour.

Issued by authority of the Kentucky Public Service Commission
in Case No. __ dated ___.

Issued: August 15, 2013
Effective: January 1, 2014

Issued by James P. Henning, President James P. Henning

Final Report

Process Evaluation of National Energy Efficiency Education (NEED) Program for Schools in Kentucky

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

February 26, 2013

Submitted by

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TECMARKET Works

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Executive Summary

Key Findings and Recommendations

This section presents the key findings and recommendations identified through this evaluation of Duke Energy's National Energy Education Development (NEED) Program for K-12 schools in Kentucky. The program evaluation covers the period of time from January 1, 2011 to October 1, 2012.

Significant Process Evaluation Findings

From the Management Interviews

- The program appears to be providing excellent high quality energy education to students within the Duke Energy service territory, but the program is falling short of meeting its goals for energy efficiency kit distribution. Unless notable changes are made, the program appears unlikely to meet its goals in the future.
- Between January 1, 2011 and October 1, 2012, the NEED program distributed 401 energy efficiency kits against a goal of 1000 kits. This represents an achievement of 40% of goal. Additional kit distributions were planned for late 2012, but the number of participating teachers and the corresponding volume of kits appeared unlikely to reach the goal of 1000.
- Between January 1, 2011 and October 1, 2012, the NEED project has conducted three teacher workshops, training 109 teachers from 63 participating schools. From among these schools, 32 classrooms distributed Duke Energy sponsored energy efficiency kits to 460 student families.
- While the program appears to be doing an adequate job of training teachers each year, the sharp decline between number of teachers receiving NEED training and the number of teachers actually distributing Duke Energy sponsored energy efficiency kits is the most notable barrier to success for this program.
- The primary reason identified for low teacher participation is an issue of classroom equity. As designed, the program only permits efficiency kit distribution to students whose parents are Duke Energy customers. Because many classrooms contain students who are not Duke Energy customers, the teachers opt out of program participation rather than creating a situation of inequality where some students receive the kits and others do not.
- Based on interviews with the NEED coordinator, another barrier to success appears to be parental objections to participating due to misunderstandings about program eligibility and parental desires for confidentiality about their Duke Energy account information.
- Test results and teacher feedback confirm that the program is providing high quality energy education that is well integrated into a wide variety of academic subjects ranging from science and math to social students and arts.
- Several Duke Energy sponsored schools, teachers, and projects have won recognition awards at the state and national levels.

- Communications between Duke Energy and program vendors are working well with no issues reported.
- Duke Energy changed fulfillment vendors in April of 2012. Kit fulfillment worked well under the previous vendor and continues to operate effectively under the new vendor.

From the Teacher Interviews

- The NEED program is doing an admirable job of delivering train-the-trainer education to teachers, as well as with providing energy-oriented curriculum that can be incorporated into a broad spectrum of teaching opportunities at all grade levels.
- The NEED program offers schools a rich set of energy-oriented curriculum and hands-on tools for teaching students about energy.
- Of the six teachers we spoke with, they are very satisfied with the program. They rated their mean satisfaction above 8 on a scale of 1 to 10 in all categories except for the teacher training workshop, which was brought down by a single low score.
- Teachers are highly satisfied with the student take-home energy efficiency kits, rating them with an average satisfaction score of 9.4. The program also received a mean satisfaction score of 9.4, while mean satisfaction with Duke Energy was an 8.8 on the 10 point scale.
- The NEED program is an entirely voluntary program that teachers participate in because they find it educationally valuable. With no extra incentives from the utility or the school district and with an already full teaching schedule, many teachers—even those who have taken the one day training workshop—are not using NEED materials in their classrooms or distributing the energy efficiency kits.
- As noted above under management interviews, teachers are concerned about giving efficiency kits to some students and not to others. While most concerned teachers opt out altogether, anecdotal reports indicate a small number of teachers are attempting to resolve the inequity issue by encouraging students who are eligible to receive the Duke Energy sponsored efficiency kits to share the kit items with students who are not Duke Energy customers. While this practice is believed to be very limited, failure to eliminate such teacher actions in the future could impact the program's energy savings. One potential solution would be to distribute kits to all students and allow the energy savings to the sponsoring utility regardless of the customer address where the kits are installed.

Table 1. Process Findings with Energy Impact Implications

Process Evaluation Results	Potential Impact Implication	Recommendations
Some number of teachers are attempting to resolve issues of classroom equity by encouraging students who are eligible to receive the Duke Energy sponsored efficiency kits to share the kit items with students who are not Duke Energy customers.	Kit items are intended to be installed in the home of the Duke Energy customer. If a kit item is installed in a non-Duke Energy customer home, Duke Energy does not receive the intended impacts of that item.	1. Demonstrate to the regulatory agency how not allowing Duke Energy to claim the savings of non-Duke Energy students has resulted in unequal kit distribution within classrooms and anecdotal reports of sharing of kit materials, leading to a possible reduction of savings for Duke Energy's customers. Duke Energy should recommend to the Commission that savings be credited to the program.

		2. Consider providing energy efficiency kits to non-Duke Energy customers in order to encourage wider adoption of the program, such as those that are provided in the non-customer kits distributed to schools via other Duke Energy efficiency programs.

Significant Process Evaluation Recommendations

- The program appears unlikely to meet its goals in the future unless the classroom equity problem is resolved. One possible way to address this issue is for Duke Energy to provide energy efficiency kits (possibly with fewer kit items) to non-Duke Energy customers as is done with other Duke Energy programs serving the schools.
- In order to avoid issues with claimed energy savings caused by teachers seeking to resolve the classroom inequity issue by sharing kit items, Duke Energy should emphasize kit eligibility rules to teachers and work with the Commission to provide appropriate alternatives, such as allowing kit distribution to non-Duke Energy customers.
- Other ways to offset low participation rates include increasing marketing efforts to bring more school districts and individual schools into the program and improving adoption rates among teachers at participating schools.
- Teachers generally do not feel it is appropriate to overcome parental objections to program participation. If Duke Energy seeks to overcome parental objections to sharing their account information (e.g. home address, etc.), avenues that do not require persuasion by teachers will need to be utilized.

Introduction and Purpose of Study

Summary Overview

This document presents the evaluation report for Duke Energy's National Energy Education Development (NEED) Program for K-12 schools as administered in Kentucky. This process evaluation was conducted by TecMarket Works and subcontractor Matthew Joyce and covers the time period between January 1, 2011 and October 1, 2012.

Summary of the Evaluation

The findings presented in this evaluation were obtained using telephone and email interviews with the Duke Energy program manager, vendor representatives, and participating teachers. An internet survey of participating families was also attempted between August 18, 2012 and October 8, 2012, but only seven people took the survey. Because so few people responded to the survey and because they did not answer many of the survey questions, the sample size was deemed too small for an analysis of statistical validity. Therefore it is not included here.

Description of Program

The Duke Energy-sponsored National Energy Education Development (NEED) project educates teachers and students in Kentucky about all facets of energy. From an educational perspective, the program is designed to foster a deeper understanding of energy on an intellectual level in order to support long-lasting changes in attitudes and behaviors. On the pragmatic level of energy savings, the program is designed to distribute student energy efficiency kits for installation in their homes. Both the educational and pragmatic aspects of the program are described and evaluated below.

As Table 2 shows, the program is reaching NEED's internal target of training 60 teachers per year, but it is not reaching its program goal of distributing 500 energy efficiency kits per year. A review of the numbers displayed in the table reveals an approximate 66% decline between the number of teachers participating in the training workshops (109) and the number of teachers participating in classroom activities (32). The reasons for this decline and suggestions to overcome the challenge are discussed below.

Program Participation

Table 2. Program Participation and Results

Time Period	Training Workshops	Teachers Participating in Training	Participating Schools	Participating Classrooms	Participating Students	Energy Efficiency Kits Distributed	Goal Energy Efficiency Kits	% of Goal
Jan 1, 2011 to Oct 1, 2012	3	109	63	32	836	401	1000	40%

**Second training workshop is set for Nov. 13, 2012 with 28 teachers representing 14 schools and is not reflected in the numbers shown in Table 2.*

Methodology

Overview of the Evaluation Approach

This process evaluation consists of two primary components: management interviews and teacher interviews. A third component, an internet survey of participating families, did not receive enough responses to be statistically valid and is not included here.

Table 3. Evaluation Date Ranges

Evaluation Component	Data Collection	Dates of Analysis
Management Interviews	9/14/12 through 11/3/12	11/3/12 through 11/19/12
Teacher Interviews	10/16/12 through 10/26/12	10/26/12 through 11/19/12

Study Methodology

Management Interviews

Between September 14, 2012 and November 3, 2012, TecMarket Works conducted interviews with Duke Energy's product manager, the NEED program coordinator, and the client manager at AM Conservation, the vendor contracted to provide order tracking and bulb fulfillment since April of 2012. The survey instrument can be found in Appendix A: Management Interview Instrument.

Teacher Interviews

Between October 16 and 26, 2012, TecMarket Works conducted telephone and email interviews with teachers in Kentucky who participated in the program between January 1, 2011 and October 1, 2012. These teachers participated in Duke Energy-sponsored NEED training workshops, presented NEED educational lessons to their classes, and/or distributed student energy efficiency kits to their students. The interview instrument can be found in Appendix B: Teacher Interview Instrument.

Participating Family Surveys

From August 18, 2012 and October 8, 2012, Duke Energy fielded an online survey of customer families who received the student take-home energy efficiency kits between November 1, 2011 and June 30, 2012.

Data collection methods, sample sizes, and sampling methodology

Management Interviews

Three management interviews were conducted by phone with program implementation managers and staff to document their experiences and suggestions about the program operations and challenges. We interviewed the Duke Energy Product Manager, the NEED program coordinator, and the client manager at AM Conservation.

Teacher Interviews

These interviews focused on teachers who, according to program tracking records, distributed Duke Energy sponsored energy efficiency kits during 2011 and 2012. The interviews were conducted by TecMarket Works' staff by phone and email. A contact list of 14 participating teachers was provided to TecMarket Works. Teachers were contacted a maximum of five times or until the contact resulted in a completed survey or refusal to complete the survey.

Participating Family Surveys

This online survey conducted by Duke Energy was targeted at the 193 families who received the student take-home energy efficiency kits via this program between November 1, 2011 and June 30, 2012. Of these 193 customers, Duke Energy had email addresses for 108 families. These customers were sent email messages directing them to take the survey online. Only seven customers responded to the survey. Although no formal investigation was conducted into the reasons for this low response rate, in our experience as evaluation professionals, lack of survey response is generally more associated with convenience factors, time intervals between initial event and subsequent survey, and levels of interest. To be successful, these types of surveys need to be supported and pushed by teachers so that response rates can improve and the importance of the action needs to be understood by the respondents.

Number of completes and sample disposition for each data collection effort

Management Interviews

Three out of three management representatives were interviewed in 2012 for a 100% response rate.

Teacher Interviews

Duke Energy provided TecMarket Works with a list of 14 teachers who were reported to have participated in the program during 2011 and 2012. TecMarket Works attempted to contact all of the teachers on the list. Upon contact, we discovered that two contacts were incorrect and no additional contact information was available. An additional six teachers on the list had not participated in the NEED program, although their students had received energy efficiency kits after the energy-related curriculum was delivered by the school librarian. Of the pool of six remaining teachers eligible for contact, TecMarket Works interviewed five teachers, plus one additional teacher who had participated in NEED training during 2009 and has remained active in the program. This brings the total number of teacher interviews to six, which is 100% of the number of interviews possible with the available contact information.

Participating Family Surveys

Between November 1, 2011 and June 30, 2012 193 families received the student energy efficiency kits via this program. Duke Energy obtained email addresses for 108 people who were sent email messages directing them to take the survey online. Only seven customers responded to the survey. Because the final sample size was too small for a statistically valid analysis, the survey findings were not analyzed for this report.

Management Interviews

Description of the Program

The Duke Energy-sponsored National Energy Education Development (NEED) Project is a program designed to educate teachers and students in Kentucky about multiple facets of energy and to encourage the installation of energy efficient devices in student homes. Educationally, the program is designed to promote long-term attitude and behavior changes in teachers, students, and their families through a comprehensive training program that integrates energy-oriented curriculum into a wide variety of subjects, ranging from science and math to social studies and art. The program is also designed to generate residential energy efficiency savings through the distribution of home energy efficiency kits that student families receive and install in their homes. Duke Energy has sponsored the NEED program since 1995. This process evaluation covers the time period between January 1, 2011 and October 1, 2012.

Educational Design and Implementation

The Duke Energy-sponsored NEED program provides twice yearly professional development workshops to K-12 educators teaching in public, private, and parochial schools within the three northern Kentucky counties serviced by the utility. The workshops help teachers to implement energy lessons that develop student knowledge and foster student leadership. The workshops are provided free of charge to educators and include: a full day of instruction, breakfast and lunch, and substitute teacher reimbursement. These full-day Duke Energy-sponsored Energy Education Workshops acknowledge that many of the teachers who are interested in energy do not have science backgrounds, and thus the workshops approach the subject matter from a variety of perspectives. Topics covered throughout the day include: the science of energy, renewable and nonrenewable resources, fundamentals of electricity and magnetism, transportation (such as plug-in hybrid vehicles), and energy efficiency and conservation.

Since January of 2011 the program has conducted three full-day workshops, training a total of 109 teachers. More specifically, two workshops were held in 2011, serving 62 teachers. One workshop serving 47 teachers has been conducted to date in 2012. Another workshop scheduled for November 13, 2012 has an additional 28 teachers registered. The NEED program strives to train at least 60 teachers per year, so the program met the objective in 2011 and is on track for 2012. The NEED program has met this objective for many years. This leads the NEED coordinator to estimate that since Duke Energy began sponsoring the NEED project in Kentucky in 1995 it has seen more than 1000 teachers pass through its training. In theory all of these teachers are eligible to be using the NEED materials in their classrooms each year. However, the number of potential teachers is actually likely to be less due to retirement, job changes, moves, and teachers returning for refresher training.

In addition to the full day training workshops, the NEED program provides teachers with annually updated, age-appropriate energy curriculum that can be integrated into classes ranging from science, math, and economics, to social studies, English, art, and drama. For instance, students calculate payback periods for energy efficient appliances in math, write and perform plays about energy, and discuss the history of energy use in social studies. This approach of integrating energy topics into existing subject matter has proven to be a useful means of overcoming one of the most common objections to program participation—finding time in busy schedules to talk about energy. To further encourage participation, the curriculum and activities are correlated with National Science Education Standards and Kentucky Core Content and Program of Studies in science and other disciplines.

In addition to studying about energy resources, electrical safety, and energy efficiency, students learn through hands-on inquiry-based lessons built around classroom energy kits that teach concepts such as force, motion, light, heat, electricity, magnetism, and energy transformation. Because one of the program's fundamental principles is "kids teaching kids," many teachers encourage students to master the materials and present them to their classmates and fellow students, such as fourth graders teaching third graders about electric circuits. Those same lessons are typically shared with parents as well.

Between January 1, 2011 and October 1, 2012, 63 schools have used the Duke-Energy sponsored NEED educational materials in their classrooms. More specifically, 42 schools used the materials in 2011, and 21 schools have used the materials to date in 2012. An additional14 schools are registered to start using the materials after November 13, 2012.

Extracurricular Activities

The NEED program also extends to extracurricular activities such as after-school energy clubs that encourage students to investigate behavioral energy impacts at school and at home, as well as teaching skills such as how to read utility meters, investigate phantom loads, and conduct energy audits. While the number of schools fielding energy clubs is not a statistic that has been tracked to date, the NEED coordinator estimates that 63 schools have hosted or will be hosting energy clubs during 2012.

Starting in 2012, two schools have fielded teams to engage in the new Kentucky NEED VendingMiser Project, through which participating schools receive a free motion-detecting VendingMiser unit to reduce energy consumption of a cold beverage vending machine. As part of the program, students study plug loads before and after installing the device and then calculate energy savings for a single vending machine and for multiple units throughout the school and the school district. An additional six schools are scheduled to submit applications for participation before the end of 2012.

NEED also hosts events ranging from energy management trainings for local school districts to an annual national energy conference for educators with informational sessions, new technology displays, and recognition awards for exceptional students and teachers. As shown in the table below, Duke Energy-sponsored students, teachers and energy clubs have earned recognition at the state and national levels. Duke Energy offers scholarships to teachers and students from its service territory to offset the costs of attending the awards ceremonies and the national conference.

Table 4. Duke Energy Sponsored Award Winning Schools, Teachers & Projects

Year	School	County	Award
2011	James A. Caywood Elementary	Kenton	State Winner
2011	Cooper High School	Boone	State AND National H.S. Rookie of the Year
2011	Kenton County Schools – District Level Project	Kenton	State Winner
2012	James A. Caywood Elementary	Kenton	Outstanding Elementary State Level Project

Educational Value and Quality Control

NEED places a priority on quality and conducts regular evaluations to assess the educational value of its programs.

In order to maintain the quality of its training efforts, all training workshops use a standard format, consistent course materials, and one primary instructor who facilitates all workshops in a similar manner. All of NEED's educational resources are reviewed by a teacher advisory board of educators and subject matter experts who assess scientific accuracy, comprehensiveness, objectivity, educational soundness and effectiveness.

Although individual teachers maintain discretionary latitude regarding how they deliver the lessons, NEED measures the effectiveness of their educational efforts as well. Teachers and students participate in pre- and post-tests to assess their knowledge before and after participating in the program. A review of the 2011 student pre/post testing data indicates an average pre-lesson score of 9.4 points (out of 20 possible points) and an average post-lesson score of 14.1 points, showing a substantial increase in energy-related knowledge.

In addition to student testing, teachers also fill out evaluation forms to provide feedback for improving the program. Longitudinal evaluations are conducted 90 days and one year after a teacher is introduced to NEED to assess long-term efficacy.

Energy Savings Design and Implementation

In order to drive energy savings, the program incorporates a component that focuses on the distribution and installation of energy efficient devices in residential homes. In conjunction with classroom-based learning activities, teachers are encouraged to offer students free take-home energy efficiency starter kits sponsored by Duke Energy. The entire kit package consists of:

- 13 watt Energy Star rated mini compact fluorescent (60 watt incandescent equivalent), with 12,000 hour life
- 18 watt Energy Star rated mini compact fluorescent (75 watt incandescent equivalent), with 12,000 hour life
- Energy Efficient Limelight style night light
- 1.5 GPM low flow shower head
- Roll of Teflon tape for showerhead
- 1.5 GPM kitchen faucet aerator with swivel and flip valve

- 1 GPM needle spray bathroom faucet aerator
- Water flow meter bag
- Water temperature gauge card (Hot Water Temp Card)
- Combination pack of switch and outlet gasket insulators (12/pk) - 8 outlets and 4 socket gaskets
- Duke Energy labeled DOE "Energy Savers" booklet
- Product information and instruction sheet
- Duke Energy Disclaimer
- Glow Ring Toy
- Sturdy box to securely package and ship individual EE Kits
- Duke Energy supplied kit label

In years past, teachers were directed to simply distribute the kits to their students and ask kids to get parental help to install the items. However, NEED now provides teachers with a 56 page teaching guide containing specific lesson plans for discussing each item in the kit prior to sending it home. For instance, during the session on lighting, students learn about different bulb types, terms such as watts and lumens, life cycle costs, and how to use light meters and flicker checkers. Students are then assigned homework that includes a worksheet for calculating the life cycle costs and environmental impacts of their families' light bulbs, as well as specific requirements for installing the CFLs from the efficiency kits in their homes. Follow up in-class discussions help ensure that the homework was completed and that students understand both the concepts and the practical application of the lessons.

This approach offers several advantages. First, by learning about a single item at a time, students are better able to comprehend the energy saving concepts behind the item and why it is important. The kids then relay this focused information to their parents as they ask for help installing that particular device, be it a CFL or a faucet aerator. This not only makes it more likely that the energy-saving device will be installed; it also makes it more likely that in the future the family will practice more sustainable behaviors such as replacing the original CFLs with additional CFLs rather than reverting to incandescent bulbs. Secondly, the act of introducing and sending home one item at a time maintains student interest, particularly when teachers hold back the "most exciting" items until the end.

The student energy efficiency kits are available to all students whose parents are Duke Energy customers. To qualify, at least one of the student's parents must be a Duke Energy customer and have the billing in his or her name. All families who wish to receive a kit must sign a permission form and agree to participate in a follow up survey after receiving the kit. The form records the student's name, teacher, school, and date. It also seeks confirmation that the family is a Duke Energy customer and asks for the utility customer address and signature.

Barriers to Success

Despite the simplicity of the form, the NEED coordinator and teachers we interviewed reported that some families balked at signing the form because they considered it "an invasion of privacy" to share their names and addresses with their utility company. (These people were obviously not realizing that as customers of the utility this information is already known by Duke Energy.)

The NEED coordinator indicates that customer resistance to signing the forms is not pervasive, but it is prevalent. And while she appreciates the need for Duke Energy to ensure its kits are only being distributed to its customers, she considers the requirement for families to sign the form to be a sizeable enough barrier that it inhibits the program from reaching its annual goal of distributing 500 energy efficiency kits.

According to the NEED coordinator, an even more notable barrier to success arises from resistance by the teachers who are tasked with distributing the efficiency kits to students. While the teachers we spoke with did not seem as concerned about the "privacy" issues noted above, they are concerned about the equity of student involvement in the learning activities in their classrooms. Unfortunately, in many classrooms not all students' parents are Duke Energy customers. For some teachers, this is not a problem and they distribute the kits accordingly. However, for a sizeable number of teachers equity of opportunity is of paramount importance. As a result, while some of these teachers may be willing to use NEED's in-class materials, they refuse to distribute the energy efficiency kits to eligible Duke Energy customers on the reasoning that it is better to provide none than to give the kits to only some students. This factor may well be the single most significant issue with the implementation of the program because by design the program depends upon teachers to distribute the kits to qualifying students. Without teacher participation, Duke Energy is not likely to reach its kit distribution goal.

Many schools, particularly those in the southern portions of the Duke Energy service territory, have students whose families are served by other electric providers. NEED representatives have attempted to work with these other utilities to provide similar efficiency kits, but those utilities have declined. Thus, if Duke Energy seeks to overcome the equity barrier in the classroom, alternative solutions should be sought.

One potential solution to the equity issue is for Duke Energy to offer kits to students who are not Duke Energy customers and still accrue the energy savings, assuming this is allowable under filing rules. These "non-customer" kits need not necessarily contain the same number of items as those in the "customer" kits. Offering limited kits to non-customers would help to keep costs down while simultaneously reducing concerns about equity and increasing the likelihood of teacher participation, thereby increasing the number of Duke Energy customers who actually receive the kits. In other words, while the program's average cost per customer acquisition may be higher due to the additional expense of providing non-customer kits, the total number of kits successfully distributed would also increase, as would the resulting energy savings. A cost-benefit analysis will reveal the effectiveness of such an approach.

Program Marketing and Teacher Recruitment

Because the NEED project is a "turnkey" program, NEED handles all of the marketing and promotional activities.

Duke Energy does not actively promote the program through its own marketing efforts. However, the Duke Energy program manager indicates that the NEED program is mentioned by Duke Energy representatives in contextually appropriate conversations, such as conversations between account managers and customers.

Since the NEED program operates within only three northern Kentucky counties, and because it is specifically focused on educators, the NEED staff relies primarily on email and telephone calls for its marketing efforts. NEED's outreach and recruitment efforts concentrate on two primary groups: those who focus on K-12 academics and those who focus on energy, such as school district energy managers. To reach academics NEED representatives contact the curriculum coordinators in the public, private, and parochial school districts within Duke Energy service territory to generate interest and request email distribution to the district's teachers. NEED also works with its own email database of approximately 300 teachers who have previously participated in a NEED training workshop or who have facilitated the distribution of the student energy kits in prior years. To extend its reach even further, NEED also uses its connections with school district energy managers in an effort to leverage their relationships with teachers who may be interested in the program. Marketing email messages describe all timely and relevant NEED activities, such as upcoming teacher trainings, in-class offerings, and after school opportunities.

NEED also asks the Northern Kentucky Educational Cooperative to use its email list to reach out to school district superintendents. But this approach of communicating directly with the superintendents has proven to be relatively unsuccessful; the free cost of the NEED program offsets budget considerations, but not higher priority concerns about focusing teacher efforts on increasing test scores. Other marketing efforts include working with parent teacher associations and parent teacher organizations to promote free NEED resources during *Go Green* evening events sponsored by the U.S. Environmental Protection Agency. NEED is also looking into new partnership opportunities, including a collaboration with Children Inc. that may be used to spread the word about resources and opportunities available for teachers.

Fulfillment

The fulfillment process for ordering and fulfilling the requests for energy efficiency kits typically operates as follows: School teachers gather signed permission forms from parents who are willing to install items from the student energy efficiency kits. The permission slips are given to a NEED representative, who in turn passes them on to the Duke Energy program manager. The Duke Energy program manager contacts the fulfillment company and sends a bundled order for the appropriate number of energy efficiency kits. The fulfillment company fills the orders and ships the requisite number of kits directly to each school for distribution to individual teachers, who in turn send the kits home with qualifying students.

Between January 2011 and April 2012, Niagara Conservation of Cedar Knolls, NJ served as Duke Energy's fulfillment contractor, providing bulb order processing and shipping (via FedEx). In April of 2012 Duke Energy discontinued its contract with Niagara Conservation and began working with AM Conservation Group of Charleston, SC. The Duke Energy program manager reports that the transition went well and fulfillment efforts are going smoothly. Because this process evaluation was conducted after the change in vendor, only AM Conservation was interviewed. The new fulfillment vendor indicates that operations are running well and the NEED program is being supplied with a sufficient number of energy efficiency kits. The Duke Energy program manager concurs.

Program Communications

The Duke Energy program manager and NEED representatives communicate by phone and email on an as-needed basis in order to address activities such as placing school orders for energy efficiency kits or for making arrangements for new VendingMiser participation. NEED representatives also send the Duke Energy program manager periodic updates. The Duke Energy program manager says "The NEED program is very easy to work with. Their systems are well established and operate smoothly."

Suggested Improvements

When asked to suggest potential improvements to the program, the NEED representative and the Duke Energy program manager agreed that teacher participation is a key area for improvement, citing the classroom equity issue as the most obvious barrier to success.

Another suggestion offered included a desire to establish a methodology to measure and verify the energy savings generated by the energy education the students receive and the recommendations presented to families via homework assignments or other NEED program activities. No specific means were suggested to accomplish this since tracking customer participation via the schools makes verification more complicated than interactions directly between Duke Energy and its customers.

Evaluation and Recommendations

As noted above, the NEED program has two primary objectives: energy education and energy savings. The program is reaching its objective of training 60 teachers per year, and it appears proficient in providing academically-effective, energy education curriculum to schools within the Duke Energy service territory. However, the program it is not reaching its goal of distributing 500 energy efficiency kits per year.

The approximate 66% decline between the number of teachers participating in the training workshops and the number of teachers who are distributing energy efficiency kits obviates the primary problem with the program as it is currently being implemented. If the program is to reach its kit distribution goals then either this bottleneck must be eliminated or NEED must train a larger number of teachers, or both.

Two notable reasons were identified for the bottleneck between the amount of trained teachers and amount of kits distributed. First is the number of teachers who do not want to participate in the program due to concerns about student equity. Second is the number of parents who do not want to participate in the program due to concerns about privacy. A third issue regarding educators having insufficient time to teach students about energy appears to be effectively addressed by successfully incorporating energy-related concepts into a wide variety of subjects ranging from science and math to art and social studies.

The primary challenge the program faces is the issue of teacher resistance to program participation. That teachers appreciate the educational value of the program is evidenced by their participation in the training workshops. That they decline to distribute the energy efficiency kits is evidence of their concerns about student equity that arise when they are informed that program rules permit only those students who are Duke Energy customers to receive the energy efficiency kits, while students who are not Duke Energy customers receive nothing. Because this issue is one of inequality, and many schools operate under a mandate of educational equality, the problem is not likely to be resolved with any programmatic measure short of providing energy efficiency kits to non-Duke Energy customers. These non-customer kits need not necessarily provide an equivalent number of energy efficiency items, but in order to encourage wider adoption of the program, the non-customer kits should contain at least a minimum number of items, such as those that are provided in the non-customer kits distributed to schools via other Duke Energy efficiency programs. Therefore we recommend that Duke Energy work with the commission to consider program eligibility for kit distribution to non-Duke Energy customers and appropriate assignment of the associated energy savings.

The second issue regarding parental privacy concerns impacting enrollments in the program is not a newly discovered concern. In the past, Duke Energy program managers and NEED managers have worked to simplify the permission form (see Appendix C: Sample Registration Form) on the premise that the less data that is collected, the less invasive of privacy the form appears to be. At this point, the form is arguably as simple as possible, collecting little more than the student's school information, family address, and a parental signature. Because the problem persists despite this simplification, the next most promising alternatives to overcome this barrier may be eliminating the use of the form or improving the explanations given to parents regarding why the forms are necessary and what will be done with the information that is collected on the form and in the subsequent survey. The latter alternative is far preferable for measurement and verification purposes.

To train a larger number of teachers, Duke Energy and NEED must either increase marketing efforts to school districts and individual schools or improve conversion rates by encouraging more workshop participation among teachers from schools already using its program. Both options are worth exploration. However, it is important to note that because Duke Energy operates in only three counties in northern Kentucky, the number of school districts from which to recruit participating teachers is necessarily limited. This fact makes increased conversion rates from participating schools even more important.

One other recommendation for Duke Energy pertains to its role as an educational sponsor in the schools. Upon reviewing this program we uncovered that while NEED believes in collecting data on the educational value of its efforts, Duke Energy does not require NEED to systematically collect this information or provide documentation of the results. As a program sponsor, it is within Duke Energy's purview to request documentation such as the results of pre- and post-testing of teachers and students, teacher evaluation forms, and curriculum reviews by NEED's academic standards board. Regular review of this data will help ensure that Duke Energy is investing in worthwhile academic programs and that Duke Energy's reputation as an educational sponsor remains high.

In summary, this program appears to provide well-developed and academically valuable energy-efficiency education to schools within Duke Energy's service territory. If these goals are deemed important, then the program appears to be providing value in terms of sponsored energy efficiency education. However, as currently implemented, this program is falling short of achieving its energy savings goals. In order to achieve those goals, changes will need to be made to encourage greater teacher participation and wider distribution of the energy efficiency kits.

Teacher Interviews

This section presents findings from interviews conducted with teachers who participated in the Duke Energy-sponsored NEED program. To qualify for an interview, teachers must have attended a NEED training workshop, implemented the NEED educational materials in their classrooms, or distributed the energy efficiency kits to their students.

Duke Energy provided TecMarket Works with a spreadsheet containing the names of 14 participating teachers. Twelve of these teachers proved to be reachable. Of the 12 teachers, six worked at the same school and none of them had actually participated in the NEED program. However, another teacher at the same school did participate in a NEED training workshop in 2009. Due to a job change she did not teach the NEED curriculum in 2012, but she continued to oversee the after school student energy team. To ensure continued school participation in the program, this teacher trained the school librarian (also a certified teacher) to present the NEED materials. The school librarian used library-time to train the six classes at the elementary school and helped those classes to distribute the Duke Energy sponsored student energy efficiency kits. The NEED-trained teacher provided information regarding the schools activities via a telephone interview.

In total, TecMarket Works conducted interviews with six teachers from six different schools, including four parochial schools and two public schools. Grade levels represented ranged from fourth to eighth grade. Of the six teachers, two were initially trained in 2007 and returned for refresher training in 2011, two were trained for the first time in 2011, one was trained in 2009, and one teacher did not state when her training occurred.

The teacher interviews combined open-ended discussion questions for capturing qualitative insights with survey questions designed to quantify satisfaction with various elements of the program. While the sample sizes are too small for statistical validity, they do provide directional feedback for the program. With that in mind, we present the following findings.

Energy Efficiency Education

All of the teachers we spoke with said they had incorporated the NEED curriculum and hands-on materials into their lessons in order to introduce their students to energy concepts prior to sending home the Duke Energy sponsored student energy efficiency kits. As one teacher explained, "We followed the plan, introducing each concept and then the associated item from the kit. So we gave the lesson on water and then presented the low flow showerhead, etc." Teachers told us this current approach works better than earlier program guidelines. "I used to just send the kits home without ensuring that the kids knew why the kits were important. Now I talk about each kit item one at a time so that they really understand the importance of each device. For instance, I had my students survey their homes to count the number of CFLs and incandescents installed. Then I had them calculate the lifetime savings on a CFL. That way when they took the bulbs home they could explain to their parents why they should install them."

Student Participation

To gain insights into the level of program participation within their classrooms, we asked teachers to discuss how many eligible students took home the kits and installed at least one of the items. Teacher responses ranged from full participation to various levels of lesser engagement. Their estimates and observations are summarized or quoted below.[1]

- 100% of students were eligible. Everyone participated and all reported installing one or more item. The light bulbs were the most used, while showerheads were the least installed.
- 82% of the students in our school were Duke Energy customers, and of these 43% ordered the kits. That means that 57% of parents refused for various reasons.
- "80% of my students were Duke Energy customers. They ordered the kits and shared with the 20% who were not." (Note: This is an example of teachers attempting to resolve the program's classroom inequity issue in a way that diminishes claimed energy savings for Duke Energy.)
- "By staggering the introduction of each item we get about a 90% install rate. The low flow showerheads are the item most frequently already installed. They have about a 75% install rate, which is the lowest of all items in the kit."
- "I followed up to see which students had installed items. Not very many did. So I actually called their parents to ask why not. I didn't learn much except that parents normally sign forms from school even if they don't intend to do anything."

When we asked teachers to discuss the barriers limiting kit distribution and item installation, they explained that even when students are eligible to receive the kits some parents opt not to accept them. In some cases this is because older siblings have already been through the program, but in other cases teachers told us that parents refused for a variety of reasons based upon misunderstandings about the program, such as objecting because the kits are "an inappropriate use of tax dollars" or because they considered themselves to be ineligible because they live in Section 8 housing. One teacher told us that she tried to overcome these parental objections by explaining more details about the program, but the other teachers appear to have limited their advocacy to the act of extending the offer of the kits to their students. As one teacher stated, "If parents were not interested in signing the permission form, so be it." With so many other requirements on teacher time, this level of classroom advocacy (as opposed to the one teacher's attempts to prompt further parental engagement) seems to be a reasonable limit on what the program can expect from teacher involvement.

[1] Teacher comments are reported as stated in order to faithfully reflect their thoughts and wording, but teacher estimates have not been verified for accuracy of measurement or percentage, and may not be representative of actual results.

Teacher Satisfaction

To ascertain teacher satisfaction with numerous aspects of the program, the six participating teachers were asked to rate their satisfaction on a 1-to-10 scale with 1 indicating Very Unsatisfied and 10 indicating Very Satisfied. Teachers were asked to rate their satisfaction with the NEED training workshops, the curriculum, the in-class materials, the student take-home efficiency kits, the program overall, and their satisfaction with Duke Energy. However, it must be noted that the sample size was too small to provide statistical validity. Thus the results discussed below are intended for directional information only.

Overall, the small group of teachers we spoke with was very satisfied with the program. They rated their mean satisfaction above 8 in all categories except for the teacher training workshop, which was brought down by a single low score. The satisfaction ratings are summarized in Figure 1and then explained in more detail below.

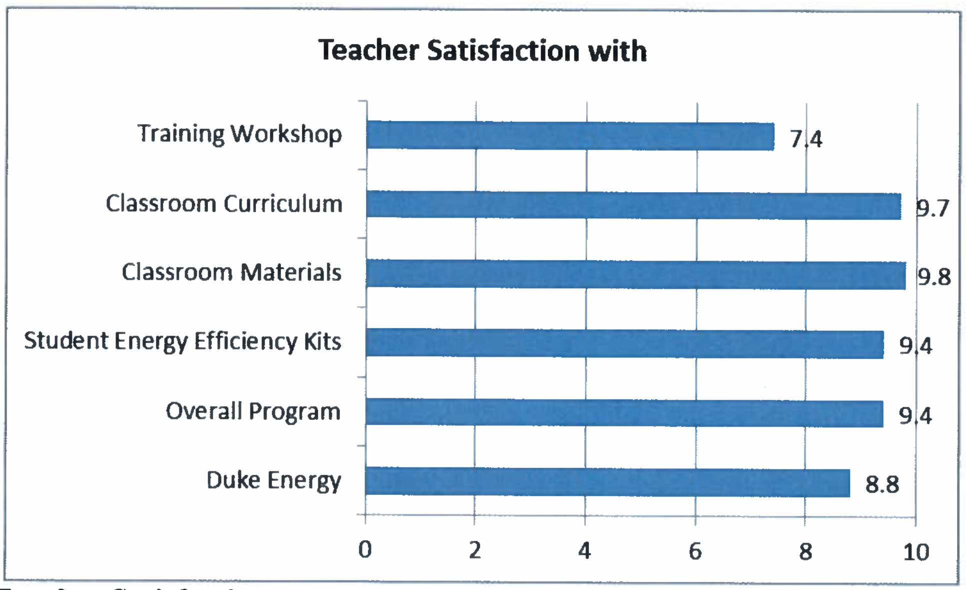

Figure 1. Teacher Satisfaction

Satisfaction with the NEED Training Workshop

When asked to rate their satisfaction with the training workshop, the teachers we spoke with gave an average satisfaction score of 7.4. More specifically, the scores were 10, 9, 9, 8, 8, and 3; the lowest rating bringing down the overall average. Five of the six teachers explained their ratings with the following verbatim responses.

- “It offered lots of good information, but some of the training was a little long.”
- “I would have liked to have more info on what is in the kits.”
- “It provided tons of information and was very well prepared.”
- “I thought it was very poorly organized and a waste of time. I didn't know much more when I finished than before I went.”

- "I like that the materials are updated each year. The training isn't just sitting and listening. I love the hands on training stations and demonstrations by students. Actually doing it makes you more comfortable implementing it in the classroom."

Satisfaction with the NEED Classroom Curriculum

The teachers we interviewed are highly satisfied with the classroom curriculum provided by the NEED program, returning an average satisfaction rating of 9.7. In fact, 5 of the 6 teachers we spoke with rated the curriculum a 10 on the 10-point scale. One teacher rated the curriculum an 8. They described the classroom curriculum as follows:

- "NEED provides lots of great materials."
- "They have great hands-on learning tools, as well as good information that makes it accessible for parents and kids."
- "Everything is in very kid friendly language, making teaching easier."
- "I love it, but I only gave it an 8 since some is really drawn out. You could teach for a year and not cover everything the program provides."
- "They are very flexible and provide lots to choose from so we can use what we want and skip the rest."

Satisfaction with the Classroom Materials

Hands-on in-class learning materials are a hallmark of the NEED program, and teachers rate this aspect of the program very highly with an average score of 9.8. Their praise for the classroom materials included the following replies.

- "Last year I taught fourth and five grades. This year I'm only teaching fourth graders but we are using the materials right now. The kids really like to see what uses energy and how much. They loved using meters to see how much their game stations used."
- "They are great for providing hands-on lessons."
- "There are lots of materials and the kids love them."
- "I continue to use them year after year."
- "Everything we need is included. We can even teach kids how to read electric meters. Not even many adults can do that."
- "I use lots of the different NEED in-class teaching kits. The school owns several and I can borrow others from the Northern Kentucky University Center of Environmental Education for up to two weeks at a time."

Satisfaction with Student Take-Home Energy Efficiency Kits

Teachers were also highly satisfied with the student take-home energy efficiency kits. They gave the kits an average satisfaction score of 9.4, with five teachers giving the kits a 10 out of 10 rating and one teacher giving the kits a score of 7, not due to the kits themselves, but rather because they were not as adequately integrated with other elements of the program as she would have liked. Specific teacher feedback is noted below:

- "I gave them a 10 because it's good for kids to have something that is hands on and practical."
- "My students enjoyed them and learned a lot."
- "I'd always rate the kits highly. I have used them two or three times now."
- "The only question I have is I am not sure what the strobe light ring in the kit is for. I wish that had been better explained."
- "Even though I am a teacher, I received a kit since my child was in the class. We liked everything in it, especially the socket gaskets, which my family had not considered even though we had recently upgraded our HVAC, windows, and insulation."
- "I love the Duke Energy home kits, but the NEED curriculum that goes with them isn't so great. I used the kits last year and the materials didn't flow well from one topic to the next. That made it hard to maintain student interest, but I admit part of that was due to the [middle school] students who were required to attend since it was the only class that fit in their schedules."

Overall Satisfaction with the Program

Overall satisfaction with the program was very high among the teachers we spoke to who gave an average satisfaction rating of 9.4. Four teachers gave a 10 rating, while one each gave scores of 8 and 9. When asked why they gave those ratings, teachers provided the following verbatim replies.

- "It's a good program."
- "I love it and have used it for several years. I only took a break this year due to the high number of repeat families with younger siblings whose older brothers and sisters already received the kits in previous years."
- "It's a good program with lots of ways to integrate the material into math, science, economics, etc."
- "It's very comprehensive. They are very responsive and provide great materials."
- "The lady who did the training was poor, but other NEED people I've met since then have been great."
- "I love the NEED program, but I only gave it a 9 since there is always room to improve."

Overall Satisfaction with Duke Energy

The teachers we spoke with gave Duke Energy an average overall satisfaction rating of 8.8. Three teachers rated their satisfaction a 10, while two others gave scores of 7 and 8. One teacher did not answer the question. When asked to explain their ratings the teachers gave the following answers.

- "They are a great sponsor, but I'm not a Duke customer."
- "They have been great and have provided everything we need. This year we had issues calculating kWh so we called them up and they explained it. I'm very satisfied."

- "As the NEED sponsor they do well, but my Duke Energy mentor was supposed to call me back and never did. Hence the lower score."
- "Duke gets a 9 as a sponsor for their great programs. They get a 7 as an energy provider. Average it out and you can give them an 8."

Evaluation and Recommendations

Teachers who are actively participating in the program are highly satisfied with it and with the quality of educational materials that are provided for their use. With mean satisfaction scores above 9 on the 10 point scale for virtually all elements of the program, teachers found very little room for improvement from an educational perspective.

However, when it comes to generating energy savings, the teacher interviews produced some important insights for program improvement. The twin issues of limited parent engagement and classroom inequity surfaced during discussions about barriers to program participation.

From the teacher perspective, kit distribution is limited because parents choose not to participate for a variety of reasons. As a group, the teachers feel it to be inappropriate to attempt to overcome parental objections when they send home the kit order forms. Given the teachers' reluctance to influence parental involvement, if Duke Energy wishes to overcome parental barriers to participation, the program will need to develop new means of overcoming objections through marketing collateral or via additional messages conveyed by students, NEED representatives or Duke Energy employees.

Because all six teachers we spoke with were active program participants, by definition they overcame their concerns about classroom inequality in kit distribution. However, in at least one instance the means used to overcome those inequality issues may be undermining the goal of the program. If teachers continue to encourage eligible students to share energy efficiency kit items with non-Duke Energy customers, then the energy savings of the program may be diminished and measurement and verification will be compromised. Whether Duke Energy chooses to overcome the inequity issue with non-customer kits or via another means, the sharing of kit contents with non-Duke Energy customers must be addressed if the integrity of the program is to be preserved.

Appendix A: Management Interview Instrument

Name: ____

Title: ____

Position description and general responsibilities:

____

____

____

We are conducting this interview to obtain your opinions about and experiences with the _____ program. We'll talk about the program and its objectives, your thoughts on improving the program, and the technologies the program covers. The purpose of this study is to capture the program's current operations as well as help identify areas where the program might be improved. Your responses will feed into a report that will be shared with Duke Energy and the state regulatory agency. I want to assure you that the information you share with me will be kept confidential; we will not identify you by name. However, you may provide some information or opinions that could be attributed to you by virtue of your position and role in this program. If there is sensitive information you wish to share, please warn me and we can discuss how best to include that information in the report.

The interview will take about an hour to complete. Do you have any questions for me before we begin?

1. Please describe your role and scope of responsibility in detail.
2. How long have you been involved with the program?
3. Describe the timelines and evolution of the Program as it pertains to your company.
4. Have there been any recent changes been made to your duties or your company's role since you started?
    a. If YES, please tell us what changes were made and why they were made. What are the results of the change?
5. In your own words, please describe the Program's objectives. (e.g. enrollment, energy savings, non-energy benefits)
6. Can you please walk me through your portion of the program's implementation?

7. Of the program objectives you mentioned earlier, do you feel any of them will be particularly easy to meet, and why?

8. Which program objectives, if any, do you feel will be relatively difficult to meet, and why?

9. Are there any objectives you feel should be revised prior to the end of this program cycle? If yes, why?

10. Are there any areas in which you think services can be improved?

11. How are your business activities coordinated with Duke Energy and other contractors/vendors?

    a. Do you think methods for coordination should be changed in any way? If so, how and why?

12. Describe your process for tracking participation and other program data.

13. Describe your quality control process

14. Overall, what would you say about the program is working really well?

15. Describe any challenges that you've face and how you've overcome them.

16. What area needs the most improvement, if any?

    a. (If not mentioned before) What would you suggest can be done to improve this?

17. Are there any other issues or topics we haven't discussed that you feel should be included in this report?

18. Do you have any further questions for me about this study or anything else?

Thank you!

Appendix B: Teacher Interview Instrument

Instrument

Introduction

Hello. My name is ______ and I am reaching out on behalf of Duke Energy to conduct a teacher survey about the National Energy Education Development (NEED) program sponsored by Duke Energy. Our records indicate that a teacher at your school, _______, participated in this program. May I speak with or leave a message for ______ please?

Call 1:	Date: _______	Time: _______	❑AM or ❑PM
Call back 2:	Date: _______	Time: _______	❑AM or ❑PM
Call back 3:	Date: _______	Time: _______	❑AM or ❑PM
Call back 4:	Date: _______	Time: _______	❑AM or ❑PM
	❑ Contact dropped after fourth attempt.		

When person is reached reintroduce.

Hello. My name is ______ and I am reaching out on behalf of Duke Energy to conduct a teacher survey about the National Energy Education Development (NEED) program sponsored by Duke Energy. This program provides teachers with free training, classroom curriculum, and in-class exercise kits to help teach students about the many facets of energy. Duke Energy also provides students with take-home energy efficiency kits containing compact fluorescent bulbs, low flow shower heads, and other energy savings measures. Our records show that you participated in this program. We would very much appreciate your feedback to better understand how teachers value and use the program.

The call will take approximately 15-20 minutes. If you have free time and are available during the school day we can speak now. Otherwise we can schedule at your convenience, including during the evenings if you prefer.

Teacher Interview Instrument

Name: ______________________________

School: ______________________________

Address: ______________________________

Grade: ______________________________

Have you participated in the National Energy Education Development (NEED) Program? (yes, no, don't know) If so, when?

Using a scale of 1 to 10, where 1 means "Very Dissatisfied" and 10 means "Very Satisfied", please rate how satisfied you are with **the training you received at the NEED workshop**. <u>Why do you give that rating?</u>

Did you use the materials and the knowledge you gained from the NEED workshop in your classroom? (yes, no, don't know) If so, how did you use them?

Using a scale of 1 to 10, where 1 means "Very Dissatisfied" and 10 means "Very Satisfied", please rate how satisfied you are with **the curriculum** you received from NEED. <u>Why do you give that rating?</u>

Using a scale of 1 to 10, where 1 means "Very Dissatisfied" and 10 means "Very Satisfied", please rate how satisfied you are with **the classroom materials** received from NEED. <u>Why do you give that rating?</u>

Did you incorporate the use of the **classroom energy kit**? (yes, no, don't know) If so, how did you use it?

Using a scale of 1 to 10, where 1 means "Very Dissatisfied" and 10 means "Very Satisfied", please rate how satisfied you are with the student energy kits that you received from NEED. <u>Why do you give that rating?</u>

Did you incorporate the use of the **student take-home energy kits**? (yes, no, don't know) If so, how did you introduce them to your students and integrate them into the lessons?

What is your best estimate of the percentage of your students were eligible (must be Duke Energy Customers) to receive the student take-home kits?

What is your best estimate of the percentage of eligible students who actually ordered the Duke Energy take-home kits (i.e. their parents signed the forms)?

How did you address those students in your class who were not eligible for the take-home kits?

How many of your students reported installing one or more items from the take-home kits?

Which items were most frequently installed? Which were least frequently installed?

How can the Duke Energy-sponsored student energy kits be improved?

How can the NEED training be improved?

Using a scale of 1 to 10, where 1 means "Very Dissatisfied" and 10 means "Very Satisfied", please rate how satisfied you are with your **overall experience with NEED program**. Why do you give that rating?

Using a scale of 1 to 10, where 1 means "Very Dissatisfied" and 10 means "Very Satisfied", please rate how satisfied you are with the **sponsor of the program Duke Energy**. Why do you give that rating?

Is there anything else about the program you would like to mention?

Thank you. Your time and insights will help us to improve the program.

Appendix C: Sample Registration Form

Kentucky NEED Project
Putting Energy into Kentucky Schools

Kentucky NEED Project

An affiliate of the National Energy Education Development Project

To: Families of Students at: ______________________________

From: Pam Proctor, Program Associate
Carolyn Bergs, Regional Coordinator
The Kentucky NEED Project

Re: Energy Efficiency Project

Your family has the opportunity to participate in a project being sponsored by The Kentucky NEED Project, the Kentucky Department for Energy Development and Independence and Duke Energy. Soon, your student will begin a unit of study on the topic of energy efficiency. All students will study and learn about simple low cost/no cost ways to be energy efficient at school and at home.

Families will be offered a FREE Home Energy Efficiency Kit. This kit contains measures that can be implemented at home to save your family money on your monthly utility bills.

- CFL lightbulb (compact fluorescent light bulbs)
- Refrigerator thermometer
- Low-flow shower head
- Outlet gaskets
- Faucet aerators

How to Receive Your Free Energy Efficiency Kit
If your family would like to participate in this project and receive a free residential energy efficiency kit, you will need to complete two forms.

1. *Energy Efficiency Project Registration Form:* Please fill out the attached **Registration Form** and return it to your child's teacher. Your signature and address assures that your family will receive the above mentioned energy saving measures.
2. *Installation Survey*: At the end of the unit, an **Installation Survey** will be given to the participating families. This information is being collected for statistical purposes only and will not be shared with any other party.

REGISTRATION FORM ATTACHED

Please complete this Project Registration Form and Return to your child's teacher by:

____

Energy Efficiency Project Registration Form

Please type or print:

1. Student's First & Last Name ____________________________

2. Teacher____________________________________

3. School____________________________________

4. Date____________________

5. Our family's electric utility provider is (check one)
   ☐ Duke Energy Kentucky or ☐ Other: ____________________

6. Does your family wish to receive and energy efficiency kit? ☐ YES ☐ NO

7. Utility Customer Signature:____________________________

8. Utility Customer name (please print)________________________

9. Customer's Address ________________________________

10. City __________________________ Zip Code __________

Process and Impact Evaluation of the Energy Star® Products (CFLs) Program in Kentucky

Final Report

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

September 28, 2012

Submitted by

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Pete Jacobs
BuildingMetrics, Inc.

TABLE OF CONTENTS

Executive Summary

Significant Process Evaluation Findings

From the Management Interviews

- Retailer participation was motivated by the potential for these coupons to drive more customers to their stores.
  - The success of this partnership is exemplified by Wal-Mart, which provided an in-store endcap to help customers find the CFL six-packs that could be purchased at a discount using the coupon.

- The bar coding process was described as helpful but in need of further development. In particular, since there are unique PIN codes embedded in each coupon's bar code, it is important that each coupon gets individually scanned. There is some concern that retail clerks are not aware of this, and when they receive multiple coupons at once, they may simply take one and scan it repeatedly rather than scan each one individually.

- The free CFL offer in the neighboring state of Ohio may have created some confusion and affected perceptions of the program for those living in overlapping media markets. In particular, hearing about a "free CFL" offer in a neighboring state may have devalued perceptions of the "$8 off" offer when asked about the offer during the survey which was conducted a year later.

From the Participant Surveys

- Traditional channels such as coupons and mail-in forms and rebates continue to be among the best ways to reach low-income CFL redeemers.

- According to the survey responses from the coupon redeemers, dimmable CFLs are the best candidates for a specialty CFL discount program.

- Among those who did not redeem the coupons, the mean satisfaction rating for the CFL coupon savings amount is 8.1 which is a full point lower than the mean rating of 9.1 given by coupon redeemers. However, since 8.1 is still a high rating and the dollar amount of the coupon was not mentioned by non-redeemers as a reason for non-use, it is probable that this difference in mean ratings is caused by a preference bias. Customers who elect to use a promotional offer are more likely to like that offer than the customers who elect not to take advantage of the offer. In other words, this bias theorizes that participants who use the coupon tend to value it more highly than those who do not use it. TecMarket Works does not believe that a higher coupon dollar savings amount would necessarily result in a higher relative satisfaction rating between redeemers and non-redeemers.

- Seven of the 118 (5.9%) CFL redeemers who installed CFLs obtained through the CFL coupon program indicated that they had subsequently removed a total of 14 of those CFLs from sockets. Six respondents removed a total of 12 CFLs because they had burned out, and one respondent removed two CFLs because they were not bright enough.

- For coupon redeemers, the likelihood of participation in a theoretical direct mail, retailer coupon, and manufacturers' coupon programs show little difference between these programs and those that offer free CFLs or discounted CFLs. This suggests that the delivery method of the measures is a more important driver of participation among CFL coupon redeemers than the type of savings offered. Please see Figure 4 for more information.

Impacts

Table 1 presents the estimated overall impacts from the engineering analysis.

Table 1. Estimated Overall Impacts

	Gross Savings	Net Savings
Annual Savings Per Bulb Distributed		
kWh	56.3	44.3
kW	.0086	.0068

Note: All kW impacts reported herein are coincident unless labeled otherwise.

The impacts in this table were calculated using engineering algorithms from Appendix G: Impact Algorithms. These estimates also take into account the reconciliation between self-reported and actual usage, lighting logger data, operating hours, and the length of a day at the time of the year the survey results were collected and when lighting loggers were installed. These two factors, and the reasons for their inclusion, are explained in their respective sections: Self-Reporting Bias and Daylength Adjustment. The net-to-gross ratio used to calculate net savings is 78.68%. Freeridership and spillover, the two components of the net-to-gross ratio, are calculated in Net to Gross Analysis.

Significant Impact Evaluation Findings

- Average wattage of a replaced bulb is 61 watts. All CFLs were 13W
  - See Impact Analysis on page 60.
- A first year installation rate of 69.3% was reported, with an ISR of 81.2%.
  - See In Service Rate (ISR) Calculation on page 64.
- The HVAC system interaction factors for annual electricity consumption and demand are -0.0058 and 0.167 respectively
  - See Table 38 in Appendix G: Impact Algorithms on page 137.
- The coincidence factor for the system peak kW from 3:00PM to 4:00PM is 0.1876
  - See Figure 22 on page 63.

- Surveyed participants report slightly increased operating hours when switching from an incandescent to a CFL. Hours of use from the logger study are 3.95 and 4.03 for incandescent and CFLs respectively.
  - See Table 34 on page 65.
- The net to gross ratio is 78.68%.
  - See Table 30 on page 60.
- Living/family room, kitchen, and master bedroom, in that order, are the three most popular room types for bulb replacements; together they make up 62% of all bulb installations.
  - See Figure 21 on page 61.

Introduction and Purpose of Study

Summary Overview

This document presents the evaluation report for Duke Energy's Energy Star® Products (CFL) Program as it was administered in Kentucky. The evaluation was conducted by TecMarket Works and BuildingMetrics, Inc.

Summary of the Evaluation

The objective of the process evaluation is to document program operations, customer satisfaction, and identify areas of improvement for future program implementation. The impact evaluation is designed to estimate the energy savings that result from the program.

The findings presented in this report were calculated using survey data from participants in the Duke Energy's Energy Star® Products campaign as presented in Table 2 below.

Table 2. Evaluation Date Ranges

Evaluation Component	Sample Pull: Start Date of Participation	Sample Pull: End Date of EMV Sample	Dates of Data Collection
Redeemer and Non-Redeemer Surveys	April 18th, 2011	June 15th, 2011	Surveys September 19th, 2011 to December 7th, 2011
Engineering Estimates	April 18th, 2011	June 15th, 2011	Loggers: February 7th, 2012 to April 2nd, 2012

TecMarket Works conducted a phone survey with a random sample of 127 participants from Kentucky between September 19th, 2011 and November 22nd, 2011. (Non-participant phone surveys discussed in later sections went through December 7th) Surveyed participants were asked how many CFLs that were currently installed in light fixtures were purchased using Duke Energy's CFL coupon. Additional, more specific information was collected for a maximum of three bulbs. This information included the location of the CFL, the type and wattage of the bulb that it replaced, and the average hours per day that it was in use. This data can be seen in Table 31. The decision to limit the number of CFLs about which to collect detailed information to three was made in the interest of time, as the surveys were quite lengthy. The information gathered about the three CFLs is sufficient and provides statistically significant data.

A separate sample of surveyed participants agreed to take part in a lighting logger study. A total of 120 loggers were installed in the homes of 27 participants and collected data from February 7th, 2012 to April 2nd, 2012. Lighting logger data included room type, fixture type, and hours of use. This data can be seen in Table 32 and Table 33.

An impact analysis was performed for all CFLs by room type and can be seen in Table 35. However, it should be noted that individual room type samples are of insignificant size to achieve statistical relevance and are presented as anecdotal evidence. The impacts are based on an engineering analysis of the impacts associated with the self-reported installs identified through the participant surveys. The hourly use data was taken from the lighting loggers and adjusted to reflect yearly averages using the daylength algorithm developed via a larger logger study conducted in California[1] that documented the monthly change in lighting usage due to seasonal variances in daylength. The daylength adjustment is calculated in the Daylength Adjustment section on page 63.

This report is structured to provide program impact estimations per bulb redeemed as well as overall program savings based on an extrapolation of these results to the full participant population presented in the participant database provided to TecMarket Works on June 26, 2011 (n=2,282 customers). This number does not reflect all of the coupons used by customers, as there were coupons that were yet to be sent in by retailers, and coupons otherwise not fully processed and therefore not reflected in the participant database.

[1] The Cadmus Group. "Upstream Lighting Program Evaluation Report. Prepared for CPUC". November 16th, 2009. Pg. 16.

Description of Program

The Duke Energy's Energy Star® Products (CFLs) program in Kentucky (herein referred to as the "CFL coupon program") provided coupons for $8 off a 6-pack of GE "Energy Smart" 13-watt CFLs. The coupons, with barcodes for tracking purposes, were directly mailed to customers.

Program Participation

The coupon was mailed to about 98,000 customers, and 3,930 customers redeemed the coupon before it expired on June 15th, 2011, providing a coupon redemption rate of approximately 4.0%. However, not all of the coupons were completely processed and in the participant database provided to TecMarket Works on June 26, 2011. An additional 1,648 coupons were processed after the coupon expiration date, as the retailers were allowed six months after the coupon expired to send the coupons in for full processing and reimbursement.

This report presents results based on 2,282 participants. The participant population was pulled for the evaluation sample shortly after the coupon expiration date, and therefore, those participants (n=1,648) that had their coupons processed after June 26, 2011 are not included in this evaluation.

Methodology

Overview of the Evaluation Approach

This process evaluation had four components: management interviews, participant surveys, non-participant surveys, and an impact analysis based on engineering algorithms.

Study Methodology

Management Interviews

TecMarket Works conducted interviews with two members of Duke Energy's program management, the Residential Account Manager (Marketing) and the Product Manager. Additionally, TecMarket Works interviewed the Marketing Manager for Utilities at GE, which is the partnering vendor, manufacturing the CFLs to which the coupon applied. The interview instrument can be found in Appendix A: Management Interview Instrument.

Participant Surveys

This survey focused on customers who, according to program tracking records, received and redeemed a coupon mailed to them from Duke Energy for the purchase of a six pack of GE 13-watt CFLs between the dates of April 18th, 2011 through June 15th, 2011. The survey was conducted by phone by TecMarket Works' staff from a randomly generated sample of 2,282 customers who redeemed their CFL coupons, with 127 phone surveys initiated and 122 participant survey respondents responding to all of the survey questions. The survey instrument can be found in Appendix B: Redeemer Survey Instrument.

Non-Participant Surveys

This survey focused on customers who, according to program tracking records, received but did not redeem the coupon mailed to them from Duke Energy (between the dates of April 18th, 2011 through June 15th, 2011). The survey was conducted by phone by TecMarket Works' staff from a randomly generated sample from 95,656 customers who did not redeem their CFL coupons, with 92 non-participant survey respondents responding to all of the survey questions. Surveys were conducted by telephone. The survey instrument can be found in Appendix C: Non-Redeemer Survey.

Note: The evaluation plan stated that the evaluation was to split the sample of participant and non-participant surveys into two categories: Low-Income and Non-Low-Income. However, after the surveys were completed, the evaluation team noticed that the low-income indicator provided by Duke Energy did not match up with the annual income reported by the surveyed customers, leading to the discovery that the incorrect indicator was provided in the participant population. For this evaluation, the customer stated information was used to determine income status. However, only a small number of low-income customers completed the survey, and therefore results by income level are limited and provided for informational purposes only, as they are not statistically significant.

Impact Analysis

Phone surveys were conducted with a random sample of 127 participants. A total of 120 lighting loggers were installed in 27 participants' homes. Participants in the lighting logger study were a subset of the phone survey respondents.

Engineering algorithms can be seen in Appendix G: Impact Algorithms. These algorithms were enhanced beyond those in the Draft Ohio Technical Resource Manual (TRM)[2] to take advantage of additional primary data collected relevant to Kentucky. These unit energy savings values were applied to customers in the engineering analysis sample.

Number of completes and sample disposition for each data collection effort

Participant Surveys

From the sample list of customers, 1,459 participants were called between September 19th, 2011 and November 22nd, 2011, and a total of 127 usable telephone surveys were completed yielding a response rate of 8.7% (127 out of 1,459). This is a lower than usual response rate but it is driven by the need for the contacted customer to recall using the coupon.

Non-Participant Surveys

From the sample list of customers, 3,756 non-redeemers were called between November 22nd, 2011 and December 7th, 2011, and a total of 92 usable telephone surveys were completed yielding a response rate of 2.4% (92 out of 3,756). This is a lower than usual response rate but it is driven by the need for the contacted customer to recall receiving the coupon.

Impact Analysis

A total of 127 participants answered the phone survey and 120 lighting loggers were installed in 27 of those participants' homes. Nine of the lighting loggers were excluded from the analysis due to erroneous data[3], a failure rate of 7.5%, leaving a total of 111 good loggers used for the analysis.

Expected and achieved precision

Participant Surveys

The survey sample methodology had an expected precision of 90% +/- 7.3% and an achieved precision of 90% +/- 7.1%.

Non-Participant Surveys

The survey sample methodology had an expected precision of 90% +/- 8.7% and an achieved precision of 90% +/- 8.6%.

Impact Analysis

[2] PUCO Case No. 09-512-GE-UNC

[3] Nine of the loggers provided an erroneous date read when the data was downloaded. Duke Energy has since corrected this issue.

Engineering estimates rely on participant survey responses. Sampling procedures for the participant survey had an expected precision of 90% +/- 7.3% and an achieved precision of 90% +/- 7.1%.

Description of baseline assumptions, methods and data sources

Baseline assumptions were determined through a mixture of phone and online customer surveys providing self-reported values of baseline lamp watts and operating hours. Robust data concerning HVAC system fuel and type were available from Duke Energy's Home Profile database (appliance saturation survey type data). Interaction factors derived from this data were used in favor of deemed values from secondary sources as they more accurately represent the participant population given the geographic proximity. A breakdown of these factors by system and fuel type can be seen in Appendix G: Impact Algorithms.

Description of measures and selection of methods by measure(s) or market(s)

The program distributed coupons for a six-pack of 13-watt CFLs. The enhanced Draft Ohio TRM's impact algorithms were used to calculate energy savings. All customers are in the residential market.

Threats to validity, sources of bias and how those were addressed

CFL installations were self-reported by the surveyed participants. There is a potential for social desirability bias[4] but the customer has no vested interest in his/her reported measure adoptions, therefore this bias is expected to be minimal. Hours of use were collected with lighting loggers installed in participants' homes. Participation was tracked through the use of the barcode on the redeemed coupon. There is a potential for bias in the engineering algorithms' parameters, such as replaced wattages and installation rates, which are self-reported by the surveyed participants.

[4] Social desirability bias occurs when a respondent gives a false answer due to perceived social pressure to "do the right thing."

Management Interviews

Program Overview

From April 18th, 2011 through June 15th, 2011, Duke Energy sent mailers to approximately 98,000 Kentucky residential customers offering one coupon for $8.00 off of a six-pack of GE 13-watt CFL bulbs redeemable at Wal-Mart or Kroger stores. A copy of the mailer can be found in Appendix E: Coupons. Compared to the previous Kentucky CFL program in 2009, the 2011 audience was both larger and broader. This campaign also provided a larger incentive than 2009's offer of $3.00 off two (2) two-packs.

Eligible customers included those who had not previously redeemed more than 15 bulbs through other Duke Energy CFL offers. Duke Energy customers across all demographic groups in Kentucky were eligible. Table 3 summarizes the audience categories and details the number of mailers sent to each.

Table 3. Kentucky CFL 2011 Audience

PRIZM Demographic Group	Number of Mailers
Financially Secure Homeowners	20,052
Young Mobile Achievers	8,646
Budget Conscious Renters	8,108
Budget Conscious Homeowners	6,278
Mainstream Families	10,828
Sustaining Seniors	11,157
Financially Secure Traditionalists	13,557

Audience-targeted messaging was developed by Duke Energy's market insights specialists and utilized for this campaign. For example:

- Young Mobile Achievers and Financially Secure Homeowners: Messaging stressed savings and environmental benefits (e.g., "Want to do something great for yourself as well as the environment? Redeem these coupons.")
- Budget Conscious Renters, Budget Conscious Homeowners, and Sustaining Seniors: Messaging stressed coupon savings and money savings (e.g., "Why wait to save money? Take advantage of these valuable coupons.")
- Mainstream Families, Financially Secure Traditionalists, and Financially Secure Homeowners: Messaging stressed savings and longer bulb life.

The mid-April start of the campaign was chosen to capitalize on Earth Day's occurrence and the increased consumer awareness it brings regarding energy efficiency and conservation.

Retailer participation was motivated by the potential for these coupons to drive more customers to their stores. Wal-Mart provided an in-store endcap to help customers find the CFL six-packs. When consumers redeemed a coupon at Wal-Mart or Krogers, the retailers scanned its bar code.

Duke Energy attempted to track message-level results by embedding message-specific PIN codes into the coupon bar code.

Most of the messaging was via the direct mail materials, although information was also provided on Duke Energy's website. Customer questions were primarily received by Duke Energy via phone rather than online.

Duke Energy coordinated most directly with GE, who in turn coordinated with retailers. Duke Energy's coordination with GE included a statement of work, planned start/end dates for the offer, identification of retailers, and anticipated redemption rates (to prepare inventory). Ongoing follow up coordination was facilitated by weekly contacts between Duke Energy's Product Manager and GE.

Goals and Results of the Program

Duke Energy's pre-launch Communication Plan for this program (dated March 20th, 2011) described the goal of this campaign as "to have a five to seven percent response rate to our coupon which translates to 40,000 bulbs." This represented a more ambitious target than the 1.4% result achieved in 2009.

The actual response rate for the 2011 campaign was 4%. While this was slightly below the 5-7% goal, it nearly tripled the 2009 rate and overall was viewed as a success by the program managers.

Evaluation and Recommendations

Several factors were cited as contributing to the success of this campaign. The increased response rate over that of 2009 was most directly attributed to the larger incentive offered in 2011. The use of audience-targeted messaging (based on Duke Energy's internal analyses) also enhanced effectiveness, although the Duke Energy managers we spoke with expressed some interest in further exploring messaging options that might resonate better with different market segments.

The primary suggestion for improving the response rate in future campaigns is to further increase the incentive. Duke Energy reported that campaigns in other states offering options for free CFLs[5] yielded response rates as high as 25%.

Retailers generally like the program because it drives customers to their stores. They also get the benefit of the full price for the product, and the program is easy for retailers to manage. However, one retailer limitation is that floor employees and clerks oftentimes have little awareness of the campaign, which makes compliance with redemption requirements more difficult.

For instance, the program used unique PIN codes embedded in each coupon's bar code to track redemption rates. Thus it was important that each coupon was individually scanned. There is some concern that retail clerks were not aware of this, and when they receive multiple coupons at

[5] The Residential Smart $aver Energy Efficiency CFL Program (IVR, WEB, BRC).

once, they may simply have scanned one coupon repeatedly rather than scanning each one individually. For this reason, the bar coding process was described as helpful but in need of further development regarding the communication of the redemption process to retailers and clerks.

Future campaigns should consider increasing the number of redemption locations for customers, such as involving more retailers so that customers will have more options for where to shop. An additional option is to offer direct shipping to customers (via website and phone redemption), which was described as simple, easy, and very well received in other states[6].

The free CFL offer[7] in the neighboring state of Ohio may have created some confusion and affected perceptions of the program when it came time to answer survey questions about the program for those living in overlapping media markets. In particular, hearing about a "free CFL" offer in a neighboring state may have devalued perceptions of the "$8 off" offer. In addition, while the considerable variation across states' programs enables testing of different creative options, currently there is no clearinghouse of information about how the different factors affect coupon impact.

Consumer education is another area that generated further suggestions for enhancing CFL acceptance and adoption. This includes further education on the savings benefits to the customers, as well as the overall environmental value of transitioning to CFLs. Additionally, customers continue to have misconceptions about CFLs that deter adoption. Examples of common misconceptions include: no instant on, not meeting lifetime claims, not fitting some fixtures, stark color of the light, and safety issues such as risks of mercury contamination or fire. These misconceptions are explored further in the participant survey results presented in the next section.

[6] Duke Energy is offering free CFLs to customers in Ohio, North Carolina, and South Carolina through the Residential Smart $aver Energy Efficiency Products CFLs program. Draft reports indicate that this program has been a success from the perspective of Duke Energy, TecMarket Works, and the surveyed participants.
[7] The Residential Smart $aver Energy Efficiency Products CFLs program.

Participant Surveys

This section presents the results of the surveys conducted with customers who redeemed the coupons mailed to them (Redeemers).

Program Awareness

Redeemers were asked to rate the influence of several factors on their decision to obtain CFLs using the CFL coupon. Ratings were provided on a 1-to-10 scale, with 1 indicating that the factor was not at all influential, and 10 indicating that the factor was very influential.

According to the surveyed coupon redeemers, the desire to save on utility costs was the most influential component that persuaded them to obtain the CFLs using the coupon, followed closely by the coupon itself.

Table 4. Factors Influencing CFL Purchasing Decision

Factor	N	Mean Influence Score
Your desire to save on utility costs	126	9.4
The CFL coupon	126	9.1
Your desire to be more environmentally responsible	126	8.4
The brand of CFLs offered by the Program (GE 13-watt)	125	6.8
Friends or family by word of mouth	123	4.3
Duke Energy advertising on TV, radio, or in a newspaper	123	4.0
Other non-Duke Energy advertising	120	2.3
Advertising on Duke Energy's Web Site	125	1.8
Duke Energy's social media advertising	124	1.4
Friends or family by social media such as Facebook	123	1.3
A public person or group followed on Twitter or Facebook	123	1.2
Friends or family by email	123	1.2

Reasons for Participation

Redeemers were asked an open-ended question to give all the reasons that made them decide to take advantage of the CFL coupon offer from Duke Energy. Answers were codified into the following categories:

- Needed light bulbs
- To save energy
- To save money
- Because it was free
- To try CFLs
- It was environmentally correct
- Convenience
- CFL last longer than standard bulbs
- Other

The distribution of answers is shown in Table 5. The desire to save money and energy were by far the most cited reasons for participating in the CFL coupon program.

Table 5. Reasons for Participation in the CFL Coupon Program

Category	N	Percentage of all survey respondents (N=127)
To save money	84	66.1%
To save energy	66	52.0%
CFLs last longer	42	33.1%
To try CFLs	22	17.3%
Other	16	12.6%
Needed light bulbs	14	11.0%
Convenience	6	4.7%
It was environmentally correct	4	3.1%
Because it was free	2	1.6%

Note: Participants were allowed multiple responses

The "other" responses are as follows:

- "I like CFLs" (n=7)
- "I like coupons" (n=2)
- "We are transitioning to CFLs" (n=2)
- "CFLs are brighter than standard bulbs" (n=2)
- "To avoid stressing the grid and the need for new power plants"
- "Because incandescents are being phased out"
- "CFLs are the way to go"

Retail Store at Which the CFL Coupons were Redeemed

As shown in Table 6 below, the majority of coupon redeemers (59.8%) recalled purchasing their CFLs at Wal-Mart using the CFL coupons while 29.9% of redeemers recalled redeeming their CFLs at Kroger's. These two stores account for 90 percent of all CFL coupon redemption responses. The other stores listed were not partners in the program, but these recollections of where the CFL Coupons were redeemed are likely correct as the coupon was a manufacturer's coupon and therefore could be redeemed at stores other than the two partnering stores.

Table 6. Retail Store at Which the CFL Coupons were Redeemed

Store	N	Percent
Wal-Mart	76	59.8%
Kroger's	38	29.9%
Lowe's	5	3.9%
Home Depot	3	2.4%
Ace Hardware	1	0.8%
Other Grocery Store	1	0.8%
Don't Know	3	2.4%
Total	127	100%

Redeemers Promoting the Program

TecMarket Works asked all redeemers if they had told anyone else about the CFL coupon program and, if so, how many people they told and how they told them. The responses from 126 redeemers are shown in Table 7 and Table 8.

Table 7. Redeemers who Told Others About the Program

Did you tell others about the CFL coupon program?	N	Percent
Yes	74	58.7%
No	50	39.7%
Don't Know	2	1.6%

All redeemers (with the exception of the redeemer who informed the Web forum members) indicated that they had informed others via word of mouth. Two redeemers indicated that they had informed others via email in addition to using word of mouth.

Table 8. Type and Number of People Told About the CFL Coupon Program by Redeemers

Type of person told	Number of redeemers	Total Number of people told about CFL program per type
Family	54	133
Friends	32	130
Co-Workers	14	42
Neighbors	17	43
Clients	1	6
Web Site Forum member	1	83

Note: Survey participants were allowed multiple responses

Prior CFL Use

Redeemers were asked how long they had been using CFLs before using the Duke Energy coupon. Responses included:

- Never purchased until now
- 1 year or less
- 1-2 years
- 2-3 year
- 3-4 years
- 4 or more years

As seen in Table 9 below, 37.3% of redeemers indicate that they have purchased CFLs in the past two years or less (without the coupon) and 23.0% of redeemers in KY indicate that this is their first purchase of CFLs. This data suggests that CFL saturation was still low within the coupon redeeming population prior to the use of the Duke Energy coupon.

The percentages from the previous Duke Energy Kentucky CFL coupon program findings on prior CFL use are also shown in Table 9 for comparison to the current findings. In addition to indicating a low CFL saturation within the coupon redeeming population, the similar percentages of first-time CFL users in both studies' surveys also shows that the Duke Energy CFL coupon program is successfully targeting participants with no prior use of CFLs.[8]

Table 9. Time Since First Purchase of CFLs

	Never purchased until now	1 year or less	1-2 Years	2-3 Years	3-4 Years	4 or more years
current	23.0%	11.9%	25.4%	24.6%	4.8%	10.3%
previous[9]	21.6%	10.8%	24.3%	21.6%	13.5%	8.1%

CFL Installation and Subsequent Removal

TecMarket Works asked all redeemer survey respondents how many CFLs they had installed that were obtained through the CFL coupon program. One-hundred eighteen out of one-hundred twenty-seven redeemers (93%) reported installing 522 program CFLs for an average of 4.2 installed CFLs per all surveyed redeemers.

Of the 118 redeemers who installed program CFLs, seven respondents (5.9%) indicated that they had subsequently removed a total of 14 (2.7% of 522 CFLs reported installed) of program CFLs from sockets. Six respondents removed a total of 12 CFLs because they had burned out, and one respondent removed two CFLs because they were not bright enough.

Future CFL Purchases

Redeemers were asked to consider their future CFL purchases and identify how many CFLs they would expect to purchase in the next year if CFLs were offered at a certain price compared to a standard (incandescent) bulb. The prices offered were:

- The same price as a standard bulb
- $1 more than a standard bulb
- $2 more than a standard bulb
- $3 more than a standard bulb

Redeemers were also asked how many CFLs they would purchase if they were free, but required a mail-in rebate form or an online rebate form.

Results are shown in Table 10 below and illustrated in Figure 1 and Figure 2. With CFLs being offered at the same price as a standard bulb, 19.8% of redeemers indicated they would purchase

[8] TecMarket Works, "Duke Energy Smart Saver CFL 2011 update memorandum for Ohio and Kentucky," January 12th, 2011, pg. 10.
[9] TecMarket Works, "Duke Energy Smart Saver CFL 2011 update memorandum for Ohio and Kentucky," January 12th, 2011.

one to three CFLs, and 71.3% of redeemers indicated they would purchase four or more. More than 80% of redeemers indicated they would purchase at least one CFL bulb if the price per bulb was $1 more. When the price reaches $2 more, 29.4% of redeemers indicate they would not purchase CFL bulbs and at $3 more, this percentage rises to 48.4% of redeemers who would not purchase CFLs. This indicates that most customers are willing to pay CFL prices that are within a price point of $1 to $2 of a comparable incandescent bulb.

Table 10. Hypothetical CFL Purchases Under Four Different Buying Scenarios, n=126

Number of CFLs customer would purchase		Don't Know/ Not sure	0	1-3	4-6	7-9	10-12	13-15	16-max allowed
If CFLs were the same price as a standard bulb	N	6	5	25	40	13	28	1	8
	%	4.8%	4.0%	19.8%	31.7%	10.3%	22.2%	0.8%	6.3%
If CFLs were $1.00 more than standard bulbs	N	7	13	29	43	13	14	3	4
	%	5.6%	10.3%	23.0%	34.1%	10.3%	11.1%	2.4%	3.2%
If CFLs were $2.00 more than standard bulbs	N	14	37	29	30	7	5	1	3
	%	11.1%	29.4%	23.0%	23.8%	5.6%	4.0%	0.8%	2.4%
If CFLs were $3.00 more than standard bulbs	N	14	61	25	19	4	1	1	1
	%	11.1%	48.4%	19.8%	15.1%	3.2%	0.8%	0.8%	0.8%

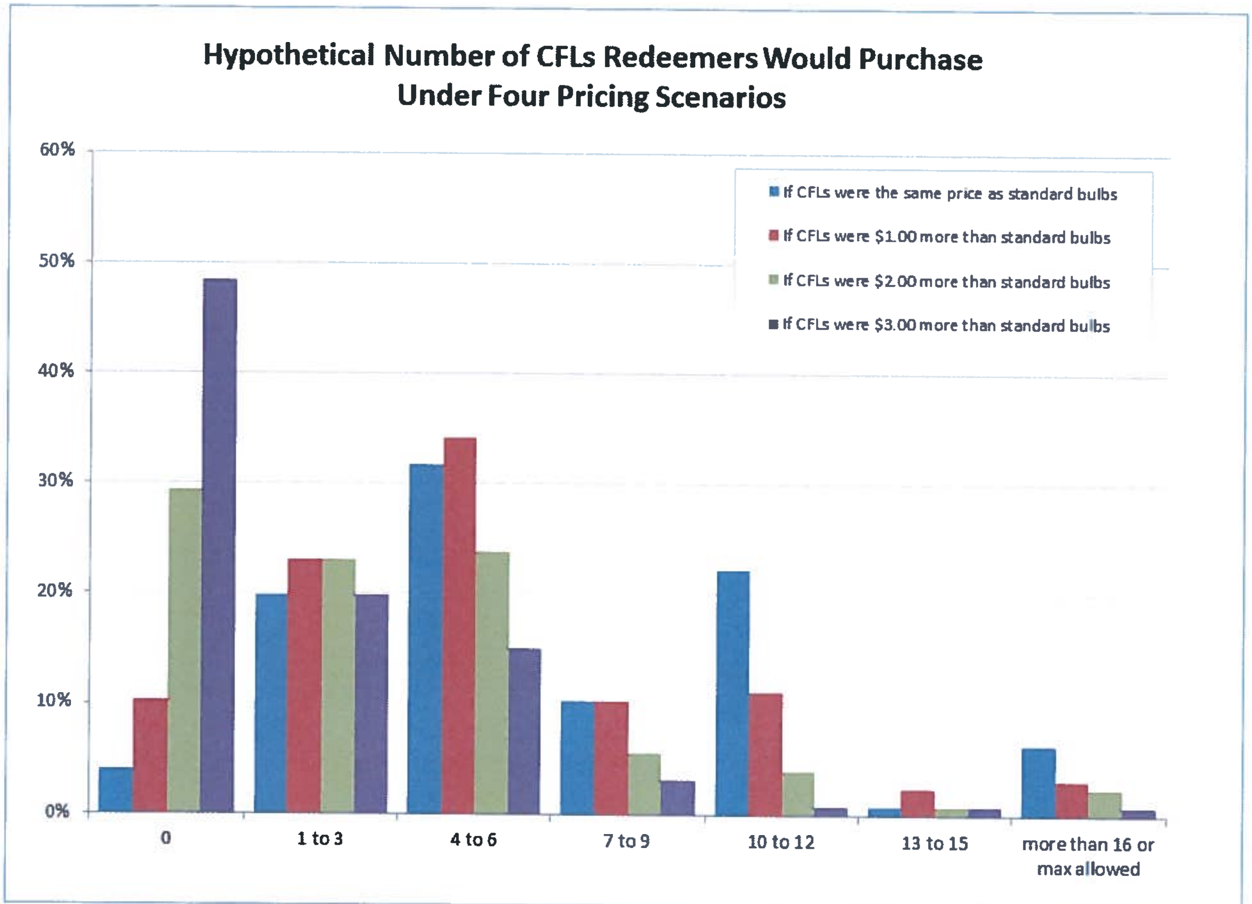


Figure 1. Hypothetical Pricing Scenarios, n=126

Table 11. Hypothetical CFL Purchases Under Two Different Redemption Scenarios, n=126

Number of CFLs customer would purchase		Don't Know/ Not sure	0	1-3	4-6	7-9	10-12	13-15	16-max allowed
If CFLs were free but the customer had to mail in a rebate form to get their money back	N	2	11	9	42	16	27	0	19
	%	1.6%	8.7%	7.1%	33.3%	12.7%	21.4%	0.0%	15.1%
If CFLs were free but the customer had to fill out an online form to get your money back	N	1	30	9	32	13	19	0	22
	%	0.8%	23.8%	7.1%	25.4%	10.3%	15.1%	0.0%	17.5%

If the CFL bulbs are free with a mailed-in rebate form, 89.6% of redeemers said that they would purchase at least one CFL. Since this percentage is lower than the percentages for CFLs at the same price as incandescent bulbs in both states, this suggests that 5% of redeemers may be experiencing a barrier other than price when deciding to purchase CFLs.

For example, some customers may still not be at all interested in purchasing CFLs due to size, slow illumination, aesthetics or the quality of light and would not purchase CFLs regardless of price or price difference.

In addition, for some of these redeemers the hassle of the rebate process may outweigh other advantages of purchasing CFLs; for example, six (4.8%) redeemers stated they would purchase CFLs at a price equal to standard bulbs but would not obtain them if they were free through the use of a mail-in rebate. This number jumps to 25 (19.8%) when comparing a price equal to standard bulb with the use of an online mail-in rebate.

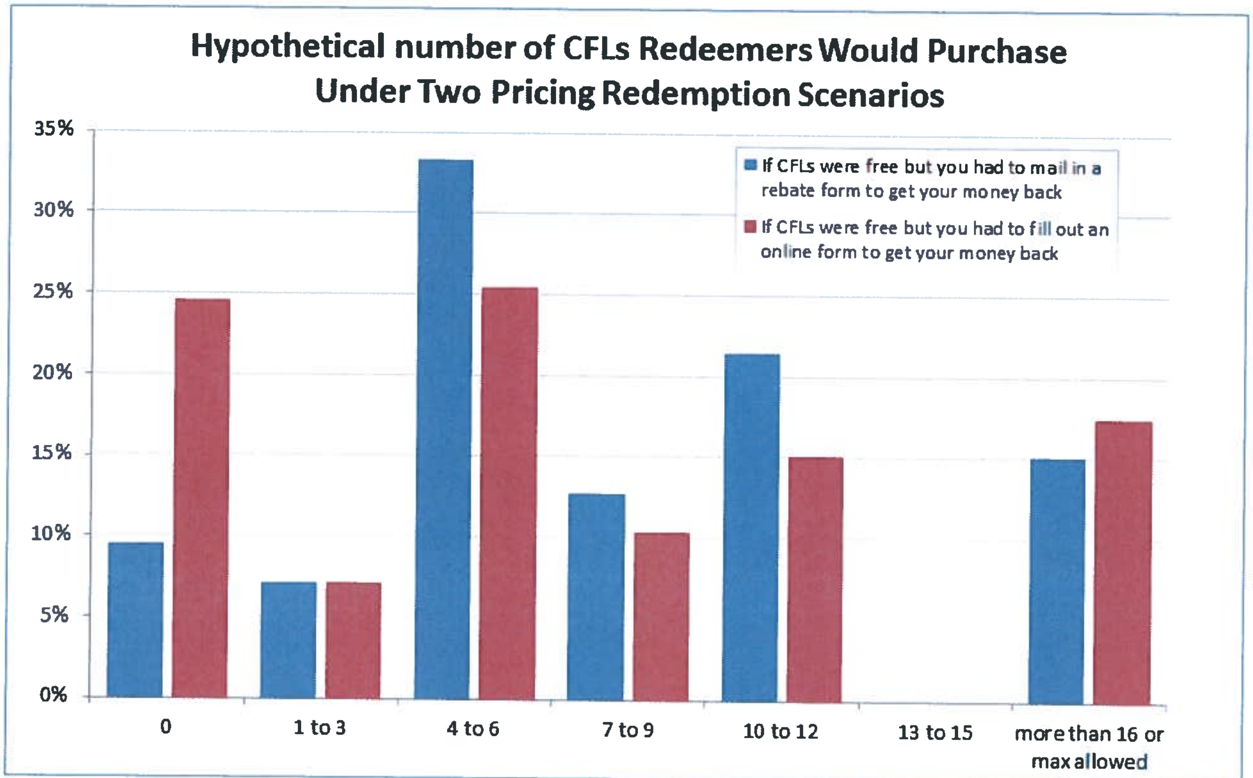


Figure 2. Hypothetical Purchases Under Different Pricing Redemption Scenarios, n=126

The difference in preference for mail-in over online rebate forms is even more striking when filtered for low-income redeemers (n=27, or 21% of the redeeming responders). Although, the low-income indicator provided by Duke Energy for this analysis may not have been complete or fully accurate data, TecMarket Works deemed this anecdotal analysis to be worth presenting.

As seen in Figure 3, 13 out of 27 (48%) of low-income redeemers said they would obtain zero CFLs if they were free but required an online form to be filled out. This is nearly double the amount of the redeemer population as a whole (23.8% or 30 out of 127) who said they would not obtain free CFLs if completing an online form was required. Four (14.8%) low-income redeemers stated they would obtain zero CFLs if a mail-in rebate was required. This is also elevated compared to the redeemer population as a whole (7.1% for all redeemers and 14.8% for low income redeemers), but not nearly as wide of a difference as the online rebate.

Although the low-income indicator provided by Duke Energy did not provide complete data on low income status of all the customers, these findings indicates that traditional channels such as coupons and mail-in forms and rebates continue to be the best way to reach low-income CFL redeemers.

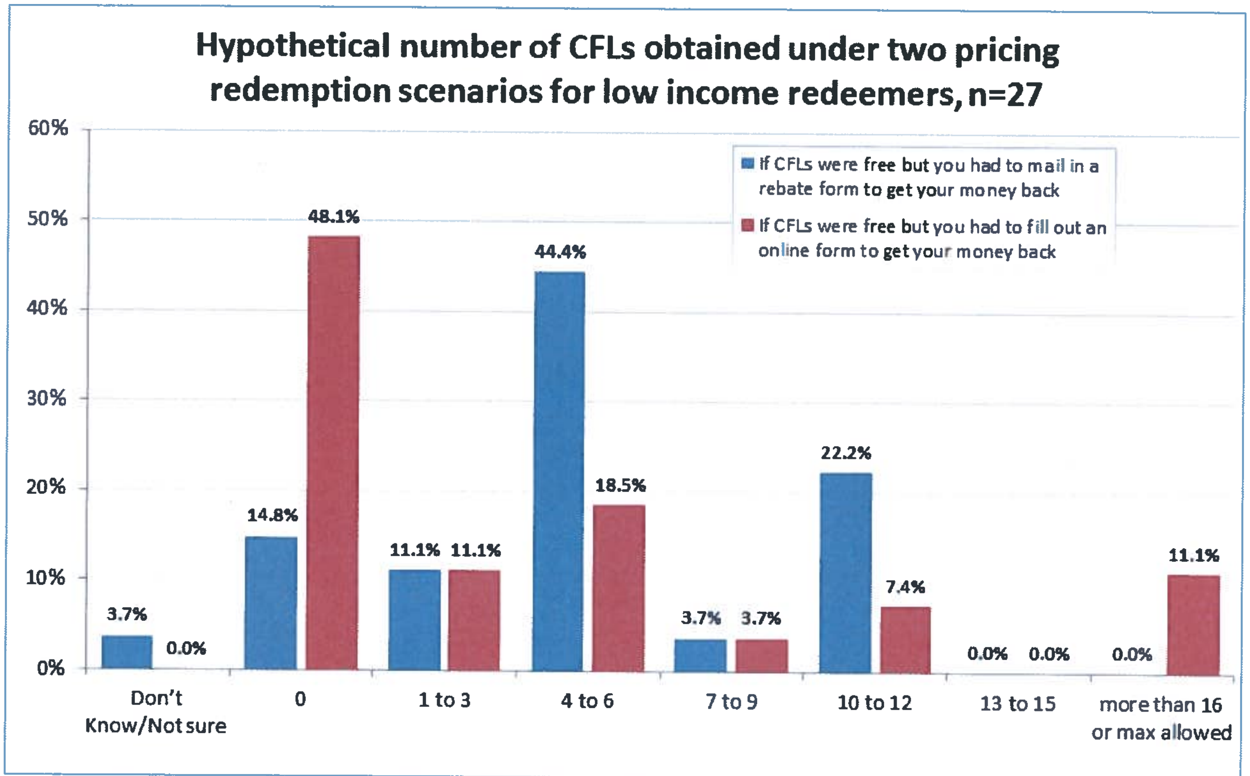


Figure 3. Hypothetical CFLs Obtained Through Free Rebate Scenarios by Low Income Redeemers

Likelihood of Participation in Six Free and Discount CFL Programs

In order to assess the difference in likelihood of participation between free and discount CFL programs, TecMarket Works asked about half (n=66, 52%) of the surveyed redeemers to rate their likelihood of participation, on a 1-to-10 scale, in six hypothetical CFL distribution programs that offered **discount** CFLs, and then asked the other (n=61, 48%) surveyed redeemers to rate their likelihood of participation, on a 1-to-10 scale, in six hypothetical CFL distribution programs that offered **free** CFLs. Price types were split among respondents in order to avoid ratings resulting from comparisons between the types.

The mean ratings and program types are shown in Figure 4.

Likely participation is rated much higher in programs using direct mail, retailer coupons and manufacturer coupons than the use of a stand or an online vendor.

Additionally, for redeemers, the ratings for likelihood of participation in the direct mail, retailer coupon and manufacturers coupon program show little difference between programs that offer free or discounted CFLs with discounted CFLs rated only slightly lower (0.2-0.4) than free CFLs. This suggests that the method of delivery of a program is a more important driver of participation among CFL coupon redeemers than the type of savings offered.

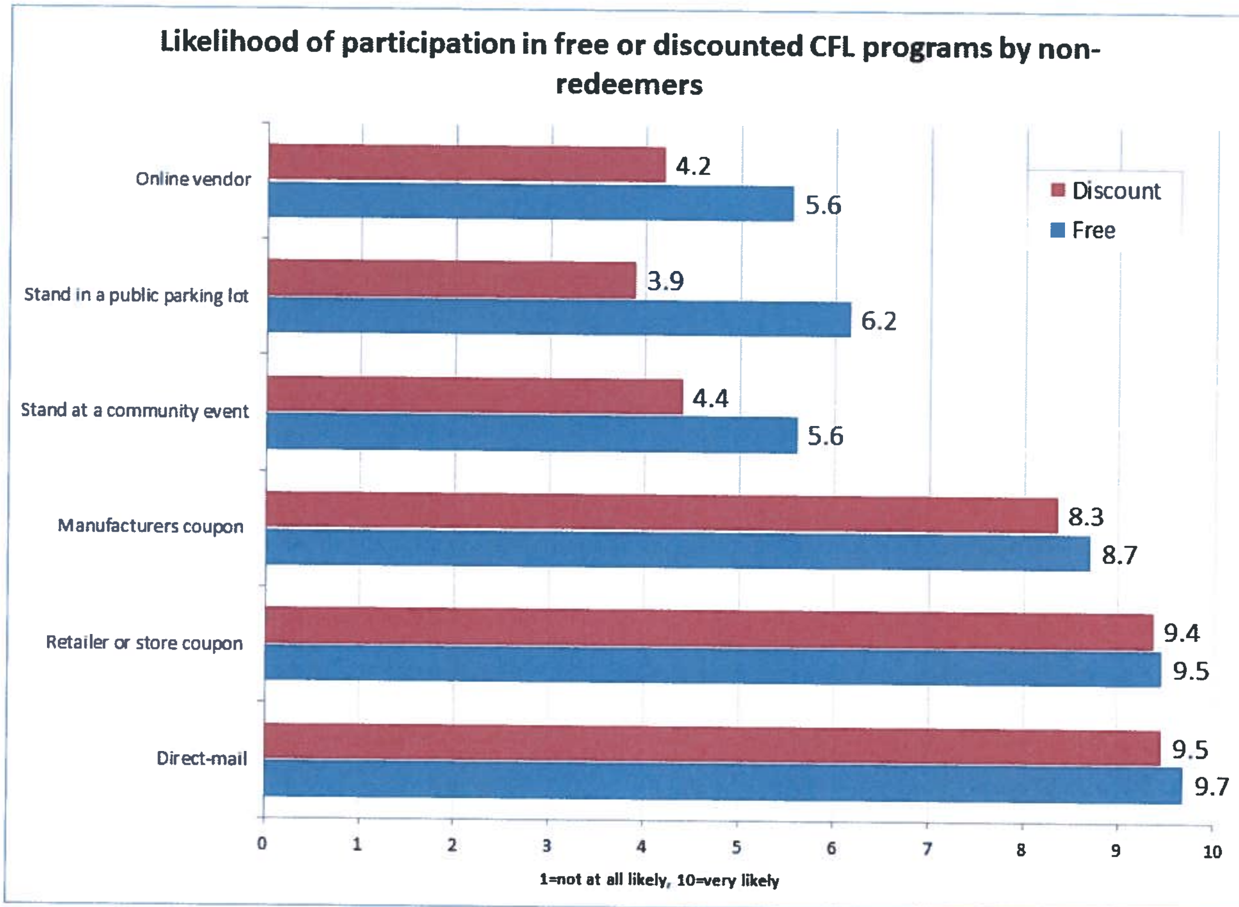


Figure 4. Mean Ratings of Likelihood of Participation in CFL Programs Among CFL Coupon Redeemers, n=127

Light Bulb Characteristics

Surveyed coupon redeemers and non-redeemers were asked to rate how important specific bulb characteristics are to them when making their bulb purchasing decisions. The results of these importance ratings are shown in Table 12. Responses are provided on a 1-to-10 scale with 1 indicating that the characteristic is not important to them, and 10 indicating that it is very important.

Interestingly, the availability of CFL bulbs in stores that participants normally shop was rated higher (8.6 average) than the purchase price of the bulb (8.4 average).

Factors often perceived as barriers to CFL adoption, such as aesthetics (5.0 average), mercury content (5.7 average) and availability of dimmable bulbs (4.7 average), were not rated as very important by survey participants.

Overall, this suggests that the most important factors for continued CFL adoption and installation by Duke Energy customers is continued utility savings from the bulbs, an affordable price point, and the availability of bulbs either directly from Duke Energy or in stores where people normally shop.

Table 12. Importance of Bulb Characteristics in Purchasing Bulbs (Redeemers Only)

Bulb Characteristic	N	Mean Importance
Cost savings on your utility bill	116	9.1
Energy savings	116	8.9
Availability of the bulb in stores you normally shop	116	8.6
Purchase price of the bulb	117	8.4
Selection of wattage and light output levels available	117	8.2
Ease of disposal	112	7.1
Availability of utility programs or services that offer the bulb directly	111	6.9
Speed at which the bulb comes up to the full lighting level	116	6.4
Recommendation from the utility company	117	5.8
Mercury content of the bulb	110	5.7
Attractiveness or appearance of bulb	116	5.0
Recommendation of family or friends	117	4.8
Ability to dim the lighting level	117	4.7

This series of questions about bulb characteristics was also asked of non-redeemers, and their ratings are compared to those of the redeemers in Figure 5. The non-redeemers and redeemers were consistent in their rating scores across the factors that are most important to them. However, the non-redeemers found characteristics such as the purchase price and saving money or energy to be slightly less important to them than they are to the coupon redeemers.

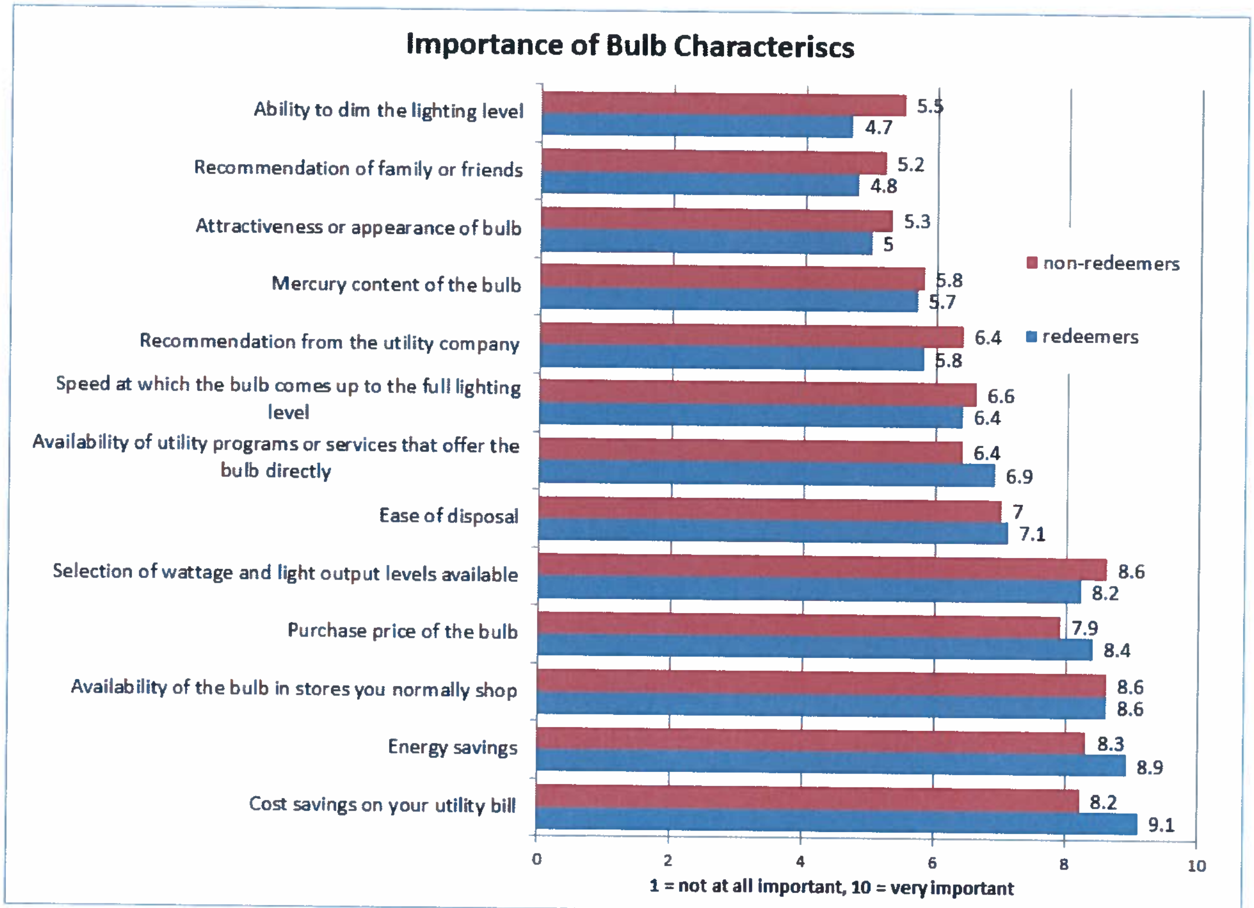


Figure 5. Importance of Bulb Characteristics to Coupon Redeemers and Non-Redeemers

Participant Satisfaction

Overall program and CFL satisfaction scores are very high, and Duke Energy satisfaction is also very high.

Redeemers were asked to rate, on a 1-to-10 scale with 1 indicating very dissatisfied and 10 indicating very satisfied, their satisfaction with the process for receiving the coupons (mean =9.5), the process for obtaining their CFLs from a local retailer (mean=9.4), the light quality of the CFLs obtained (mean=8.5), the overall quality of the CFLs obtained through the CFL program (mean =9.1), and their satisfaction with the dollar savings amount of the CFL coupon (mean=9.1). The satisfaction rating distributions for these categories are shown in Figure 6 though Figure 12.

Participants, who rated their satisfaction for any category at a seven or lower, were also asked a follow-up question as to the reason for their low level of satisfaction. These reasons are listed following each figure.

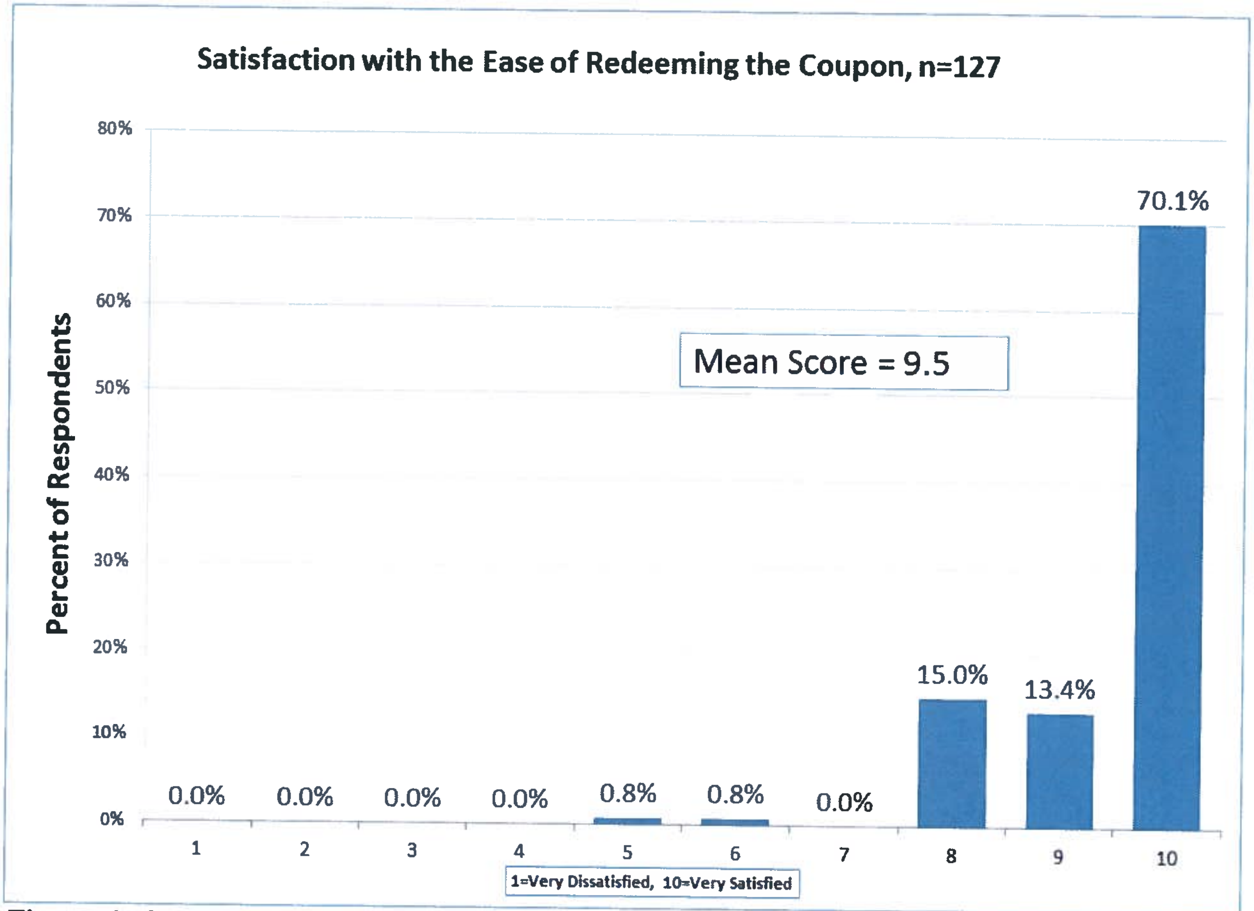


Figure 6. Satisfaction with the Ease of Redeeming the CFL Coupon

The two respondents that rated their satisfaction at seven or less did not provide any reasons for their scores.

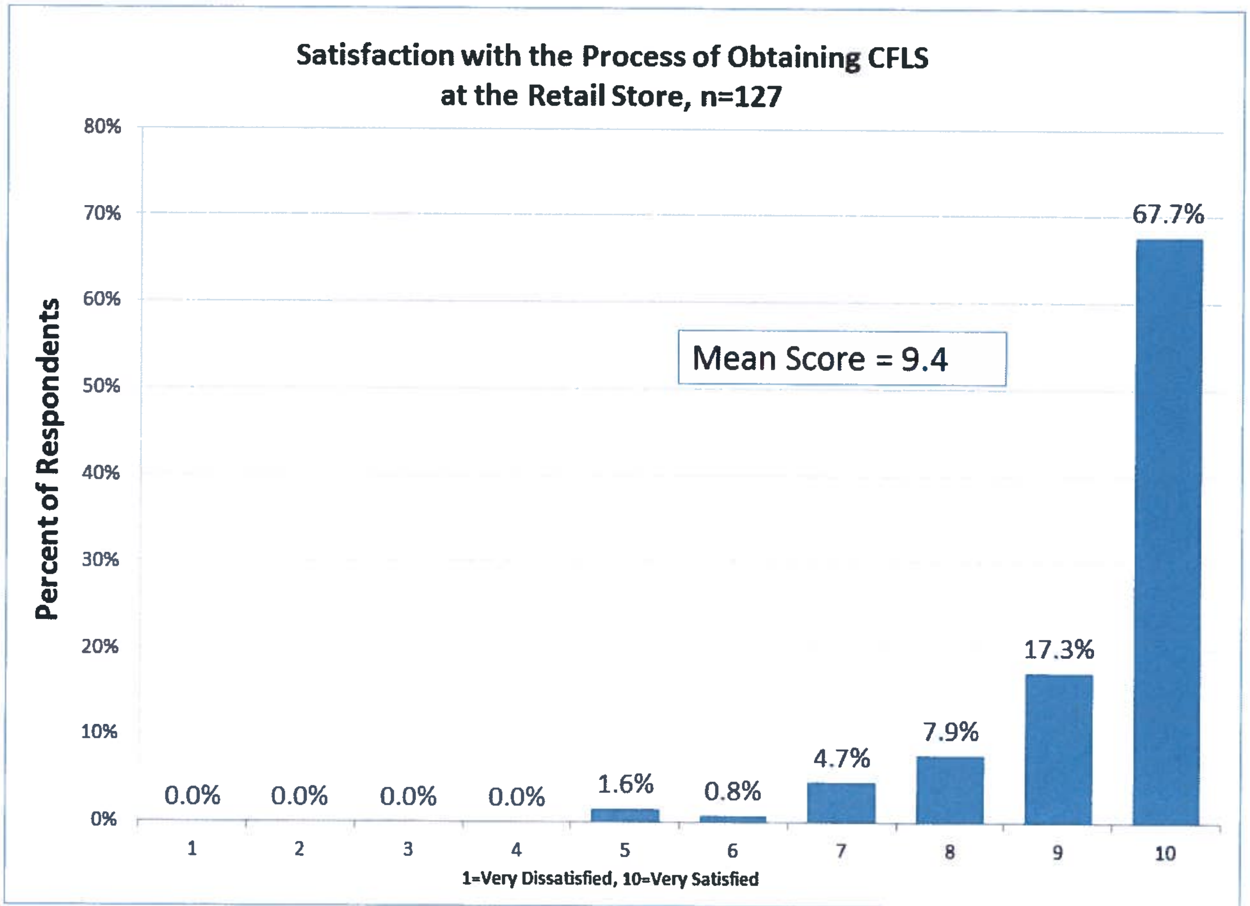


Figure 7. Satisfaction with the Process of Obtaining CFLs at the Retail Store

Reasons for ratings of seven or less:

- "Stock had run out" (n=2)
- "First store visited did not have the right CFLs" (n=2)
- "Only one wattage available and they were hard to locate in the store."

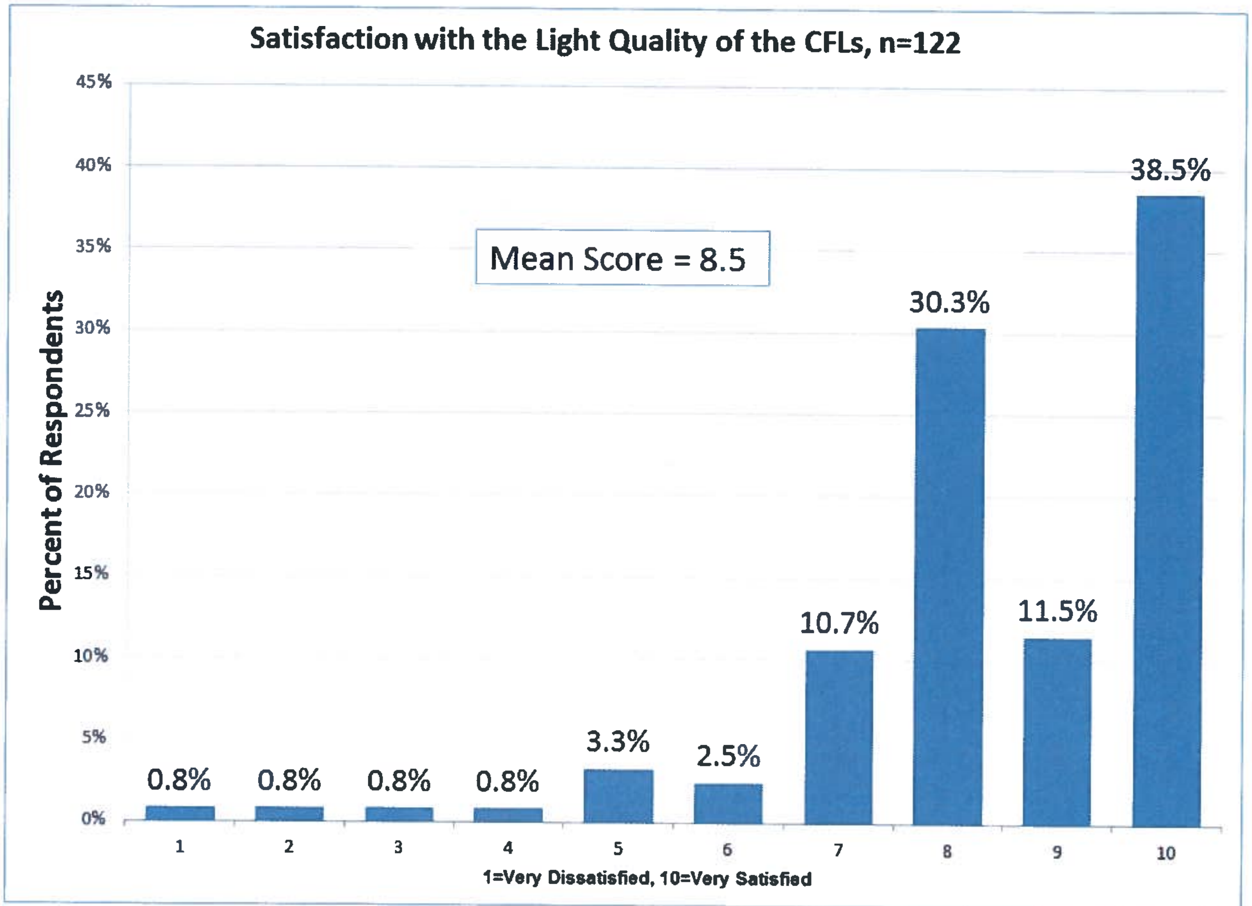


Figure 8. Satisfaction with the Light Quality of the CFLs

Reasons for ratings of seven or less:

- "Bulb too dim" (n=17)
- "Takes too long to warm up" (n=4)
- "Bulb too orange in color" (n=2)

Time since first installation of CFLs had no impact on satisfaction levels of CFLs suggesting that long-time users are not more or less satisfied with their CFLs than are new users.

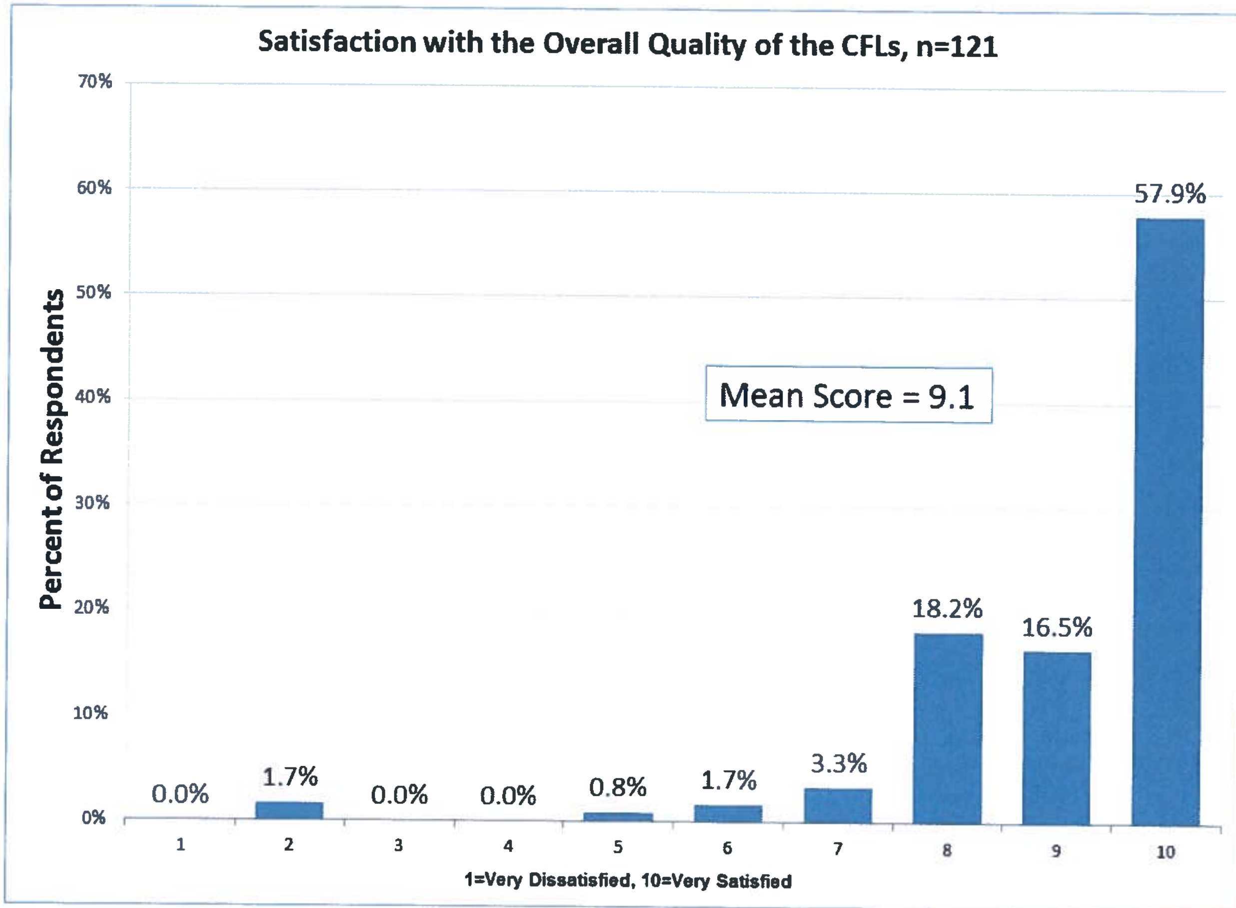


Figure 9. Satisfaction with the Overall Light Quality of the CFLs

Reasons for ratings of seven or less:

- "Burned out too quickly" (n=2)
- "Bulb too dim" (n=2)
- "Takes too long to warm up" (n=1)
- "Bulb too orange in color" (n=2)
- "Bulb generates too much heat"

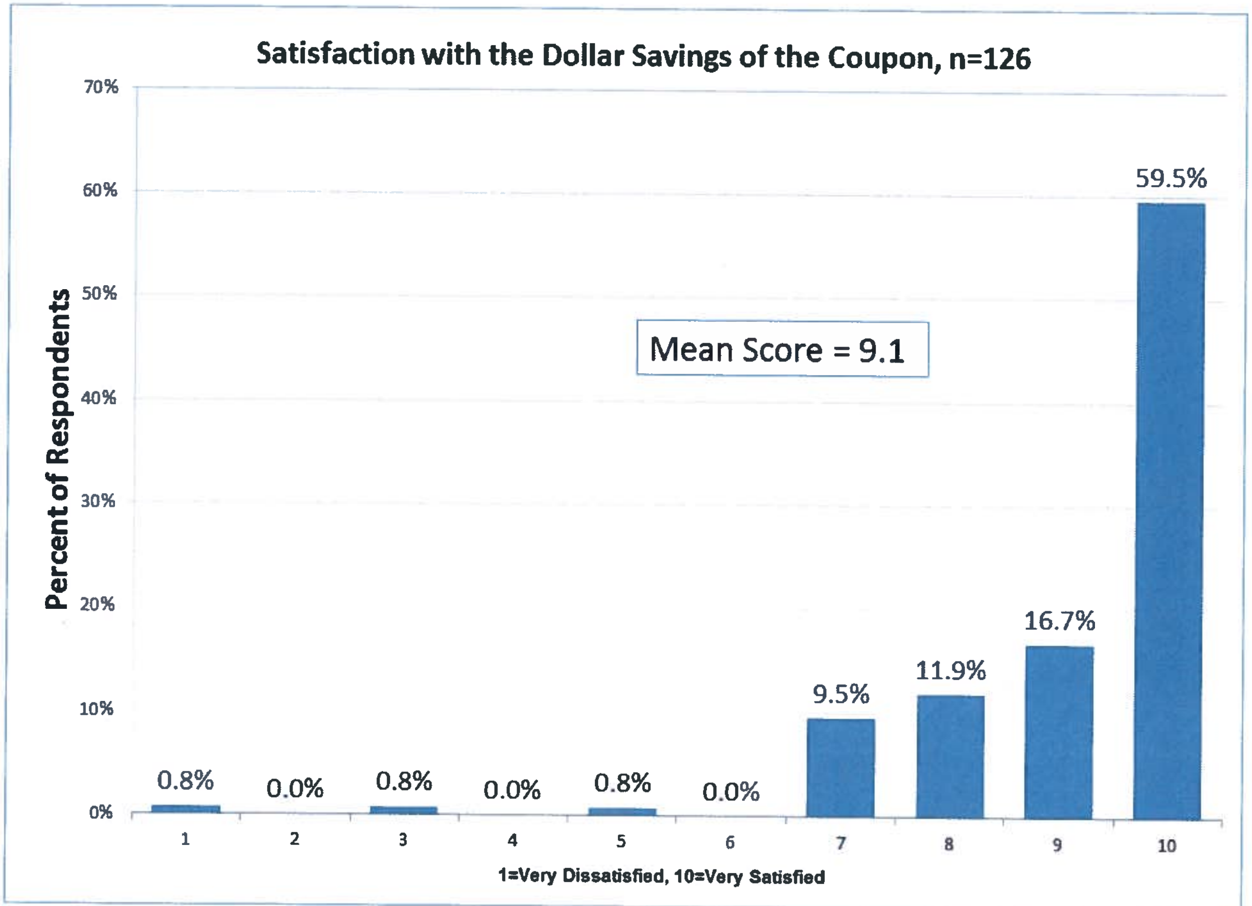


Figure 10. Satisfaction with the Dollar Savings of the Coupon

Reasons for ratings of seven or less:

- "Raise the amount of the discount" (n=10)
- "CFLs are very expensive for people on fixed incomes"
- "Provide free CFLs like what was offered to my family in Ohio"

Participants were also asked to rate, on a 1-to-10 scale, the Kentucky CFL coupon program overall (mean=9.3), and Duke Energy overall (mean=8.3). The satisfaction rating distributions for these categories are shown in Figure 11 and Figure 12.

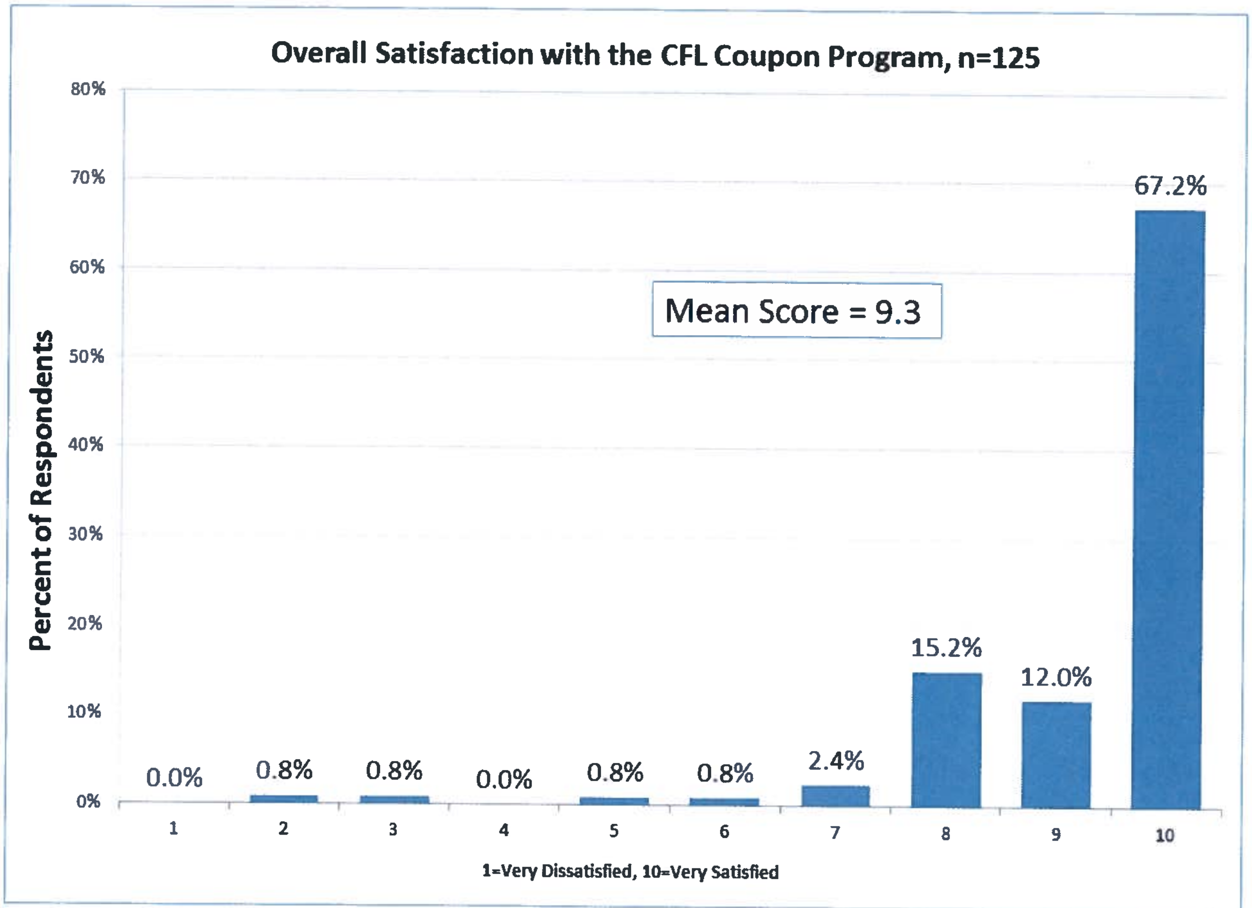


Figure 11. Overall Satisfaction with the CFL Coupon Program

Reasons for ratings of seven or less:

- "Not enough wattage choices"
- "Would like to use only Sylvania bulbs"
- "Offer the coupons twice a year or more frequently"

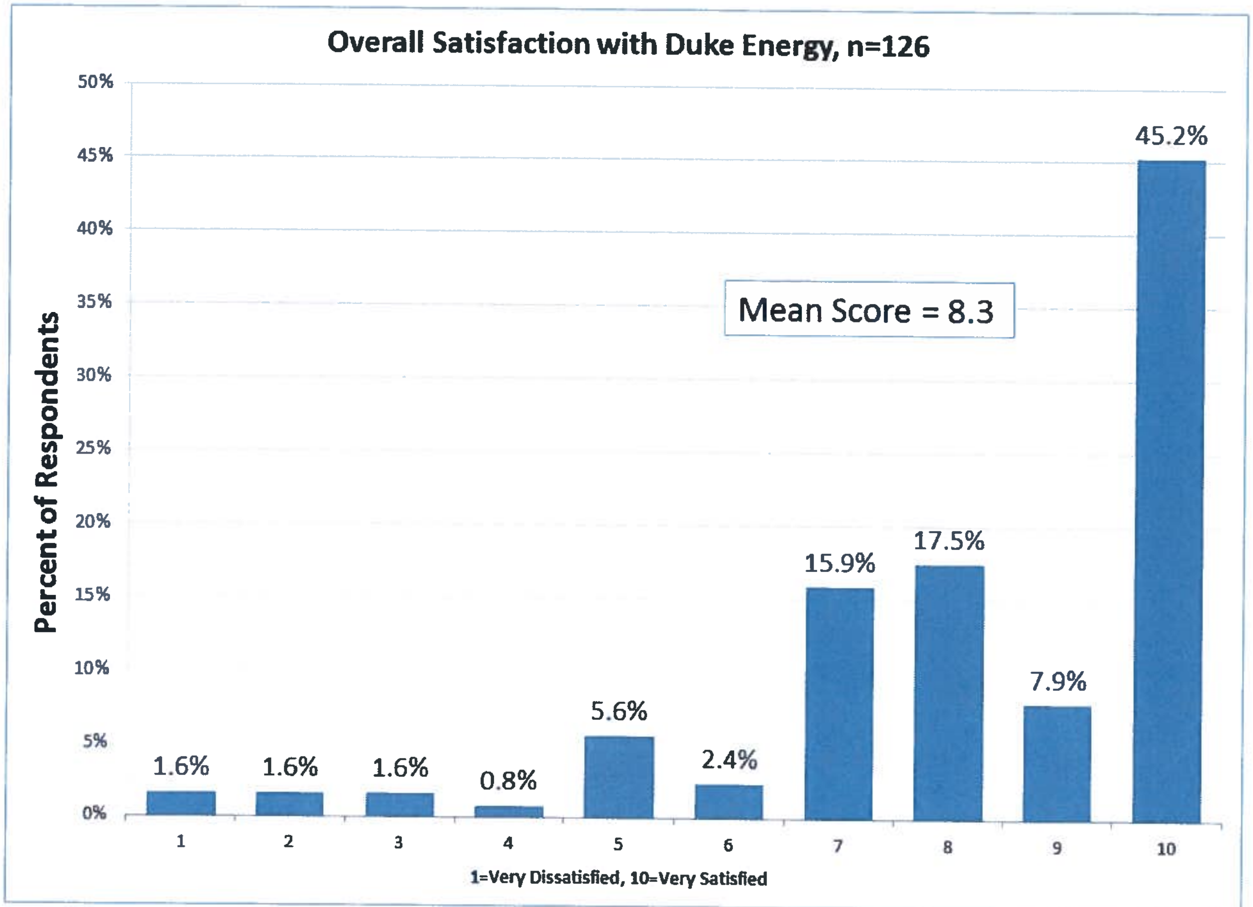


Figure 12. Overall Satisfaction with Duke Energy

Reasons for ratings of seven or less:

- "Would like to see lower rates" (n=13)
- "Bills are confusing, unclear" (n=6)
- "Outages are too frequent" (n=5)
- "Poor customer service" (n=2)

Redeemers were asked what they liked most about the coupon program, and provided the following responses. Redeemers overwhelmingly liked saving money by using the coupon.

- Saving money (n=89)
- The convenience (n=20)
- It allowed me to try CFLs (n=14)
- Saving energy (n=10)
- The name brand CFLs (n=4)
- CFLs are long-lasting (n=1)
- It was proactive - Duke took the initiative (n=1)

Redeemers were asked what they liked least about the coupon program, and provided the following responses.

- CFLs are still too expensive (n=10)
- The limited number of retailers (n=4)
- Having to go to multiple stores to find the right CFLs (n=3)
- Having to go to Wal-Mart (n=3)
- CFLs are too dim (n=3)
- Concern about mercury and proper disposal of CFLs (n=2)
- Having to return to the store after CFL inventory ran out (n=2)
- Early expiration date on coupon (n=2)
- I don't like the color of the light (n=1)
- I got bad bulbs that burned out quickly (n=1)
- Limitation on type of bulb (n=1)
- One bulb didn't work (n=1)
- Only 6 CFLs (n=1)
- Price for these CFLs at Kroger's seemed too high compared to other retailers (n=1)
- Warm-up period for CFLs (n=1)

Additional Energy Efficient Actions Taken

Redeemers were asked if they installed any of the items listed in Table 13 following their participation in the CFL coupon program. Over 25% of the surveyed redeemers reported that they have installed caulking in their homes since participating in the CFL coupon program.

Table 13. Additional Measures Installed After Redeeming Duke Energy's CFL Coupon

Measure	N	Percent Redeemers Indicating they Installed Measure
None	69	54.8%
Caulking	33	26.2%
Weather stripping	24	19.0%
Wall or ceiling insulation	16	12.7%
Programmable thermostat	14	11.1%
Low flow showerhead	14	11.1%
Faucet aerators	9	7.1%
Electric wall outlet gaskets	5	4.0%

Note: Survey participants were allowed multiple responses

Additionally, thirty out of 126 (23.8%) of survey respondents indicated that they had purchased and installed 56 higher-cost measures, such as energy efficient equipment including appliances, windows or heating and cooling equipment, after purchasing CFLs with the coupon.

Table 14. Higher-Cost Measures Installed by Coupon Redeemers

Measure	Number of each installed
Washer and dryer	6
Furnace	3
Refrigerator	5
HVAC	2
Dishwasher	3
New Windows	31
Water heater	3
Heat pump	1
Oven	2

Participants were asked to rate the influence, on a 1-to-10 scale, that participation in the CFL program had on their decision to install or purchase further energy efficient measures. The average influence rating across all participants who installed further measures is 3.24. This indicates that the CFL coupon program is not the primary driver for the installation of further energy efficient measures, but it does have some influence on further purchasing decisions.

Participation and Interest in Other Duke Energy Programs

TecMarket Works asked the surveyed coupon redeemers if they were participants of any of the following Duke Energy programs.

- Online Services
- Power Manager®
- Home Energy House Call
- Home Energy Comparison Report
- Personalized Energy Report
- Residential Smart $aver®

We also asked what their level of interest is in other Duke Energy programs (after providing a brief description of the program[10]) on a 1-to-10 scale with 1 indicating "not at all interested" and 10 indicating "very interested".

The most commonly reported program they have participated in was Online Services, which is a variation of the Personalized Energy Report in which customers can log into their Duke Energy accounts online and complete a survey about their home to receive recommendations for energy efficiency improvements that they can make. However, it should be noted that many of these customers may not have been aware of the survey and the report (and free CFLs) that they would receive for completing the survey, and instead believed that having on online account with Duke Energy meant the same thing as completing the survey and being a participant in the program.

[10] Please see questions 56a-56e in Appendix B: Redeemer Survey Instrument for the program descriptions provided to the customers.

With the similarity of the Personalized Energy Report and Online Services, we did not ask about their interest in Online Services.

As presented in Table 15 below, redeemers typically are not participating in other Duke Energy programs, and have only a mild interest in them.

Table 15.Participant and Interest in Other Duke Energy Programs

Program	Number Indicating Participation	Percent Indicating Participation	Mean Level of Interest in Program's Offerings (n=127)
Online Services	45	35.4%	N/A
Power Manager	18	14.2%	4.0
Home Energy House Call	17	13.4%	6.3
Home Energy Comparison Report[11]	15	11.8%	5.4
Personalized Energy Report	13	10.2%	5.9
Residential Smart $aver	1	0.8%	5.6

Redeemers were asked what other services Duke Energy could provide to help them improve their energy efficiency. The verbatim responses are below. Not all of the responses are about energy efficiency, but are included here for completeness.

- More rebate programs (n=5)
- Free CFLs (n=2)
- Lower rates (n=2)
- Bill insert that shows a breakdown of energy used by appliances on stand-by.
- Incentives for manufacturers to produce a wider variety of CFLs.
- Incentives for more EE heating systems, esp. in apartment buildings.
- Infrared thermal scanning to identify precise heat/AC loss areas
- List of preferred vendors in the area for installation of energy related products
- More incentives & better promotion for Home Energy House Call.
- More local government involvement in energy efficiency programs.
- Offer incentives for producing solar, wind & other renewable sources of energy.
- Better customer service - human telephone operators.
- Don't adjust rates seasonally
- Hire more staff or contractors to help customers
- Promote geothermal conversion technology via subsidies for subcontractors.
- Promote more low-cost energy efficiency tips.
- Reach out more to first-time homeowners & elderly customers.
- Rebate incentives for people to install programmable thermostats.
- More education about natural gas & CO hazards - how to deal with them in an emergency.

[11] This program is now named "My Home Energy Report".

- More education about switching from old to new gas meters.
- Stagger the release of coupons to avoid stores running out of inventory.
- Whole house surge protection.

Interest in Specialty CFL Bulbs

TecMarket Works asked all redeemers to gauge, on a 1-to10 scale with 1 indicating "not at all interested" and 10 indicating "very interested", whether they would be interested in a direct-mail specialty bulb CFL program that shipped discounted bulbs to them. Redeemers were then asked about specific types of specialty bulbs (dimmable, outdoor flood, three-way, spotlight, and candelabra CFLs) and their level of interest in these bulbs if they were offered through a Duke Energy program in the future.

Overall Interest in a Specialty CFL Bulb Program

Overall interest has a mean of 7.1 with the distribution of answers shown in Figure 10. More than a third of redeemers indicated the highest level of interest (10) and more than 50% of redeemers indicated very high interest (8, 9, or 10).

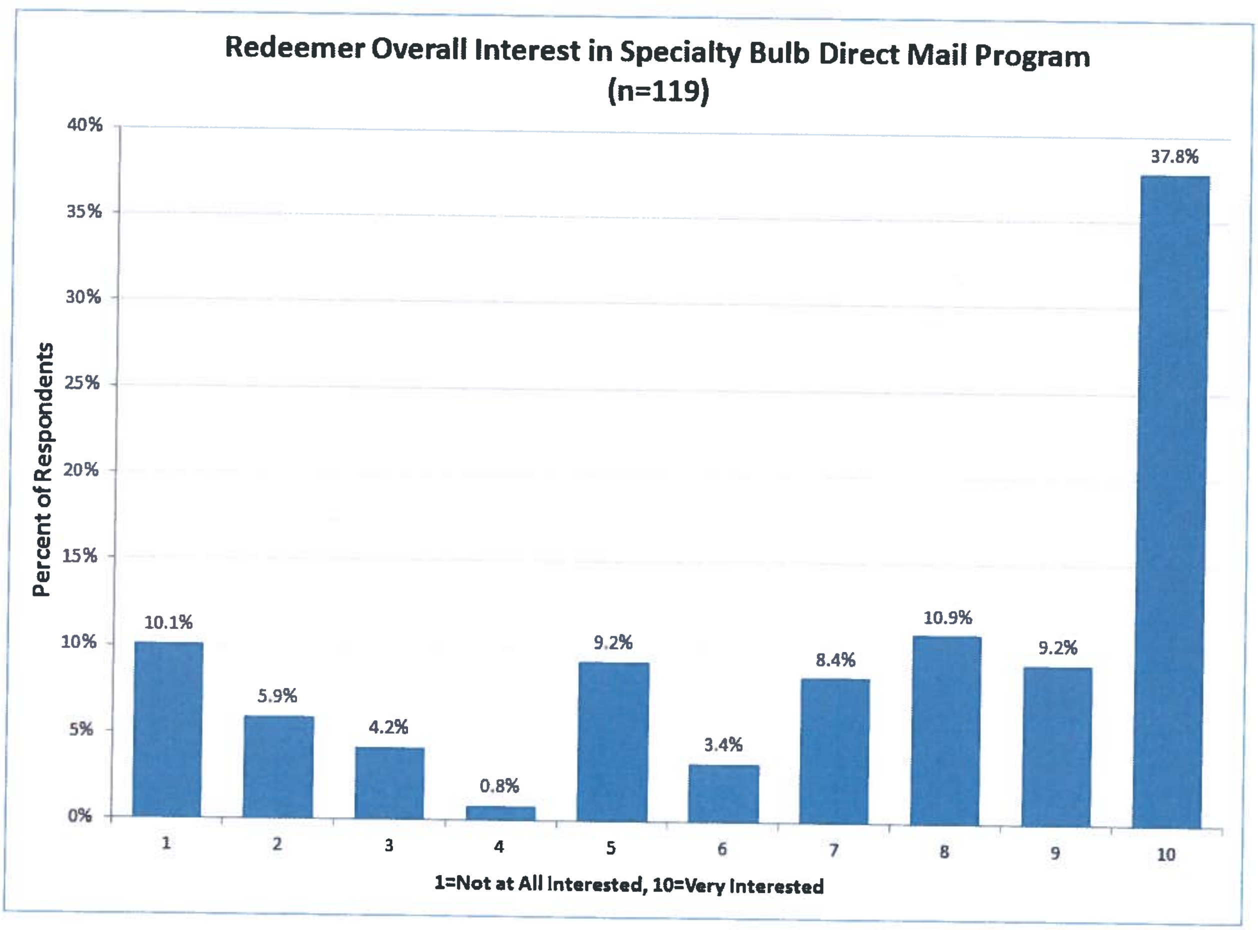


Figure 13. Redeemers' Overall Interest in a Specialty Bulb Direct Mail Program

Interest in Specific Specialty Bulb Types

As seen in Figure 14, CFL programs that offer dimmable and three-way CFLs had the highest levels of interest among all redeemers (62% and 56% respectively). More than half of all redeemers also expressed interest in a CFL discount program that offers outdoor flood lights. Forty-four percent of redeemers expressed an interest in a candelabra CFL discount program. Most redeemers were not interested in a CFL program that offered discounts on spotlights or "other" lights, such as ornamental lights or nightlights.

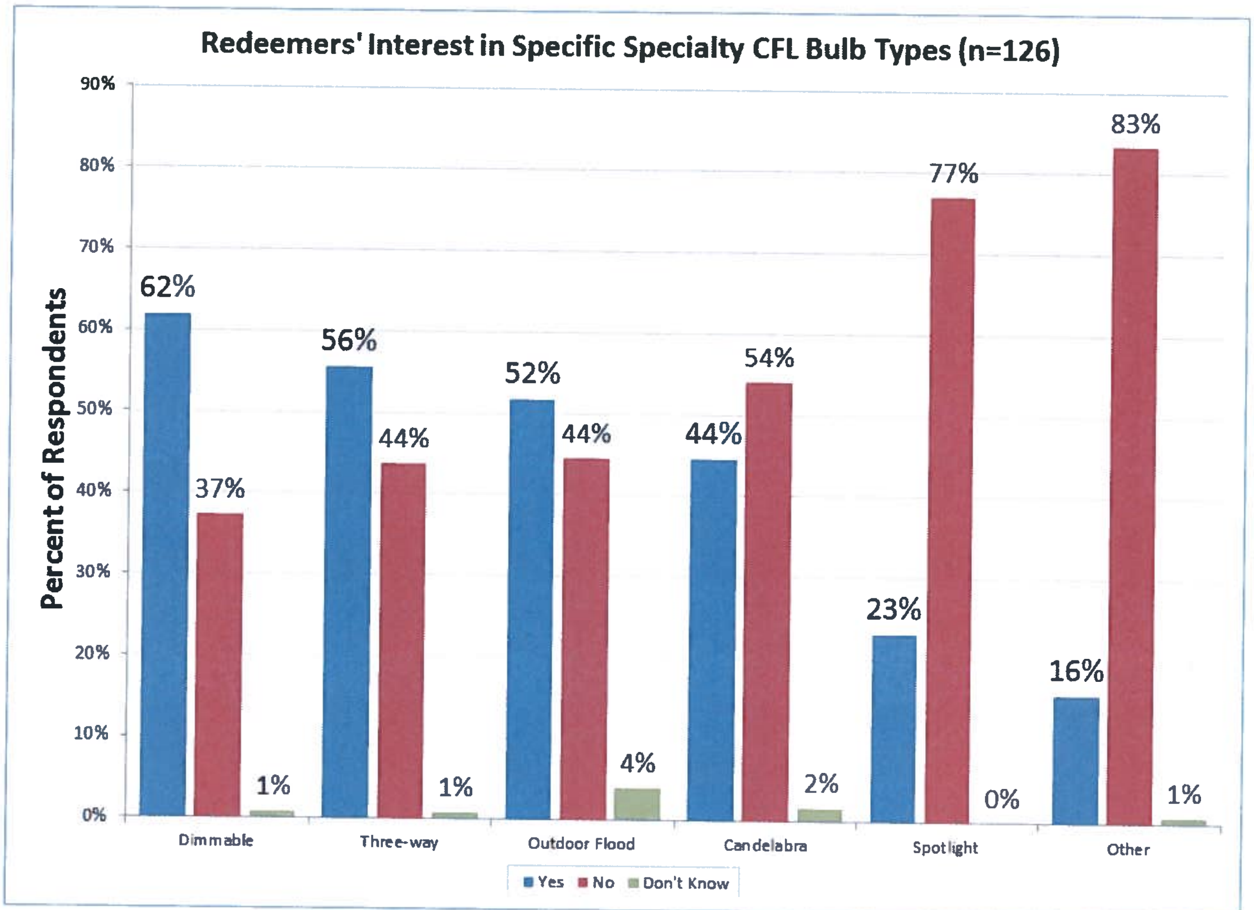


Figure 14. Redeemer Interest in Specific Specialty Bulb Types

Estimated Bulb Hours and Available Sockets

TecMarket Works also asked coupon redeemers who indicated an interest in a specific specialty bulb type to estimate the average hours of use that bulb type would receive in their home. TecMarket Works then averaged these estimates across those redeemers indicating an interest in that particular type of CFL and across all redeemers surveyed. The results are shown in Table 16. All bulbs, regardless of type, were given hours of use estimates by interested redeemers that average between 3.5 hours and 3.7 hours. Therefore, estimated hours of use would appear not to be a factor in determining which specialty bulb programs would result in higher energy savings.

Table 16. Estimated Per Bulb Hours of Usage for Redeemers Indicating an Interest in Each Specialty CFL

Bulb Type	Number of redeemers indicating interest in specialty CFLs	Percent of redeemers indicating interest in specialty CFL	Average hours of usage per day per bulb
Dimmable	78	61.9%	3.7
Three-way	70	55.6%	3.5
Outdoor Flood	65	51.6%	3.5
Candelabra	56	44.4%	3.6
Spotlight	29	23.0%	3.6
Other	20	15.9%	3.5

TecMarket Works asked redeemer if they currently had any of each of the specific specialty bulbs installed in their home, and, if so, how many of those specialty sockets were already filled with a CFL. The results show the estimated number of sockets available in homes that reported having specialty bulbs regardless of their interest in a CFL discount specialty bulb program.

The difference in the numbers of redeemers in the second column of Table 16 and the "n" value in the second row of Table 17 come from the fact that some respondents who are interested in a specialty bulb program do not currently have specialty bulbs installed in their home, and other respondents who do have specialty bulbs installed are not currently interested in any specific specialty bulb CFL discount program. Table 17 shows an estimate of the maximum number of sockets available for each CFL specialty type if targeting prior redeemers of CFL program regardless of interest in specialty CFLs.

Table 17. Estimated Number of Current Specialty Bulbs in Use by Redeemers

Bulb Type ->	Dim-mable	Three-way	Outdoor Flood	Candelabra	Spotlight	Other	Overall
Number of Redeemers	49	53	66	30	25	16	239
a) Total number of bulbs reported to be in redeemer homes	330	123	183	416	121	55.5	1228.5
b) Average number of bulbs in homes of redeemers with specialty bulbs *(Number of Redeemers/a)*	6.73	2.32	2.77	13.87	4.84	3.47	34
c) Average number of bulbs in home per all respondents *(Number of Redeemers /126)*	0.39	0.42	0.52	0.24	0.20	0.13	1.9
d) Reported Number of specialty bulbs already CFLs	17	8	21	33	9	3	91
e) Reported Percent of specialty bulbs	5.2%	6.5%	11.5%	7.9%	7.4%	5.4%	7.4%

that are already CFLs *(d/a)*							
f) Average Number of estimated Incandescent-filled Specialty Sockets, for redeemers with specialty bulbs *(b – d)*	6.68	2.26	2.66	13.79	4.77	3.08	33.2
g) Average Number of estimated Incandescent-filled Specialty Sockets, for all redeemers *((a – d) / 126)*	**2.48**	**0.91**	**1.29**	**3.04**	**0.89**	**0.42**	9.0

Dimmable CFLs are the best candidates for a specialty CFL discount program targeting all current CFL redeemers, having the most interest, highest estimated hours of use per bulb, and a high number of estimated sockets per redeemer with specialty bulbs.

Outdoor floodlights and three-way bulbs are the second-best candidates. The hours of use for these bulb are equal with the interest in three-way bulbs being slightly higher (56% compared to 52%) and the estimated number of sockets available for outdoor floodlights being slightly higher (2.26 compared to 2.66 of redeemers with each specialty bulb installed).

Candelabra lights had the highest number of sockets available per all respondents, but the lights' lower wattage and relatively low interest from respondents (44%) would make them less likely candidates for a CFL discount program.

Both spotlight and "other" bulbs had low interest and low numbers of available sockets per all redeemers and should not be considered for a specialty discount CFL program at this time. However, considering the amount of homes with spotlight bulbs (4.84), a spotlight specialty program could become a candidate for a discount program if it directly targeted customers with spotlight sockets.

Non-Redeemer Surveys

All 92 non-redeemer survey respondents recalled receiving the CFL coupon from Duke Energy. Five of the 92 (5.4%) respondents stated that they gave away their coupon to someone else: two to family members, one to a friend, one to a neighbor, and one whose identity the respondent was unable to remember.

The two respondents indicating that they gave their coupon to family members stated that their family member had used the CFL coupon. One respondent was unsure if the family member had installed any CFLs and the other respondent stated that the family member had installed four CFLs after using the Duke Energy CFL coupon.

Reasons for Non-Redemption

TecMarket Works asked non-redeemers an open-ended question as to any reason (or reasons) why they chose to not redeem the Duke Energy CFL coupon. Answers to this question varied widely and are summarized in Figure 15. The most common reason, reported by 13% of the respondents, was that they lost the coupon.

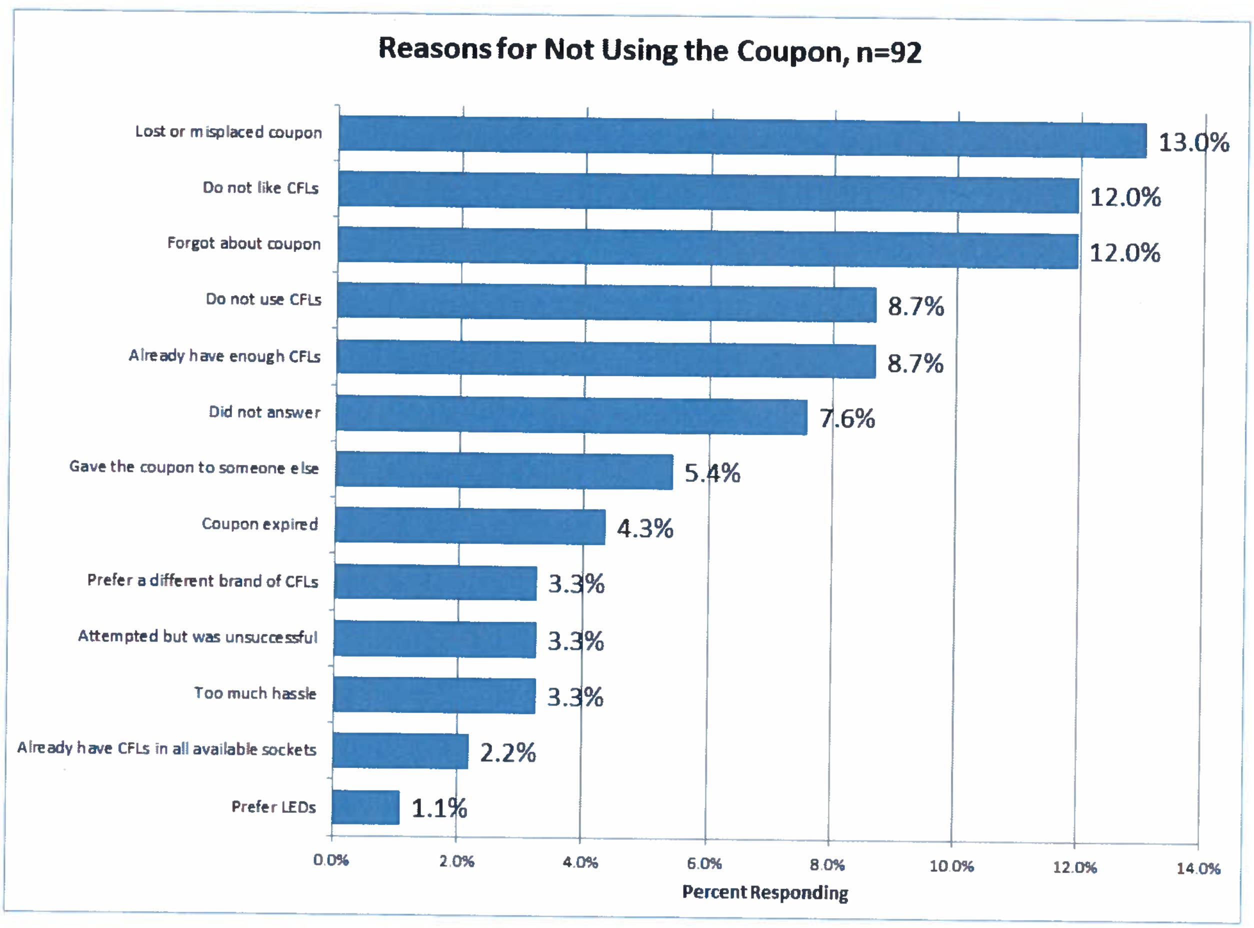


Figure 15. Reasons for Not Using the Coupon

Reasons for Dislike or Disuse of CFLs

A total of 17 non-redeemers indicated that they either did not like or did not use CFLs (two indicated that both was the case). Those non-redeemers who indicated that they did not use or did not like CFLs were also asked the reason (or reasons) for their dislike or disuse.

Again the answers varied widely with the price of CFLs and mercury/disposal concerns being the most cited reasons for dislike or disuse:

- CFLs are too expensive (n=8)
- Have mercury/disposal concerns (n=8)
- Don't like color (n=5)
- Don't like appearance or shape of the bulbs (n=4)
- Take too long to warm up (n=4)
- Too bright (n=2)
- I require specialty bulbs for my lighting (n=2)
- Lifespan is too short

Current CFL Use Among Non-Redeemers

TecMarket Works asked non-redeemers if they currently had any CFLs installed in their home. Sixty-nine out of 92 (75%) non-redeemers indicated that they do have CFLs installed.

Non-redeemers who had previously installed CFLs were asked to estimate the number of CFLs installed in their homes. Those 69 non-redeemers estimated they had installed a total of 644 CFLs for an average of 9.3 CFLs installed for those 69 non-redeemers who had any CFLs installed, and an average of 7 CFLs installed for the 92 non-redeemers overall.

Non-redeemers were also asked to estimate the wattage of the CFLs installed, but they were often unsure of the wattage or stated the wattage of an incandescent bulb of comparable lumens. Reasonable estimates of wattage were reported for 267 CFLs of which 238 were 13-watt (89%) and 29 were 20-watt (11%).

TecMarket works also asked the 69 non-redeemers who had previously installed CFLs to estimate the length of time they had been using CFLs. The results are shown in Table 18 and show that 84% of CFL users among non-redeemers have been using CFLs for a year or longer and 63% (21.5% + 19.6% + 3.3% + 18.5%) of all non-redeemers surveyed have been using CFLs for a year or longer.

Table 18. Length of CFL Usage Among Non-Redeemers who use CFLs

How long have you been using CFLs?	% of non-redeemers who use CFLs (n=69)	% of all surveyed non-redeemers (n=92)
one year or less	15.9%	12.0%
12 to 24 months	29.0%	21.7%
25 to 36 months	26.1%	19.6%
37 to 48 months	4.3%	3.3%
more than 4 years	24.6%	18.5%

CFL Coupon Influence on Awareness of Non-Redeemers

TecMarket Works asked all CFL coupon non-redeemers if receiving the CFL coupon had increased their awareness of how they could save money using CFLs. The three possible answers were "Very Much," "Somewhat," and "Not at all."

As can be seen in Table 19, a majority (59.8%) of non-redeemers stated that the CFL coupon had somewhat or very much influence on their awareness of the energy savings achievable by using CFLs. This suggests that the CFL coupon program is raising some awareness of CFL savings even among those who did not redeem their coupons.

Table 19. Awareness of CFL Savings Influenced by CFL Coupon

CFL coupon increased awareness	N	%
Somewhat	44	47.8%
Not at all	37	40.2%
Very Much	11	12.0%
Total	92	100.0%

Additional Purchases of CFLs

TecMarket Works also asked non-redeemers if the CFL discount coupon had inspired them to purchase CFLs without using the coupon.

Seven out of 92 (7.6%) of non-redeemers stated that they had been inspired by the CFL coupon program and had purchased a total of 58 CFLs without the coupon for an average of 8.3 bulbs per each of the seven purchases. This equates to 0.6 bulbs per non-redeemer survey respondent (n=92).

The seven non-redeemers who bought CFLs all rated the influence of the coupon on their purchasing decision at eight or higher on a ten-point scale where 1 means not very influential and 10 means very influential. The average of all seven influence ratings is 9.4.

None of the purchasers was among the non-redeemers who gave their coupon away.

Additional Energy Efficiency Actions Taken

Non-redeemers were asked if they installed any of the following items after receiving the Duke Energy CFL discount coupon. A third of them reported installing caulking and weather stripping in their homes since April of 2011 (shortly after the coupons were sent to customers).

Table 20. Additional Measures Installed After Receiving Duke Energy's CFL Coupon

Measure	N	Percent Redeemers Indicating they Installed Measure
None	40	44.5%

Caulking	29	32.2%
Weather stripping	29	32.2%
Wall or ceiling insulation	15	16.7%
Programmable thermostat	22	24.4%
Low flow showerhead	19	21.1%
Faucet aerators	7	7.8%
Electric wall outlet gaskets	5	5.6%

Note: Survey participants were allowed multiple responses

Additionally, 24 out of 90 (26.7%) non-redeemers indicated that they had purchased and installed a total of 34 higher-cost measures, such as energy efficient appliances, windows or heating and cooling equipment.

Table 21. Higher-Cost Measures Installed by Coupon Non-Redeemers

Measure	Number of each installed
Washer and dryer	2
Furnace	4
Refrigerator	3
HVAC	5
Dishwasher	3
New Windows	9
Water heater	3
New Doors	4
Oven	1

Light Bulb Characteristics

Surveyed non-redeemers were asked to rate how important specific bulb characteristics are to them when making their bulb purchasing decisions. The results of these importance ratings are shown in Table 22. Responses are provided on a 1-to-10 scale with 1 indicating that the characteristic is not important to them, and 10 indicating that it is very important.

The two highest ratings of influence for non-redeemers were "selection of wattage and light output types" (mean = 8.64) and "the availability of CFLs in stores where they normally shop" (mean = 8.56). This suggests that non-redeemers are most concerned with selection and convenience when it comes to obtaining CFLs.

Energy savings (mean = 8.3) and cost savings on utility bills (mean = 8.2) were reported by non-redeemer survey participants to be slightly less influential than selection and convenience.

Factors often perceived as barriers to CFL adoption, such ease of disposal (6.98 average), speed of bulb warm-up (6.58 average) and availability of dimmable bulbs (5.34 average), were not rated as highly as either convenience or cost/energy savings, but were still reported by non-redeemers to be influential in their decision to obtain CFLs.

Overall, this suggests that the most important factors for increased CFL adoption and installation by Duke Energy CFL coupon non-redeemers is offering a wide selection wattage and output levels of CFLs in stores that non-redeemers find convenient.

Table 22. Importance of Bulb Characteristics in Purchasing Bulbs (Non-Redeemers Only)

Bulb Characteristic	N	Mean Importance
Availability of the bulb in stores you normally shop	88	8.6
Selection of wattage and light output levels available	88	8.6
Energy savings	88	8.3
Cost savings on your utility bill	88	8.2
Purchase price of the bulb	88	7.9
Ease of disposal	81	7.0
Speed at which the bulb comes up to the full lighting level	86	6.6
Availability of utility programs or services that offer the bulb directly	87	6.4
Recommendation from the utility company	87	6.4
Mercury content of the bulb	84	5.8
Attractiveness or appearance of bulb	88	5.3
Recommendation of family or friends	87	5.2
Ability to dim the lighting level	87	5.5

Non-Redeemer Satisfaction

TecMarket Works asked non-redeemer survey participants to rate, on a 1-to-10 scale, their satisfaction with the dollar savings amount of the coupon they received and their satisfaction with Duke Energy overall.

Non-redeemers mean rating for the CFL coupon savings amount is 8.1 which is a full point lower than the mean rating of 9.1 given by coupon redeemers. However, since 8.1 is still a high rating and the dollar amount of the coupon was not mentioned by non-redeemers as a reason for non-use, it is probable that this difference in mean ratings is caused by self-serving attribution bias. This bias theorizes that those participants who use the coupon would tend to slightly over-estimate its value while those participants who do not use the coupon would tend to slightly under-estimate its value regardless of the reason for use or non-use of the coupon. TecMarket Works does not believe that a higher coupon dollar savings amount would necessarily result in a higher relative satisfaction rating between redeemers and non-redeemers.

Non-redeemers' mean satisfaction rating for Duke Energy overall is 8.0 which is only slightly lower than coupon redeemers' mean rating of 8.3.

The distributions of satisfaction ratings are illustrated in Figure 16 and Figure 17.

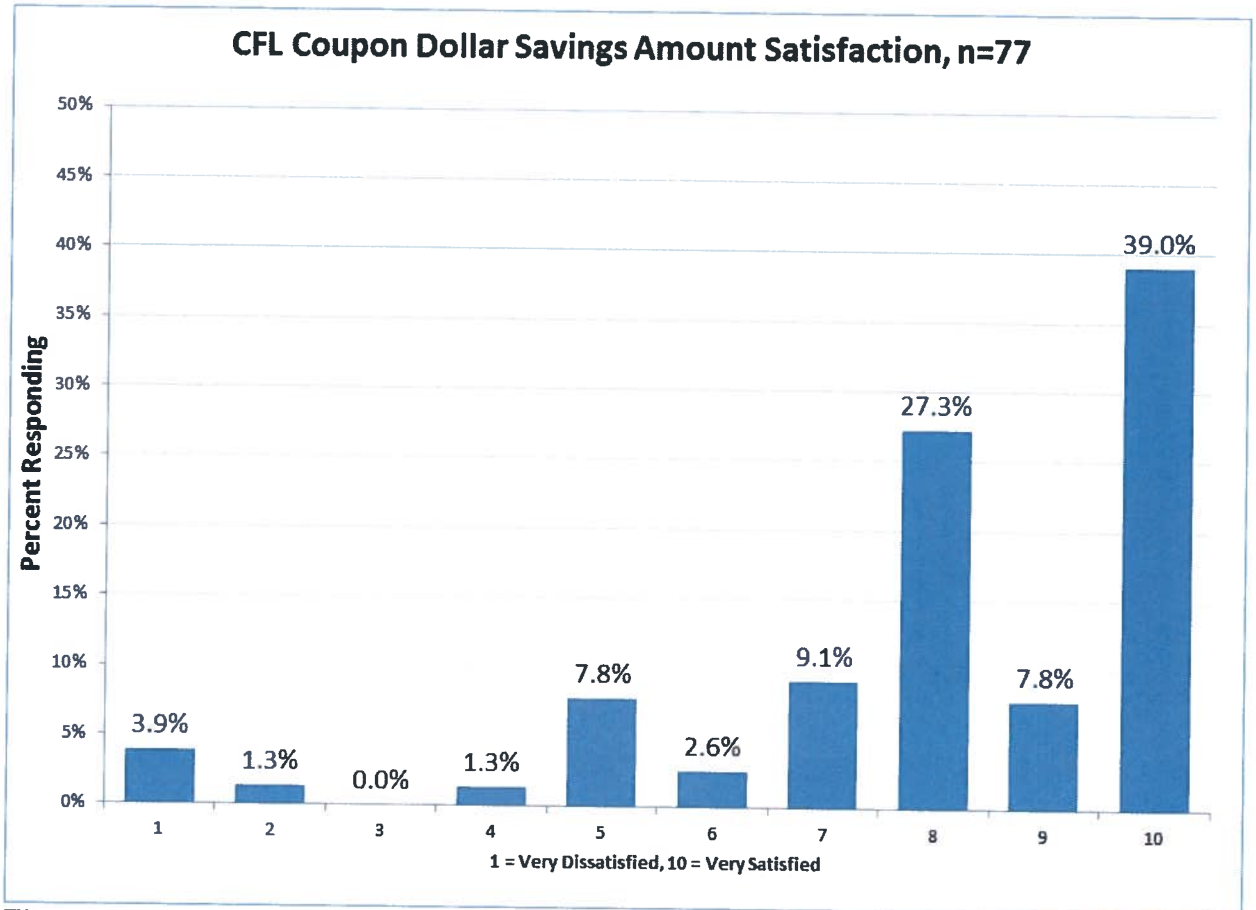


Figure 16. CFL Coupon Dollar Amount Satisfaction Distribution

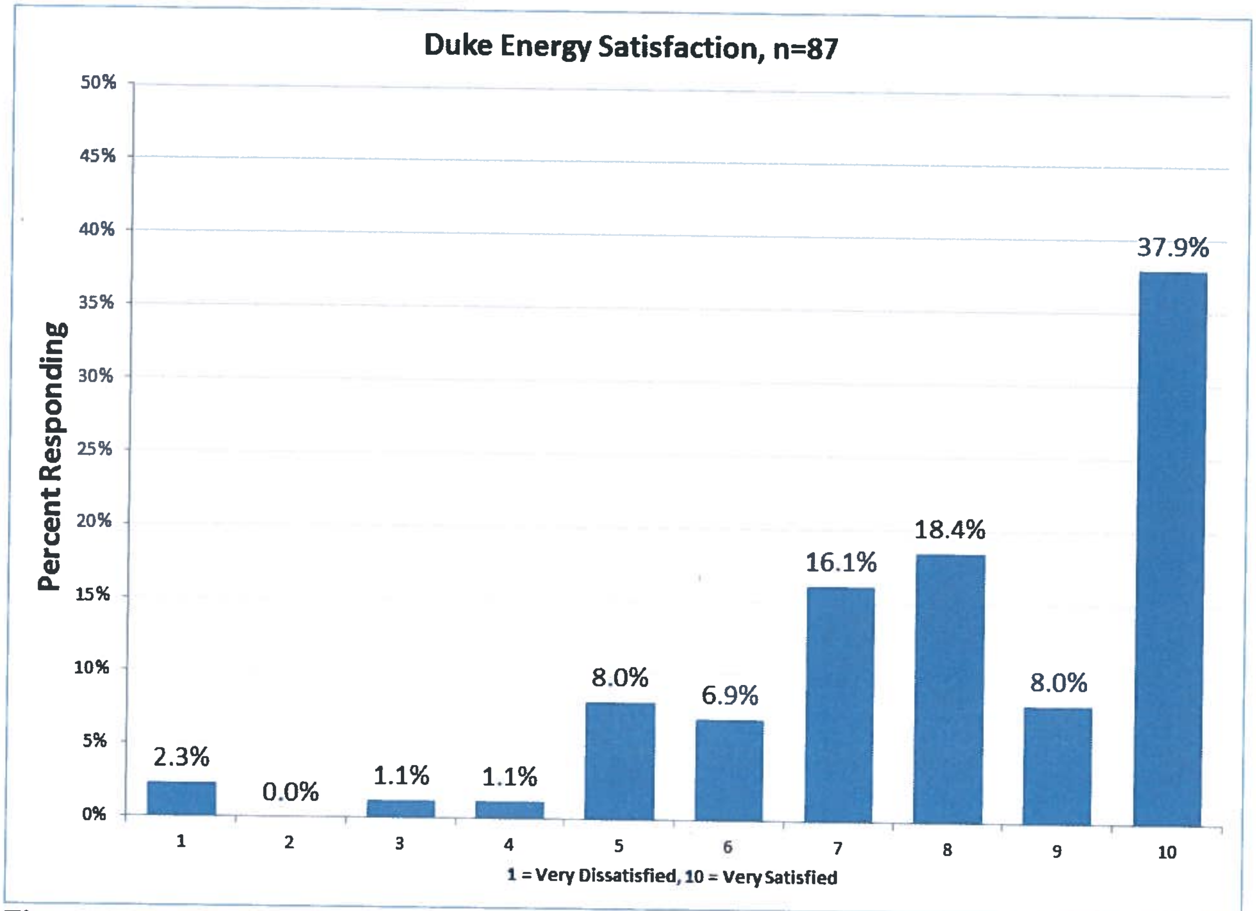


Figure 17. Duke Energy Satisfaction Rating Distribution for CFL Coupon Non-Redeemers

Non-redeemers were asked what other services Duke Energy could provide to help them improve their energy efficiency. The verbatim responses are below. Not all of the responses are about energy efficiency, but are included here for completeness.

- Residential energy audit (n=6)
- Discount or free LED program (n=3)
- Lower bills (n=3)
- More free CFLs (n=3)
- More information on website (n=3)
- Smart meter technology (n=2)
- Breakdown of cost per kwh for individual items and overall household electric use
- Duke should be involved more in the community, educating the public
- Free insulation
- Funding to help small business owners become more energy efficient
- Help with home weatherization
- Infrared scan of house in winter to show heat loss
- Install solar arrays on individual homes
- More options to help customers convert to solar power or other renewable energy for their home

- Recommendations on what kind of replacement windows to get and who to have install them
- Recycle CFLs
- Weatherization program for disabled customers who don't meet low-income requirement
- Work more on issues about gas efficiency and safety

Future CFL Purchases

TecMarket Works asked non-redeemers to consider their future CFL purchases and identify how many CFLs they would expect to purchase in the next year if CFLs were offered at a certain price compared to a standard (incandescent) bulb. The prices offered were:

- The same price as a standard bulb
- $1 more than a standard bulb
- $2 more than a standard bulb
- $3 more than a standard bulb

Non-redeemers were also asked how many CFLs they would purchase if they were free, but required a mail-in rebate form or an online rebate form.

Results are presented in Table 23 and illustrated in Figure 18 through Figure 20 for the 87 surveyed non-redeemers that answered this series of questions.

With CFLs being offered at the same prices as a standard bulb, 62% of non-redeemers would purchase at least one, and 50% of non-redeemers indicated they would purchase four or more. Fifty-four percent of non-redeemers indicated they would purchase at least one CFL bulb if the price per bulb was $1 more. When the price reaches $2 more than a comparable incandescent, 55% of non-redeemers indicate that they would not purchase any CFL bulbs or don't know how many they would purchase, and at $3 more this number rises to 64% who would not purchase any CFLs or do not know how many they would purchase.

Table 23. Hypothetical CFL Purchases Under Four Different Buying Scenarios, n=87

		Don't Know/Not sure	0	1 to 3	4 to 6	7 to 9	10 to 12	13 to 15	16-max allowed
They were the same price as a standard bulb?	N	12	21	10	13	6	13	3	9
	%	13.8%	24.1%	11.5%	14.9%	6.9%	14.9%	3.4%	10.3%
They were $1.00 more than standard bulbs?	N	13	27	12	12	4	10	2	7
	%	14.9%	31.0%	13.8%	13.8%	4.6%	11.5%	2.3%	8.0%
They were $2.00 more than standard bulbs?	N	13	35	13	10	3	9	2	2
	%	14.9%	40.2%	14.9%	11.5%	3.4%	10.3%	2.3%	2.3%
They were $3.00 more than standard bulbs?	N	12	44	11	10	2	5	1	2
	%	13.8%	50.6%	12.6%	11.5%	2.3%	5.7%	1.1%	2.3%

If the CFL bulbs are free with a mailed-in rebate form, 58.5 % of non-redeemers said that they would purchase at least one CFL. Since this percentage is lower than the percentage for CFLs at the same price as incandescent bulbs, this suggests that non-redeemers may be experiencing a barrier other than price when deciding to purchase CFLs.

For example, some customers may still not be at all interested in purchasing CFLs due to size, slow illumination, aesthetics or the quality of light and would not purchase CFLs regardless of price or price difference. Or they may prefer to shop at a trusted store or purchase a CFL brand that may not be available through any particular CFL coupon or discount program.

Table 24. Hypothetical CFL Purchases Under Two Different Redemption Scenarios, n=87

		Don't Know/Not sure	**0**	**1 to 3**	**4 to 6**	**7 to 9**	**10 to 12**	**13 to 15**	**16-max allowed**
They were free but you had to mail in a rebate form to get your money back?	N	12	24	9	10	6	13	1	12
	%	13.8%	27.6%	10.3%	11.5%	6.9%	14.9%	1.1%	13.8%
They were free but you had to fill out an online form to get your money back?	N	11	31	6	8	4	15	1	11
	%	12.6%	35.6%	6.9%	9.2%	4.6%	17.2%	1.1%	12.6%

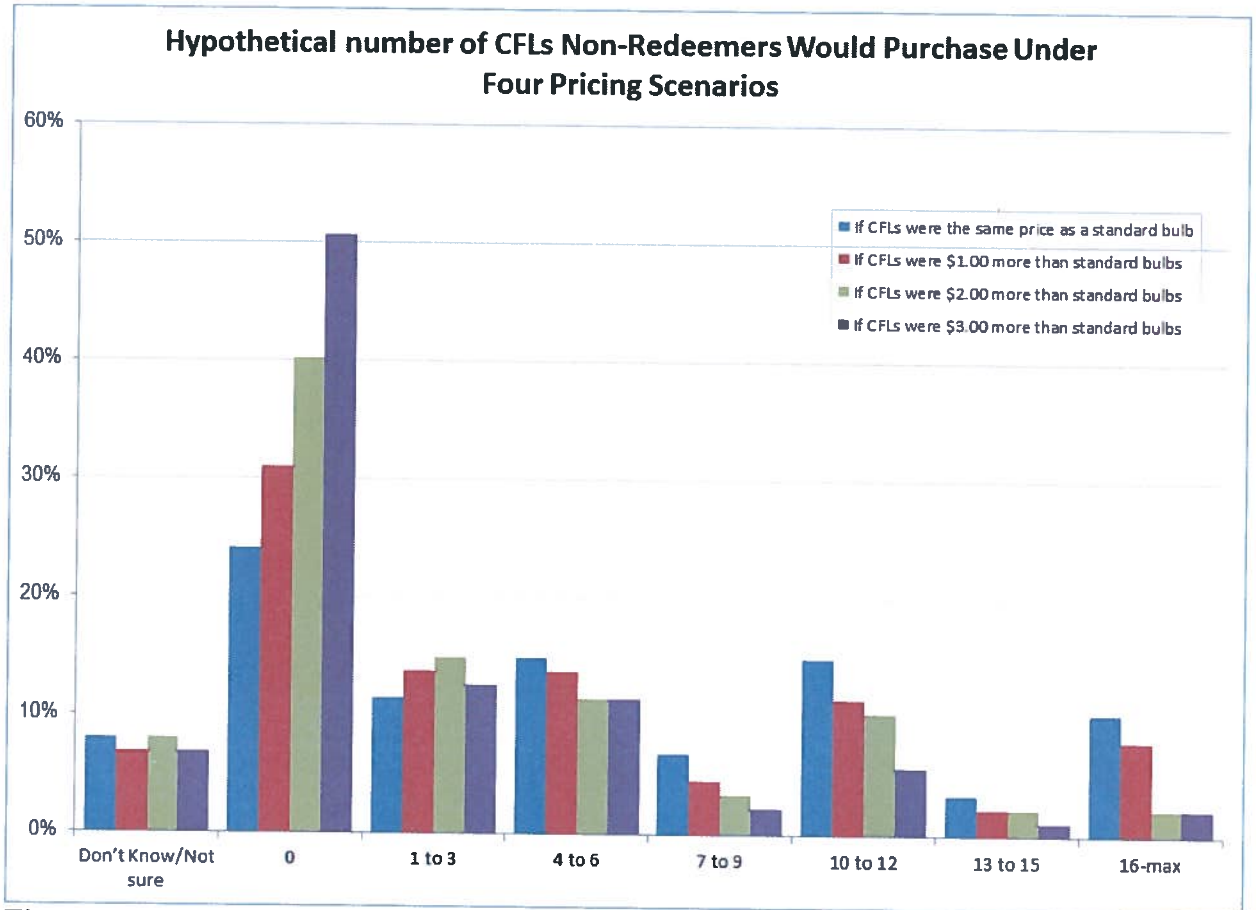


Figure 18. Hypothetical Pricing Scenarios for Non-Redeemers, n=87

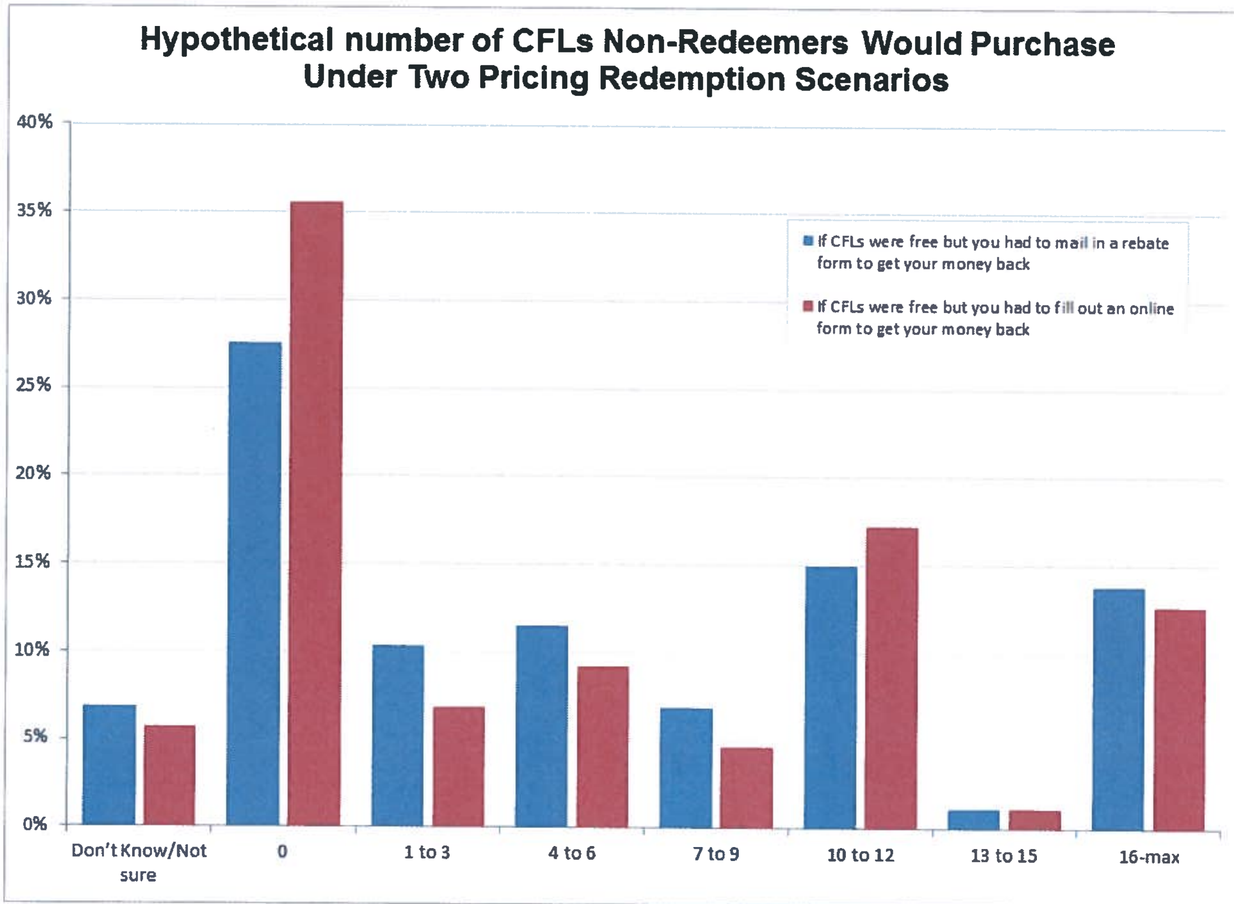


Figure 19. Hypothetical CFLs Obtained Through Free Rebate Scenarios, n=87

TecMarket Works asked 47 non-redeemers in Kentucky to rate their likelihood of participation, on a 1-to-10 scale, in six hypothetical CFL distribution programs that offered discount CFLs, and TecMarket Works asked 45 redeemers in Kentucky to rate their likelihood of participation, on a 1-to-10 scale, in six hypothetical CFL distribution programs that offered free CFLs. The mean ratings and program types are shown in Figure 20.

Likely participation is rated much higher in programs using direct mail, retailer coupons and manufacturers' coupons than the use of a stand in a public parking lot/community event or an online vendor.

Additionally, for non-redeemers in Kentucky the mean ratings for likely participation in programs with free CFLs are, on average, 1.3 points higher than the mean rating for likely participation in programs with discounted CFLs. This suggests that both the method of delivery and the savings type are likely drivers of participation in CFL programs among Kentucky CFL coupon non-redeemers.

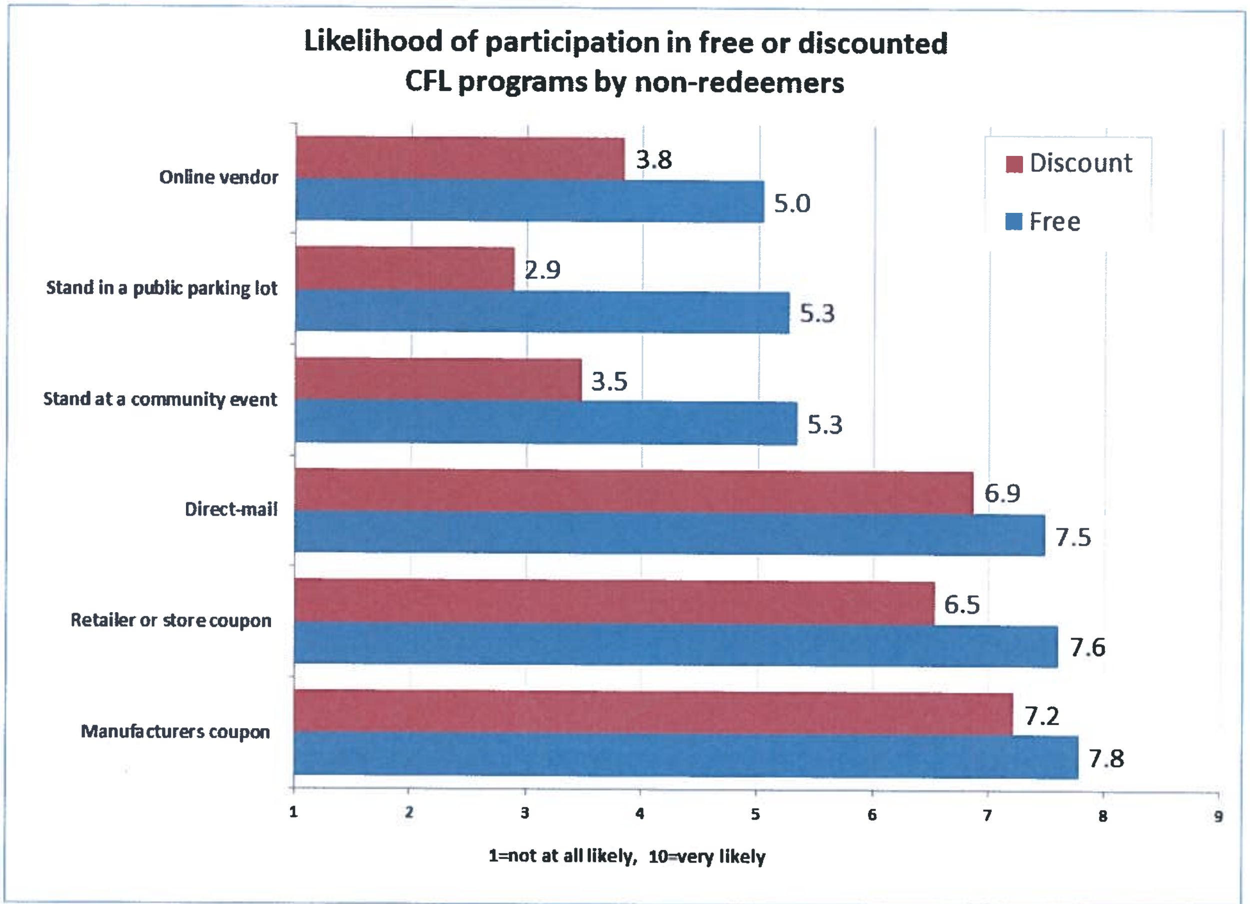


Figure 20. Likelihood of Participation in Free or Discounted CFL Programs by Non-Redeemers, n=92

Energy Efficiency and Energy Star Awareness

TecMarket Works asked redeemers and non-redeemers a series of questions about their use of Duke Energy's web site, their level of energy efficiency, and their awareness of the ENERGY STAR® label. The results are presented below.

Use of the Duke Energy Web Site

Surveyed CFL coupon redeemers and non-redeemers report a similar frequency of visits to the Duke Energy web site, with redeemers slightly more likely to visit the web site often, or once a month or more.

Visit the Duke Energy Web Site:	Redeemers, n=126		Non-Redeemers, n=90	
	N	Percent	N	Percent
Often (once a month or more)	38	30.2%	23	25.6%
Sometimes (less than once a month)	17	13.5%	18	20.0%
Never	71	56.3%	49	54.4%

Perceived Levels of Energy Efficiency

Survey responders were asked the following question: *On a scale from 1-10, with 1 indicating that you feel your home is not energy efficient at all, and 10 indicating that your home is very energy efficient: How would you rate your level of energy efficiency in your home?* As shown in the table below, half of redeemers and non-redeemers both self-report that their homes are at about an average level of energy efficiency.

Rate Their Energy Efficiency:	Redeemers, n=123		Non-Redeemers, n=87	
	N	Percent	N	Percent
Low (score of 1-4)	15	12.2%	17	19.5%
Average (score of 5-7)	62	50.4%	43	49.4%
High (score of 8-10)	46	37.4%	27	31.0%

Changes in Energy-Related Habits

Coupon redeemers report that they've made fewer changes to their energy-related habits. If survey respondents reported that they have made changes, we asked them what changes they made. A summary list of reported actions is provided below the table.

Made Changes in Habits	Redeemers, n=123		Non-Redeemers, n=90	
	N	Percent	N	Percent
Yes	34	26.8%	44	48.9%
No	92	72.4%	44	48.9%
Don't Know	0	0.8%	2	2.2%

<u>Redeemers</u>

- Turn off lights (n=21)

- Use CFLs longer, since they are EE (n=5)
- Set the thermostat higher in summer and lower in winter (n=4)
- Turn off and unplug electronics and appliances (n=4)
- Teaching children and grandchildren to be energy efficient (n=2)
- Using more CFLs (n=2)
- Bought a more energy efficient refrigerator (n=1)
- Installed 2 rain barrels(n=1)

<u>**Non-Redeemers**</u>

- Turn off and unplug electronics and appliances (n=21)
- Set the thermostat higher in summer and lower in winter (n=12)
- Turn off lights (n=7)
- Using more CFLs (n=3)
- LED lights (n=2)
- Teaching children and grandchildren to be energy efficient (n=2)
- Bought a house that has a geothermal heat pump (n=1)
- Close doors to unused rooms (n=1)
- Close ducts to unused rooms (n=1)
- I use fresh air instead of AC (n=1)
- Insulated attic (n=1)
- Lowered temperature of water heater (n=1)
- Installed a new EE furnace (n=1)
- Reconfigured heat pump (n=1)
- Use space heater instead of furnace (n=1)
- Using less energy (n=1)
- Window coverings (n=1)

ENERGY STAR® Awareness and Purchases

More than 80% of the surveyed customers are aware of the ENERGY STAR label, and many of them look for the label when shopping for major appliances. However, the coupon redeemers reported a higher rate of buying appliances with the ENERGY STAR label.

Responder:	Redeemers, n=123		Non-Redeemers, n=90	
	N	Percent	N	Percent
Has added a major electrical appliance in the past year	38	29.9%	18	19.6%
Is aware of the ENERGY STAR label	112	88.2%	76	82.6%
Typically looks for the ENERGY STAR label	102	80.3%	71	77.2%
Typically buys appliances with ENERGY STAR label	73	57.5%	25	27.2%

Perception of Reasons for the Program

TecMarket Works asked redeemers and non-redeemers to state the reason or reasons why they believe that Duke Energy is providing coupons for discounted CFLs to its customers. The most popular response among Redeemers and Non-Redeemers is that Duke Energy is offering the coupons as a way to save energy (62.2% of Redeemers and 43.5% of Non-Redeemers). All answers given are summarized below.

Reason	Percent of Redeemers (N=127)	Percent of Non-Redeemers (N=92)
Duke Energy wants to save energy/reduce electrical demand	62.2%	43.5%
Duke Energy wants to save energy for environmental reasons	52.8%	30.4%
Duke Energy wants to save their customers money	32.3%	30.4%
To help customers use more or "get used to" CFLs	8.7%	5.4%
Duke Energy wants to look good	5.5%	12.0%
To avoid building new power plants	4.7%	2.2%
To raise awareness of energy efficiency	3.9%	3.3%
Duke Energy is trying to educate people	3.1%	1.1%
Kick-back from GE	2.4%	0.0%
The government is forcing Duke Energy to do it	1.6%	5.4%
Maybe it's a tax write-off	0.0%	1.1%
Duke Energy is concerned about new cap and trade rules	0.0%	1.1%
Duke Energy's CEO is big on energy conservation	0.0%	1.1%

Net to Gross Analysis

CFL Freeridership

TecMarket Works utilized three questions from the CFL coupon program redeemer survey to estimate CFL freeridership.

A gateway question asked survey respondents what their behavior would have been if the CFL coupon program had not been available. The four available responses were: a.) bought the same number of CFLs at the same time; b.) bought fewer CFLs at the same time; c.) bought the same number of CFLS at a later time; and d.) not bought any CFLs.

All respondents were also asked to report the number of CFLs installed in their home prior to participation in the CFL coupon program, and participants who indicated that they would have bought fewer CFLs at the same time were asked how many CFLs they would have purchased in absence of the CFL coupon program.

Assigning freeridership percentages

Fourteen participants who obtained 84 CFLs and responded that they would have obtained the same number of CFLs at the same time were assigned 100 percent freeridership. Fifteen participants who obtained 90 CFLs and responded that they would not have bought any CFLs were assigned zero percent freeridership.

Nine respondents who indicated that they would have bought fewer CFLs at the same time, were each assigned a freeridership component of 100 percent to each CFL that they said they would have purchased at the same time if the program had not been available. The sum is 15 CFLs at 100 percent freeridership.

For the 89 respondents who indicated that they would have purchased the same amount of CFLs, but at a later date, prior use of CFLs was used to determine the freeridership percentage according to Table 25 below.

Quantities of pre-installed CFLs range from zero to 28 among the 89 respondents who indicated having pre-installed CFLs.

Table 25. Freeridership Calculations for Participants who would have Purchased the Same Number of CFLs at a Later Time

Number of CFLs installed prior to program	Freerider ratio	Number of respondents	Number of CFLs Obtained	Equivalent Number of CFLs at 100 percent Freeridership (column two multiplied by column four)
0	0	18	108	0
1	0	4	24	0
2	0	13	81	0
3	0	7	42	0

4	0.25	10	60	15
5	0.25	4	24	6
6	0.25	8	48	12
7	0.5	0	0	0
8	0.5	5	30	15
9	0.5	2	12	0
10	0.75	4	24	18
11	0.75	0	0	0
12	0.75	5	30	22.5
13 or more	1	9	54	54
Total		**89**		**142.5**

Table 26. Program Freeridership

Gateway Question Response	Number of Respondents	Free Rider CFLs	Free Ridership Contribution
Same # of CFLs at same time	14	84	11.02%
Same # of CFLS at later time	89	142.5	18.70%
Fewer CFLs at same time	9	17	2.23%
No CFLs	15	0	0%
TOTAL	**127**	**243.5**	**31.95%**

Spillover

TecMarket Works utilized three questions to estimate the amount of spillover in the CFL coupon program: 1) Redeemers were asked if and how many CFLs they had purchased since purchasing the CFLs via the CFL coupon program; 2) Participants who indicated they had purchased additional CFLs were asked how many of the purchased CFLs were installed; 3) Participants were also asked to rate the influence of the CFL coupon program on their decision to purchase CFLs on a 1-to-10 scale with one meaning the program had no influence and ten meaning the program was very influential.

Participants who had indicated 100 percent freeridership were automatically assigned zero percent spillover. For the rest of the participants, the amount of CFLs bought at a later date by each participant was multiplied by an influence factor as shown in Table 27.

Table 27. Spillover Influence Multipliers

Influence of CFL coupon on later purchase	Spillover Influence multiplier
1	0
2	0.1
3	0.2
4	0.3
5	0.5
6	0.6
7	0.7
8	0.8

9	0.9
10	1

Survey respondents with spillover indicated a total of 213 CFLs were purchased after participating in the CFL coupon program. When each CFL was multiplied by the influence multiplier from Table 27, the resulting sum gives an equivalent of 136 CFLs at 100 percent spillover. This sum divided by the total number of CFLs purchased by survey respondents (N=762) gives a total spillover of 15.62%.

Additional Energy Efficiency Actions Taken

Redeemers were asked if they installed any of the items listed in Table 28 following their participation in the CFL coupon program.

Table 28. Additional Measures Installed after Redeeming Duke Energy's CFL Coupon, n=126

Measure	N	%
None	69	54.8%
Caulking	33	26.2%
Weather stripping	24	19.0%
Wall or ceiling insulation	16	12.7%
Programmable thermostat	14	11.1%
Low flow showerhead	14	11.1%
Faucet aerators	9	7.1%
Electric wall outlet gaskets	5	4.0%

Note: Survey participants were allowed multiple responses.

Additionally, 30 out of 126 (23.8%) survey respondents indicated that they had purchased and installed 56 higher-cost measures such as appliances, windows and heating and cooling equipment.

Table 29. Higher-Cost Measures Installed by Coupon Redeemers

Measure	Number of each installed
Washer and dryer	6
Furnace	3
Refrigerator	5
HVAC	2
Dishwasher	3
New Windows	31
Water heater	3
Heat pump	1
Oven	2

Participants were also asked to rate the influence, on a 1-to-10 scale, that participation in the CFL coupon program had on their decision to install or purchase additional energy efficient measures. The average influence rating across all participants who installed additional measures is 3.24. This indicates that the CFL coupon program is not the primary driver for the installation of additional energy efficient measures, but it does have some influence on additional purchasing decisions.

Impact Analysis

All CFLs purchased using the coupons were 13-watts. The average wattage of a replaced bulb was 61 watts. Table 30 shows the savings per bulb redeemed. The gross savings per bulb has been adjusted downward for the in-service rate (ISR) and incorporates daylength adjustments applied to the hours of use, while the net savings per bulb has been adjusted using the net to gross percentage computed from participants' survey responses as (1-freeridership) * (1+spillover).

Table 30. Adjusted Impact: kWh and Coincident kW per Bulb Redeemed

Metric	Result
Number of Bulbs	327
In Service Rate	81.2%
Gross kW per bulb	0.0086
Gross kWh per bulb	56.3
Freeridership rate	31.95%
Spillover rate	15.62%
Total Discounting to be applied to Gross values	21.32%
Net kW per bulb	0.0068
Net kWh per bulb	44.3
Measure Life	5 years
Effective useful life net kWh per bulb	222

Methodology

Primary data collected from survey participants was used to determine the number of CFL installations and mean wattage of bulb removed seen in Table 31. Average daily hours of use from the lighting logger study, seen in Table 32, were used in place of the self-reported values for impact calculation purposes.

From the CFL installation data, the in service rate (ISR) was calculated using the algorithm in the In Service Rate (ISR) Calculation section on page 62. Next, the unadjusted daily hours of use from the lighting loggers were adjusted for daylength in the Daylength Adjustment section on page 63. Finally, this data was combined as per Appendix G: Impact Algorithms on page 137 to calculate gross savings per bulb.

Self-Reported CFL Data

Participants were asked how many CFLs purchased using Duke Energy's CFL coupons were currently installed in light fixtures. Additional, more specific information was collected for a maximum of three bulbs, including the location of the CFL, the type and wattage of the bulb that it replaced, and the average hours per day that it is in use. The compilation of this data is presented in Table 31 in its unadjusted form, that is, before the daylength adjustments are applied to the hours of use. The adjusted values appear in Table 35. Note that lighting logger, not self-reported, hours of use were used for the impact calculations.

Table 31. Unadjusted CFL Self-Reported Survey Data

Room Type	Number of Installations (Self-Reported)	Average Wattage of Incandescent Bulb Removed	Average Daily Hours of Use (Incandescent; Self-Reported)	Average Daily Hours of Use (CFL; Self-Reported)
Basement	25	56	5.3	5.4
Other bedroom	11	65	4.0	4.4
Dining room	14	53	7.0	7.9
Hall	9	58	6.3	6.3
Kitchen	61	59	6.2	6.4
Living/family room	99	67	6.6	6.7
Master bedroom	43	59	4.1	4.2
Bathroom	25	63	4.2	4.2
Other	40	59	6.2	6.2
AVERAGE/TOTAL	**327**	**61**	**5.79**	**5.91**

Figure 21 graphically shows the prevalence of CFL installations in each room type in ascending order. The living/family room, kitchen, and master bedroom, in that order, are the three most popular room types for bulb replacements; together they make up 62% of all bulb installations.

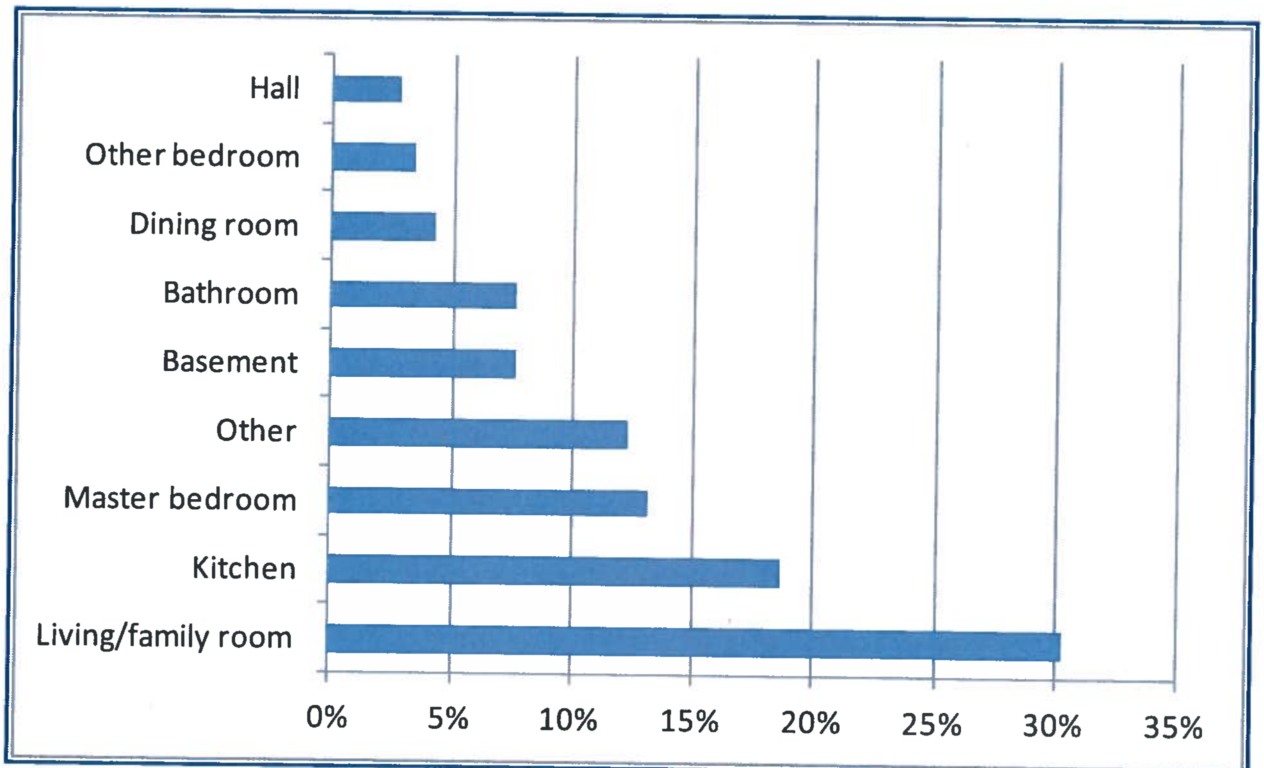


Figure 21. Percent of CFL Installations by Room Type

Lighting Logger CFL Data

In conjunction with the phone surveys, a lighting logger study was performed with a subset of phone survey participants. The purpose of this logger study was to determine how customers who redeem Duke Energy coupons are using CFLs (i.e., what room or fixture the bulbs are installed in), as well as to determine the actual hours of use of these CFLs. Hours of use by room type are shown in Table 32. Fixture type data is shown in Table 33.

Table 32. Lighting Logger Hours of Use by Room Type of Logged Bulbs

Room Type	Number of Logger Installations	Average Daily Hours of Use
Basement	12	1.94
Other bedroom	17	3.27
Dining room	4	5.58
Hall	1	0.55
Kitchen	17	6.65
Living/family room	27	4.44
Master bedroom	14	3.43
Bathroom	12	3.09
Other	7	2.37
TOTAL/AVERAGE	111	4.07[12]

Note: The overall average daily hours of use is a weighted average that uses CFL installation distribution data from the entire survey population, rather than the subset of lighting logger participants, to assign weights.

Table 33. Lighting Logger Fixture Types of Logged Bulbs

Fixture Type	Number of Logger Installations
Ceiling	31
Ceiling Fan	23
Floor Lamp	10
Hood light	1
Lamp	4
Table Lamp	30
Vanity light	12
TOTAL	111

The participants' loadshape is shown in Figure 22. As the shape demonstrates, lighting usage is at its peak around 8PM. The coincident load at 4PM, Duke Energy's peak time, is 18.76%.

[12] Weighted by number of installations from unadjusted CFL survey data (Table 31)

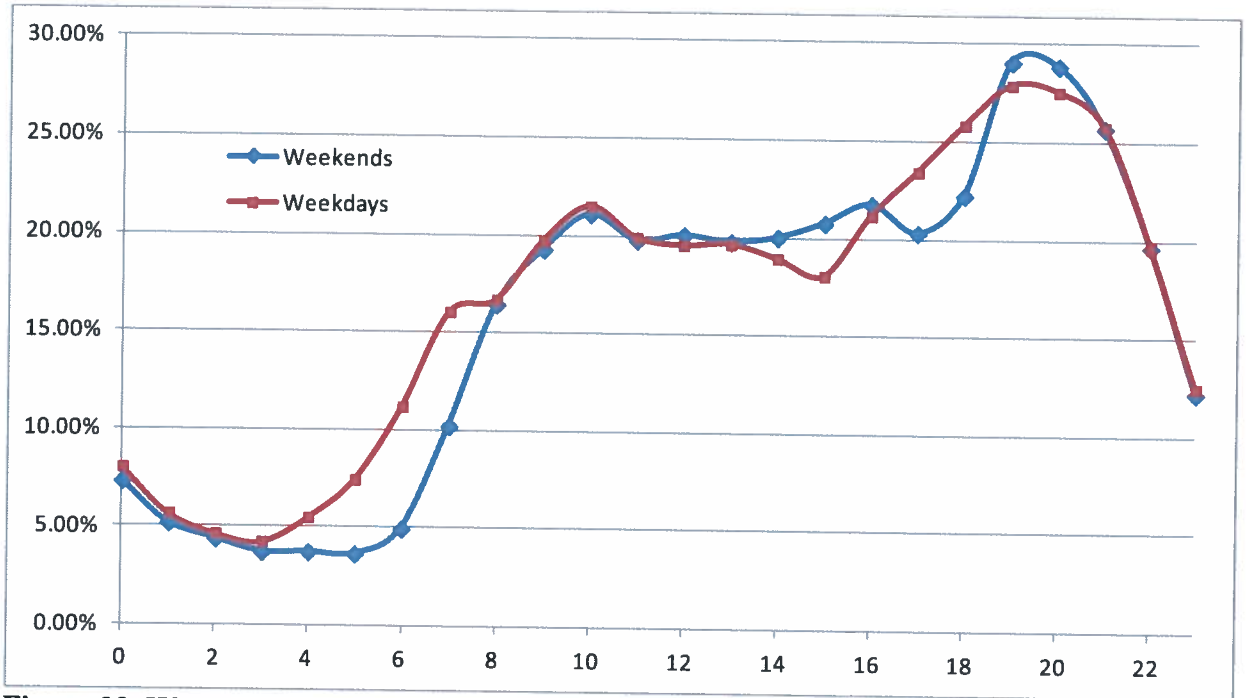


Figure 22. Weekend and Weekday Loadshapes

Daylength Adjustment

The frequency and length of time customers use their CFLs is affected by daylength. As days become longer and shorter throughout the year, the length of time a bulb needs to be used increases and decreases in rooms where natural lighting is used to offset CFL use. Depending on which time of the year lighting usage is measured, the amount of use recorded by the lighting loggers may over- or under-predict a customer's overall usage for the year. The amount of daylight during any given season is a factor of the position of the sun which determines the sunrise and sunset time and the number of hours of daylight. The increase and decrease in hours of daylight experienced throughout the year can be expressed as a sine function, and the average over- or under-prediction in hours of use as a result of increased or decreased daylight can be calculated using the following equation[13]:

Equation 1: Hours/day = hours/day average + Max deviation * sin(θd)

This approach was used by the Cadmus Group to analyze seasonal light logger data in a large residential CFL study in California. To calculate the impact of daylight on daily use, a regression analysis was used to estimate the average hours per day and maximum deviation variables in Equation 1 from observed light logger data. The right side of the function represents a progression through the year where the right hand term goes to zero on the spring and fall equinox, and is a maximum value at the winter solstice and a minimum value at the summer solstice.

[13] The Cadmus Group. "Upstream Lighting Program Evaluation Report. Prepared for CPUC". November 16th, 2009. Pg. 16.

Equation 2: $\theta d = 2\pi * (284 + n) / 365$
Where n = Julian date (1 = Jan 1; 365 = Dec 31)

The Cadmus regression model predicted the annual average hours of use and the maximum deviation. The ratio of the maximum deviation to the annual average represents the maximum percent difference in the daily hours of use relative to the annual average. Equation 2 above can be used to predict the percent over- or under-estimation of lighting hours on any particular day of the year. This is the daylength adjustment factor. The predicted maximum deviation from the annual average hours of use from the Cadmus study is on the order of ±16%.

To calculate the daylength adjustment factor for this study, Equation 2 was evaluated at the median date of the survey period (March 5th). This value was applied to the max deviation of ±16% to estimate the daylight adjustment as follows:

$$\theta d = 2\pi * (284 + n) / 365 = \mathbf{2\pi * (284 + 65.5) / 365 = 6.02}$$

Finally, Equation 1 is evaluated using the average hours per day determined through the lighting loggers to determine the daylength-adjusted actual average hours of use per day:

$$\text{Hours/day} = \text{hours/day average} + \text{Max deviation} * \sin(\theta d) = \mathbf{4.07 + 16\% * \sin(6.02) = 4.03}$$

Daylength-adjusted hours of use by room type can be seen in Table 35.

In Service Rate (ISR) Calculation

The data in the column headed "Number of Installations" of Table 31 and Table 35 represents the number of installations for which detailed information was collected, not the *total* number of installations. A total of 762 CFLs were purchased by survey participants. Respondents reported that 528 of them are currently installed in light fixtures, a first year ISR of 69.3%. The ISR is calculated to be 81.2% using the following formula:

$$\text{ISR} = \text{first year ISR} + (43\% * \text{remainder}) = \mathbf{69.3\% + (43\% * 27.7\%) = 81.2\%}$$

The remainder is the percentage of bulbs that are not installed in the first year (100% - 67.2% = 30.7%) less 3% for the 97% lifetime ISR[14]. In this case, the remainder is 27.7%. The 43% represents the percentage of the remainder that will replace an incandescent bulb rather than a CFL[15].

[14] As established in the Nexus Market Research, RLW Analytics, and GDS Associates study, dated January 20, 2009: "New England Residential Lighting Markdown Impact Evaluation".
[15] As established in the Nexus Market Research, RLW Analytics, dated October 2004: "Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs", table 6-4 where 24 out of 56 respondents indicated that they did not purchase the CFLs as spares.

Final Impact Estimates

Customers were asked if they had increased or decreased their lighting usage since installing the CFLs they received through the program. This enabled the detection of a slight increase in hours of use going from an incandescent bulb to a CFL, approximately two percent. This two percent has been applied to the hours of use data from the CFL logger study as a decrease, in order to calculate an incandescent baseline. Table 34 shows the unadjusted weighted average hours of use values across all 111 loggers along with the updated weighted average values after the daylength adjustments are applied. The final values for average daily hours of use are 3.95 and 4.03 for incandescent bulbs and CFLs, respectively.

Table 34. Adjusted Average Daily Hours of Use

Adjustment	Magnitude of Adjustment	Average Daily Hours of Use (Incandescent; Baseline)	Average Daily Hours of Use (CFL; Actual)
Unadjusted	N/A	3.99	4.07
Daylength	1%	3.95	4.03

Applying these adjustments on each individual room type allows a look at bulb savings by room type. The data in the "number of installations" column of Table 35 comes from the phone survey and is used to assign frequency weights to each room type for the purpose of calculating the weighted average across all room types. Again, bulb savings at the room type level is an unreliable figure and should not be used in any calculations. Only the weighted average across all room types, in the bottom row of Table 35, should be used.

Table 35. Adjusted CFL Logger Data with Gross Savings by Room Type

Room Type	Number of Installations (Self-Reported)	Average Wattage of Bulb Removed	Average Daily Hours of Use (Incandescent)	Average Daily Hours of Use (CFL)	kWh per Bulb	Kw per Bulb
Basement	25	56	1.86	1.90	23.4	0.0076
Other bedroom	11	65	3.17	3.23	48.7	0.0093
Dining room	14	53	5.43	5.54	64.0	0.0072
Hall	9	58	0.50	0.51	6.6	0.0080
Kitchen	61	59	6.48	6.61	86.7	0.0081
Living/family room	99	67	4.31	4.39	68.4	0.0096
Master bedroom	43	59	3.32	3.39	44.7	0.0082
Bathroom	25	63	2.98	3.04	43.6	0.0089
Other	40	59	2.28	2.33	30.9	0.0082
	327	**61**	**3.95**	**4.03**	**56.3**	**0.0086**

Total Program Savings Extrapolation

There were a total of 2,282 participants that redeemed coupons during the campaign[16]. These participants redeemed coupons for a total of 13,692 CFLs. This information is presented in Table

[16] Note that there were 1,648 additional coupons redeemed (for a total of 3,930) in the six months following the coupon's expiration date, for a total of 23,580 CFLs.

36. Multiplying the number of bulbs by the ISR yields the number of bulbs in service. The bulbs in service are then multiplied by the savings per bulb for the program to produce total annual program kW and kWh savings.

Table 36. Total Program Gross Savings Extrapolation

Participation Count	Number of Bulbs	In Service	Gross kWh	Gross kW
2,282	13,692	11,118	770,490	123.2

Self-Reporting Bias

This study included customer surveys and lighting loggers, both reporting average daily hours of use. Additionally, while auditors were installing lighting loggers, participants were asked once more to provide an estimate of average daily hours of use. As a result, there are three categories of measurements to compare: self-reported from the phone survey, self-reported to an auditor in person, and finally, actual hours of use collected by the lighting loggers. There were 30 individual bulbs out of 111 that had valid, overlapping data for all three categories. The results of the comparison are in Table 34. All values have been adjusted for daylength: the logger and audit data around the median date of the logger study, March 5th, and the phone survey data around the median date of the calling period, October 21st.

Table 37. Self-Reported vs. Actual Hours of Use

Room Type	Number of Installations	Actual (Logger) Hours of Use	Self-Reported (Audit)		Self-Reported (Phone)	
			Hours of Use	Percent Diff.	Hours of Use	Percent Diff.
Basement	2	5.12	2.96	-42%	7.42	45%
Other bedroom	5	4.65	4.22	-9%	7.32	58%
Kitchen	8	6.28	5.08	-19%	6.42	3%
Living/family room	7	4.61	3.39	-26%	4.99	9%
Master bedroom	6	3.99	5.04	26%	5.75	44%
Bathroom	1	1.96	1.96	0%	1.42	-25%
Other	1	0.18	1.46	582%	3.42	1492%
AVERAGE/TOTAL	**30**	**4.74**	**4.17**	**-12.0%**	**5.90**	**24.6%**

While there are too few data points to draw statistically significant conclusions, an interesting trend is observed. Comparing participants' self-reported hours of use to the actual hours of use shows that, on average, participants *over*estimated their lighting usage by about 25% when responding to the phone survey, while those same participants *under*estimated their lighting usage by about 12% when responding to an auditor in person. (As previously explained, the lighting logger, not self-reported hours of use, were used for the impact calculations.)

Appendix A: Management Interview Instrument

Name: ______________________________

Title: ______________________________

Position description and general responsibilities:

____

____

____

We are conducting this interview to obtain your opinions about and experiences with the Kentucky CFL campaign. We'll talk about the Kentucky CFL campaign and its objectives, your thoughts on improving the program, and the technologies the program covers. The interview will take about an hour to complete. May we begin?

General Description of Program

1. Describe the Kentucky CFL campaign. How has the program changed since it was it first started?

Program Objectives

2. In your own words, please describe the Kentucky CFL campaign's current objectives. How have these changed over time?

3. In your opinion, which objectives do you think are best being met or will be met?

4. Are there any program objectives that are not being addressed or not being addressed as well as possible or that you think should have more attention focused on them? If yes, which ones? How should these objectives be addressed? What should be changed?

5. Should the program objectives be changed in any way due to technology-based, market-based, or management based conditions? What objectives would you change? What program changes would you put into place as a result, and how would it affect the operations of the program?

Operational Efficiency (Manager's Role)

6. Please describe your role and scope of responsibility in detail. What is it that you are responsible for as it relates to this program? When did you take on this role? *If a recent change in management...*Do you feel that Duke Energy gave you enough time to adequately prepare to manage this program? Did you get all the support that you needed to manage this program?

7. Please review with us how the Kentucky CFL campaign operates relative to your duties, that is, please walk us through the processes and procedures and key events that allow you do currently fulfill your duties.

8. Have any recent changes been made to your duties? If so, please tell us what changes were made and why they were made. What are the results of the change?

Program Design & Implementation

Retailer Practices

9. *(If not captured earlier)* Please explain how the interactions between the retailers, customers and the Kentucky CFL campaign management team work. Do you think these interactions or means of communication should be changed in any way? If so, how and why?

10. Describe your quality control and tracking process.

11. Are key industry experts, trade professionals or peers used for assessing what the technologies or models should be included in the program? If so, how does this work?

12. Are key industry experts and trade professionals used in other advisory roles such as market or marketing experts or industry professionals? If so how does this work and what kind of support is obtained?

13. Describe the Kentucky CFL campaign retailer program orientation training and development approach. Are retailers getting adequate program information? What can be done that could help improve retailer effectiveness? Can we obtain any informational materials that are being used?

Market Info

14. What market information, research or market assessments are you using to determine the best target markets or market segments to focus on?

15. What market information, research or market assessments are you using to identify market barriers, and develop more effective delivery mechanisms?

16. Anything on the horizon that you think will impact the sales or use of CFL or incandescent bulbs? What is that and how do you think it will affect your program

Overall Strengths, Needs, and Suggestions

17. Overall, what about the Kentucky CFL campaign works well and why?

18. What doesn't work well and why? Do you think this discourages participation or interest?

19. Do you have suggestions for improvements to the program that would increase participation rates or interest levels?

20. Do you have suggestion for the making the program operate more smoothly or effectively?

21. Do you have suggestions for improving or increasing energy impacts?

<u>Operational, Market, & Technical Barriers and Suggestions</u>

22. Can you identify any market, operational or technical barriers that impede a more efficient program operation?

23. In what ways can these operations or operational efficiencies be improved?

<u>Attracting More Participation (Suggestions)</u>

24. In what ways can the program attract more vendors/retailers?

25. In what ways can the program attract more consumer participation?

<u>Assessment Basis</u>

26. How do you make sure that the best information and practices are being used in the Kentucky CFL campaign?

27. *(If not collected in #14 or other above)* What market information, research or market assessments are you using to determine the best target markets and program opportunities, market barriers, delivery mechanisms and program approach?

<u>Closing Suggestions and Comments</u>

28. If you could change any one thing about the program, what would you change and why?

29. Are there any other issues or topics you think we should know about and discuss for this evaluation?

Appendix B: Redeemer Survey Instrument

Use four attempts at different times of the day and different days before dropping from contact list. Call times are from 10:00 a.m. to 8:00 p.m. EST or 9-7 CST Monday through Saturday. No calls on Sunday. (Targeted sample size for completed surveys =80 participants and 80 Low Income participants.)

SURVEY

Introduction

Note: Only read words in bold type.
for answering machine 1st through penultimate attempts:
Hello, my name is ___ and I'm calling on behalf of Duke Energy to conduct a survey about Compact Fluorescent Light bulbs. I'm sorry I missed you. I'll try again another time.

for answering machine - Final Attempt:
Hello, this is ____ calling again on behalf of Duke Energy with a customer survey. This is my last attempt at reaching you, my apologies for any inconvenience.

Note: Only read words in bold type.

Hello, my name is ______. I am calling on behalf of Duke Energy to conduct a customer survey about the Duke Energy CFL Coupon Program. This was a program that provided a coupon for a discount on compact fluorescent light bulbs. May I speak with _____________ please?

If person talking, proceed. If person is called to the phone reintroduce.
If not home, ask when would be a good time to call and schedule the call-back:

Call 1:	Date: __________,	Time: _____________	❑AM or ❑PM
Call back 2:	Date: __________,	Time: _____________	❑AM or ❑PM
Call back 3:	Date: __________,	Time: _____________	❑AM or ❑PM
Call back 4:	Date: __________,	Time: _____________	❑AM or ❑PM

❑ Contact dropped after fourth attempt.

We are conducting this survey to obtain your opinions about the Duke Energy CFL Coupon Program. Duke Energy's records indicate that you participated in the program by redeeming a coupon for a six-pack of CFLs. We are not selling anything.
Your responses to our survey questions will be confidential, and will help us to make improvements to the program to better serve others. May we begin the survey?

If yes or questioning how long it will take...

The survey will take about 20-30 minutes, but when we are done with the survey I will confirm your address and we will send you $20 for your time today.

Note: If this is not a good time, ask if there is a better time to schedule a callback.

1. **Do you recall participating in the CFL coupon program?**

1. ❑ Yes, *begin* → *Skip to Q2.*
2. ❑ No,
99. ❑ DK/NS

This program was provided through Duke Energy. In this program, Duke Energy provided you with a coupon for $8 savings on a six-pack of 13-watt CFLs.

2. Do you remember participating in this program?

1. ❑ Yes, *begin* → *Go to Q2.*
2. ❑ No,
99. ❑ DK/NS

If No or DK/NS terminate interview and go to next participant.

3. **Why did you decide to take advantage of the offer?** (Select all that apply)
   a. ___ I needed light bulbs
   b. ___To save energy
   c. ___ Because it was free
   d. ___To save money
   e. ___To try CFLs
   f. ___ It was environmentally correct
   g. ___ Offer made it easy to get bulbs (convenient)
   h. ___ The bulbs last longer than standard bulbs
   i. ___Other (please specify):

4. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the ease of using your CFL coupons.**

very dissatisfied									very satisfied	
1	2	3	4	5	6	7	8	9	10	DK/NS

If 7 or less, 4a. **Why were you dissatisfied with the ease of using your CFL coupon?**

____

____

5. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the process for obtaining your CFLs at a local retailer.**

very dissatisfied									very satisfied	
1	2	3	4	5	6	7	8	9	10	DK/NS

If 7 or less, 5a. **Why were you dissatisfied with the process?**

____

____

If 7 or less, 5b. **Would you have preferred another method to obtain the CFLs?**

a. Yes (**which method?** ______)
b. No
c. Don't know

On a 1-to-10 scale with 1 being very unlikely and 10 being very likely, please rate your likelihood of participating in a CFL program that:

Note: Half of the surveyed participants will be asked this series of questions with "free", and half will be surveyed with "discounted". If a customer asks about the level of discounting, tell them to assume half off normal CFL cost.

6. **Offers free** [or discounted] **CFLs by direct-mail sent to your home**

very unlikely								very likely		
1	2	3	4	5	6	7	8	9	10	DK/NS

7. **Offers free** [or discounted] **CFLs through a retailer or store coupon**

very unlikely								very likely		
1	2	3	4	5	6	7	8	9	10	DK/NS

8. **Offers free** [or discounted] **CFLs through a manufacturers coupon that can be used at any store where that brand is sold)**

very unlikely								very likely		
1	2	3	4	5	6	7	8	9	10	DK/NS

9. **Offers free** [or discounted] **CFLs at a stand at a community event such as a fair**

very unlikely								very likely		
1	2	3	4	5	6	7	8	9	10	DK/NS

10. **Offers free** [or discounted] **CFLs at a stand in a public parking lot**

very unlikely								very likely		
1	2	3	4	5	6	7	8	9	10	DK/NS

11. **Offers free** [or discounted] **CFLs through an online vendor such as Amazon.com**

very unlikely								very likely		
1	2	3	4	5	6	7	8	9	10	DK/NS

Note: If a customer asks about the level of discounting, tell them to assume half off normal CFL cost.

12. **I'd like to talk about the CFLs you received from this program. Our records indicate that you purchased 6 CFLs with the coupon, is this correct?**
    a. Yes
    b. No
    c. Don't Know

12a. *If no to Q13*, **how many CFLs did you purchase?**
Enter response: ________________

13. **How many of the CFLs have you installed?**
Enter response: ________________

Now I'm going to ask you about each bulb you put into a light fixture…

14. **For the** [first, second, third] **CFL, in which room was the bulb installed?**
    a. Living/family room
    b. Dining room
    c. Kitchen
    d. Master bedroom
    e. Bedroom 2
    f. Bedroom 3 or other bedroom
    g. Hall
    h. Closet
    i. Basement
    j. Garage
    k. Other (specify_______)

14a. **Was the bulb you removed a standard bulb or a CFL?** (*repeat for up to 3 installed*)

a. Standard Incandescent
b. CFL
c. There was no bulb in the socket
d. Don't Know

14b. **How many watts was the old bulb that you took out?** (*repeat for up to 3 installed*)

a. Less than 44
b. 45-70
c. 71-99
d. 100 or more

14c. **On average, approximately how many hours per day is this light used?** (*repeat for up to 3 installed*)

a. Less than 1
b. 1 to 2
c. 3 to 4
d. 5 to 10
e. 11 to 12
f. 13 to 24

14d. **Did the hours of use for this fixture increase, decrease or stay the same since you replaced the old bulb with the CFL?**

a. Increased (**how many hours?____**)
b. Decreased (**how many hours?_____**)
c. Stayed the same

If less than 6 were installed:

15. **What have you done with the remaining CFLs that were not installed?**
a. Put them in storage
b. Gave them away **(15b. To whom ?______)** -- *ask question 15b then skip to Q20*
c. Threw them out - *skip to Q20*
d. Recycled them - *skip to Q20*
e. Other (please specify) _______

15b. **How many did you give away?** ________ ❑ DK

16. *If answered a. to question (15), ask (16-18)* – **Do you plan on using the remaining CFLs?**

a. Yes
b. No **Why Not?** ______________________________
c. Maybe/DK

17. **Thinking of the CFL bulbs you have stored for later use, what are the reasons that you have not installed these bulbs?**
(Select all that apply)

a. ___ I am waiting for my other standard bulbs to burn out – *ask 18a*
b. ___ I am waiting for my other CFL bulbs to burn out
c. ___I already have CFLs installed everywhere they will fit
d. ___The other lamps or light fixtures in my home are on a dimmer and don't work with the CFLs
e. ___The CFL bulbs are too dim for the other locations where I could install them
f. ___I don't like the way the CFL bulbs look in some of my fixtures
g. ___Other (please specify):

17a. **How many standard incandescent bulbs do you have in storage to replace bulbs that burn out?**

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7-11
i. 12+
j. Don't Know

18. **How long do you think it will be before you will have used all of the discounted bulbs you received from the Duke Energy coupon program?**

k. less than 1 year
l. 1-2
m. 2-3
n. 3-4
o. 4-5
p. more than 5 years
q. Don't Know

19. **Have you removed any of the CFLs you installed that you bought with the coupon?**

a. Yes (**How many?**________)
b. No (*skip to Q22*)

20. *If yes to Q20*, **Why did you remove them**?
    c. Not bright enough
    d. Did not like the color of the light
    e. The light was too bright
    f. Too slow to start
    g. Burned out
    h. Not working properly
    i. Did not like appearance/shape of the bulbs
    j. Other (**Please specify**__________)

21. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the light quality of the CFLs purchased with the coupon**

very dissatisfied									very satisfied	
1	2	3	4	5	6	7	8	9	10	DK/NS

If 7 or less, 21a. **Why were you dissatisfied with the light quality**?

____

____

22. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the overall bulb quality of your CFLs.**

very dissatisfied									very satisfied	
1	2	3	4	5	6	7	8	9	10	DK/NS

If 7 or less, 22a. **Why were you dissatisfied with the quality of the CFLs**?

____

____

23. **Before you received the CFL coupon from Duke Energy, had you already been considering installing CFLs in your home?**

    a) Yes
    b) No
    c) Don't Know

23a. *If yes to Q23*, **How many CFLs were you using in your home when you purchased the CFLs using the coupon from Duke Energy?**

____ bulbs
____ Don't know

24. **How long have you been using CFLs?**
    a. Never purchased until now
    b. 1 year or less
    c. 12 to 24 months (2 years)
    d. 25 to 36 months (3 years)
    e. 37 to 48 months (4 years)
    f. 4 or more years

25. **If the CFL coupon had not been available, would you have:**
    a. **Purchased the same amount of CFLs at the same time**
    b. **Purchased fewer CFLs at the same time**
        i. *If b*, **How many?**
    c. **Purchased CFLs at a later time**
        i. *If c*, **When?**
        ii. *If c*, **How many?**
    d. **Not purchased CFLs**

26. **On a scale from 1-10, with 1 indicating that you were very dissatisfied, and 10 indicating that you were very satisfied, please rate your satisfaction with the 13-watt CFL(s) redeemed with the coupon.**

very dissatisfied									very satisfied	
1	2	3	4	5	6	7	8	9	10	DK/NS

If 7 or less, 15a. **Why were you dissatisfied with the 13-watt CFLs?**

____

____

27. **At which store did you purchase the CFLs with the coupon?** __________

28. **On a scale from 1-10, with 1 indicating that the factor was not at all influential, and 10 indicating that the factor was very influential, please rate the level of influence of the following factors on your decision to obtain CFLs through the Duke coupon program.**

28a. **Duke Energy advertising on TV, Radio, or newspaper**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28b. **Advertising on Duke Energy's Web site**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28c. **Duke Energy advertising on social media sites such as Facebook**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28d. **The brand of CFLs offered by the program** (GE Smart Energy 13-watt bulbs)

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28e. **Other non-Duke Energy advertising**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28f. **Friends or family by word of mouth**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28g. **Friends or family by email**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28h. **Friends or family by social media such as Facebook**

Not at all influential — very influential

1 2 3 4 5 6 7 8 9 10 DK/NS

28i. **Someone you don't know personally or a group that you follow on Facebook or Twitter**

Not at all influential very influential
1 2 3 4 5 6 7 8 9 10 DK/NS

28j. **Your desire to save energy**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10 DK/NS

28k. **Your desire to save on utility costs**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10 DK/NS

28l. **Your desire to be environmentally responsible.**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10 DK/NS

On a 1-to-10 scale with 1 being not at all important and 10 being very important, please rate the importance of each of the following characteristics on choosing a light bulb for your home

28aa. **Mercury content of the bulb**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28bb. **Ability to dim the lighting level**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28cc. **Speed of which the bulb comes up to full lighting level**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28dd. **Purchase price of the bulb**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28ee. **Availability of the bulb in stores you normally shop**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28ff. **Selection of wattage and light output levels available**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28gg. **Cost savings on your utility bill**
Not at all important very important

1 2 3 4 5 6 7 8 9 10 DK/NS

28hh **Energy savings**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28ii. **Attractiveness or appearance of the bulb**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28jj. **Recommendations from family and friends**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28kk. **Recommendations from the utility company**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28ll. **Availability of utility programs or services that offer the bulbs to you directly**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

28mm. **Ease of bulb disposal**
Not at all important very important
1 2 3 4 5 6 7 8 9 10 DK/NS

29. **Did you tell anyone about the CFL coupon program?**
   a. Yes (*ask 29a and 29b*)
   b. No
   c. Don't know

   29a. **Who did you tell?** *(add number to all that apply)*
      i. ____Friends **(How many?)**
      ii. ____Family **(How many?)**
      iii. ____Co-workers **(How many?)**
      iv. ____Neighbors **(How many?)**
      v. ____Other **(How many?)**

   29b. **How did you tell them?**
      vi. Word of mouth
      vii. Email
      viii. Facebook
      ix. Twitter
      x. Web site forum

30. **Have you purchased any additional CFLs since using the Duke Energy coupon?**

    a. Yes – *ask 30a, 30b and 30c.*
    b. No
    c. Don't Know

    If yes to Q30, 30a. **How many did you purchase?** ________________

    If yes to Q30, 30b. **How many of those are you currently using?**____

    If yes to Q30, 30c. **Using a 1 to 10 scale, with 1 meaning that the Duke program had no influence, and a 10 to mean that the Duke program was very influential, please rate the influence of the Duke Energy discount CFL program on your decision to purchase additional CFLs.**

Not at all influential									very influential	
1	2	3	4	5	6	7	8	9	10	DK/NS

31. **Considering future CFL purchases, how many CFL bulbs would you purchase in the next year if they were…**
    a. **The same price as standard bulbs (___)**
    b. **$1 more than standard bulbs (___)**
    c. **$2 more than standard bulbs (___)**
    d. **$3 more than standard bulbs (___)**
    e. **Free, but you had to mail in a rebate form to get your money back (___)**
    f. **Free, but you had to fill out a form online (_)**

32. **What is your best estimate of the number of bulbs installed in your home that are not CFLs?**

    ____

33. **How many of these non-CFL bulbs are in sockets that are typically used for more than 2 hours a day?**

    ____

34. **Please list the number of bulbs currently installed in your home that are specialty bulbs such as dimmable bulbs, three-way bulbs, recessed, flood or directional lights, candelabra lights or other non-standard bulbs…** *How many <a> do you have in your home?... how many <b>, etc.*
    a. ____**dimmable bulbs**
    b. ____**Outdoor flood bulbs**
    c. ____**three-way bulbs**
    d. ____**spotlight bulbs**

e. ____ **recessed bulbs**
f. ____**candelabra bulbs**
g. ____**Other (specify)**____________

35. **For each of these specialty bulbs installed, how many are CFLs?**
    a. ____**dimmable CFLs**
    b. ____**Outdoor flood CFLs**
    c. ____**three-way CFLs**
    d. ____**spotlight CFLs**
    e. ____ **recessed CFLs**
    f. ____**candelabra CFLs**
    g. ____**Other (specify)**____________

36. **On a scale from 1-10, with 1 indicating not at all interested and 10 indicating very interested, please rate your interest in Duke Energy providing a direct mail specialty CFL program that shipped discounted specialty bulbs directly to your home:**

Not at all interested — very interested

1 2 3 4 5 6 7 8 9 10 DK/NS

Please tell me if you would be interested in receiving the following types of CFLs if they were to be offered in the future…

37. **Dimmable CFLs**
    a. Yes **(about how many hours per day would these bulbs be used?___)**
    b. No
    c. Don't Know

38. **Outdoor flood CFLs**
    a. Yes **(about how many hours per day would these bulbs be used?___)**
    b. No
    c. Don't Know

39. **Three-way CFLs**
    a. Yes **(about how many hours per day would these bulbs be used?___)**
    b. No
    c. Don't Know

40. **Spotlight CFLs**
    a. Yes **(about how many hours per day would these bulbs be used?___)**
    b. No
    c. Don't Know

41. **Candelabra CFLs**

a. Yes **(about how many hours per day would these bulbs be used?___)**
b. No
c. Don't Know

42. *(if responder indicated a different specialty bulb)* **Other** _
a. Yes **(about how many hours per day would these bulbs be used?___)**
b. No
c. Don't Know

Since you redeemed the Duke Energy CFL coupon…

43. **Have you changed any of your habits or behaviors related to energy use?**

a. ❑ Yes **Please specify**:___________
b. ❑ No
c. ❑ Don't Know

44. **Have you made energy efficiency improvements in your home, such as..**

a. -----Wall or ceiling insulation
b. -----Caulking
c. -----Faucet aerators
d. -----Outlet or switch gaskets
e. -----Low flow showerhead
f. -----Programmable thermostat,
g. -----Weather stripping?
h. -----None of these

45. **Have you purchased and installed any energy efficiency equipment (such as high efficiency appliances, windows or heating and cooling equipment?**

a. ❑ Yes
b. ❑ No
c. ❑ Don't Know

If any of the responses to questions 45 are "yes", ask 46 & 47.
If all responses are "no" or "Don't Know", skip to question #48.

46. **What type and quantity of high efficiency equipment / improvements did you install on your own?** *PROBE TO GET EXACT TYPE AND QUANTITY AND LOCATION*

Type 1: ___________________ Quantity 1: ______ Location 1:___________
Type 2: ___________________ Quantity 2: ______ Location 2:___________
Type 3: ___________________ Quantity 3: ______ Location 3:___________
Type 4: ___________________ Quantity 4: ______ Location 4:___________

47. *For each type listed in Q46 above,* **How do you know that this equipment is high efficiency? For example, was it Energy Star rated?**

Type 1: ______________________________
Type 2: ______________________________
Type 3: ______________________________
Type 4: ______________________________

48. **Please rate the influence of your experience with the Duke Energy CFL coupon program regarding your decision to purchase additional equipment on your own on a scale from 1-10, with 1 indicating that the coupon program was not at all influential, and 10 indicating that the coupon program was very influential:**

Not at all influential								very influential		
1	2	3	4	5	6	7	8	9	10	DK/NS

49. **How often do you use the Duke Energy Web Site?**
    a. Often (once a month or more)
    b. Sometimes (less than once a month)
    c. Never

50. **How would you rate your level of energy efficiency in your home before you participated in Duke Energy's CFL program on a scale from 1-10, with 1 indicating that you feel your home is not energy efficient at all, and 10 indicating that your home is very energy efficient:**

Not at all efficient								very efficient		
1	2	3	4	5	6	7	8	9	10	DK/NS

51. **Have you added any major electrical appliances to your home in the past year?**
    a. Yes
    b. No

52. **Are you aware of the ENERGY STAR label?**
    a. Yes
    b. No.

53. **Do you typically look for the ENERGY STAR label when purchasing an appliance?**
    a. Yes

b. No

54. **Do you typically buy appliances with the ENERGY STAR label?**
    a. Yes, all of the time
    b. Yes, some of the time
    c. No, never

55. **Why do you believe that Duke Energy is providing discounted CFLs to their customers?**
    a. ___Duke Energy wants to save their customers money
    b. ___Duke Energy wants to save energy for environmental reasons
    c. ___Duke Energy wants to save energy for economic reasons
    d. ___Duke Energy wants to look good (PR)
    e. ___The government is forcing Duke Energy to do it
    f. ___Other (specify)

56. **Are you currently a participant in any of the following Duke Energy programs** (*check all that apply*)**:**
    a. **___Power Manager**
    b. **___Residential Smart Saver**
    c. **___Home Energy House Call**
    d. **___Home Energy Comparison Report**
    e. **___Personalized Energy Report**
    f. **___Online Services**

For all programs not checked in Q56, ask the following question
NOTE: Do not read name of program before description, though you may let them now afterwards.

On a scale from 1-10, with 1 indicating not at all interested and 10 indicating very interested, please rate your interest in Duke Energy providing the following programs:

56a. (*Power Manager*) **A program that provides bill credits in exchange for allowing Duke Energy to temporarily cycle your air conditioning unit during periods of high use**

Not at all interested								very interested		
1	2	3	4	5	6	7	8	9	10	DK/NS

56b. (*Residential Smart Saver*) **A program that provides rebates for energy efficient improvements to your house such as energy efficient heating and cooling units.**

Not at all interested								very interested		
1	2	3	4	5	6	7	8	9	10	DK/NS

56c. (*Home Energy House Call*) **A program in which an assessor comes to your house, suggests energy efficiency improvements, and Duke Energy provides certain low-cost improvement materials for free.**

Not at all interested — very interested

1 2 3 4 5 6 7 8 9 10 DK/NS

56d. (*Home Energy Comparison Report*) **A program that provides an ongoing comparison of your energy use with that of people who live in similar homes**

Not at all interested — very interested

1 2 3 4 5 6 7 8 9 10 DK/NS

56e. (*Personalized Energy report*) **A program that provides personalized energy analysis and ways to save energy and money by filling out a few questions about your home either online or by mail.**

Not at all interested — very interested

1 2 3 4 5 6 7 8 9 10 DK/NS

On a scale from 1-10, with 1 indicating that you were very dissatisfied, and 10 indicating that you were very satisfied, please rate your satisfaction with…

57. **the dollar savings amount of the Duke Energy CFL coupon**

1 2 3 4 5 6 7 8 9 10 DK/NS

❑ Don't Know

If 7 or less, **How could this be improved?**______________________________

____

58. **the CFL coupon program overall.**

1 2 3 4 5 6 7 8 9 10 DK/NS

❑ Don't Know

If 7 or less, **How could this be improved?**______________________________

____

59. **Duke Energy overall**

1 2 3 4 5 6 7 8 9 10 DK/NS

❑ Don't Know

If 7 or less, **How could this be improved?**____

____

60. **What did you like most about the CFL coupon program?**

Response: ____

61. What did you like least about the CFL coupon program?

Response: ____

62. **What other services could Duke Energy provide to help improve home energy efficiency?**

Response: ____

Finally, we have some general demographic questions…

63. **In what type of building do you live?**
    - **a. Single-family detached building**
    - **b. Mobile Home/Manufactured home**
    - **c. Condominium**
    - **d. Duplex/two-family**
    - **e. Multi-family building (3 or more units)**
    - **f. Townhouse**

64. **What year was your residence built?**
    - a. 1959 and before
    - b. 1960-1979
    - c. 1980-1989
    - d. 1990-1997
    - e. 1998-2000
    - f. 2001-2007
    - g. 2008-present
    - h. Don't Know

65. **How many rooms are in your home (excluding bathrooms, but including finished basements)?**

a. None
b. 1 to 3
c. 4
d. 5
e. 6
f. 7
g. 8
h. 9
i. 10 or more

66. **What is the primary fuel used in your heating system?**
   a. Electricity
   b. Natural Gas
   c. Oil
   d. Propane
   e. Other (please specify) _______

67. **What is the secondary fuel used in your primary heating system, if applicable?**
   f. Electricity
   g. Natural Gas
   h. Oil
   i. Propane
   j. Other (please specify) _______
   k. None

68. **Which of the following best describes your home's heating system?**
   a. None
   b. Central forced air furnace
   c. Electric Baseboard
   d. Heat Pump
   e. Geothermal Heat Pump
   f. Other (please specify) _______

69. **How old is your heating system?**
   a. 0 to 4 years
   b. 5 to 9 years
   c. 10 to 14 years
   d. 15 to 19 years
   e. more than years
   f. Don't know

g. Do not have

70. **Do you use one or more of the following to cool your home?** ***(Mark all that apply)***

___None, do not cool the home
___Heat pump for cooling
___Central air conditioning
___Through the wall or window air conditioning unit
___Geothermal Heat pump
___Other (specify?______)

71. **What is the fuel used in your cooling system?**

a. Electricity
b. Natural Gas
c. Oil
d. Propane
e. Other (please specify) _______
f. None

72. **How old is your cooling system?**

a. 0 to 4 years
b. 5 to 9 years
c. 10 to 14 years
d. 15 to 19 years
e. 19 years or older
f. Don't know
g. Do not have

73. **How many window-unit or "through the wall" air conditioner(s) do you use?**

a. None
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7
i. 8 or more

74. **What is the fuel used by your water heater?** *(Mark all that apply)*

a. ___Electricity
b. ___Natural Gas

c. ___Oil
d. ___Propane
e. ___Other (please specify) _______
f. ___No water heater

75. **How old is your water heater?**
    a. 0 to 4 years
    b. 5 to 9 years
    c. 10 to 14 years
    d. 15 to 19 years
    e. more than 19 years

76. **What type of fuel do you use for indoor cooking on the stovetop or range?** *(Mark all that apply)*
    a. ___Electricity
    b. ___Natural Gas
    c. ___Oil
    d. ___Propane
    e. ___Other (please specify) _______
    f. ___No stovetop or range

77. **What type of fuel do you use for indoor cooking in the oven?** *(Mark all that apply)*
    a. ___Electricity
    b. ___Natural Gas
    c. ___Oil
    d. ___Propane
    e. ___Other (please specify) _______
    f. ___No oven

78. **What type of fuel do you use for clothes drying?** *(Mark all that apply)*
    a. ___Electricity
    b. ___Natural Gas
    c. ___Oil
    d. ___Propane
    e. ___Other (please specify) _______
    f. ___No clothes dryer

79. **About how many square feet of living space are in your home?** ***(Do not include garages or other unheated areas)***

Note: A 10 foot by 12 foot room is 120 square feet

   a. Less than 500
   b. 500 – 999
   c. 1000 – 1499
   d. 1500 – 1999
   e. 2000 – 2499

f. 2500 – 2999
g. 3000 – 3499
h. 3500 – 3999
i. 4000 or more
j. Don't know

80. **Do you own or rent your home?**
    a. Own
    b. Rent

81. **How many levels are in your home (not including your basement)?**
    a. One
    b. Two
    c. Three

82. **Does your home have a heated or unheated basement?**
    a. Heated
    b. Unheated
    c. No basement

83. **Does your home have an attic?**
    a. Yes
    b. No

84. **Are your central air/heat ducts located in the attic?**
    a. Yes
    b. No
    c. Not applicable

85. **Does your house have cold drafts in the winter?**
    a. Yes
    b. No

86. **Does your house have sweaty windows in the winter?**
    a. Yes
    b. No

87. **Do you notice uneven temperatures between the rooms in your home?**
    a. Yes
    b. No

88. **Does your heating system keep your home comfortable in winter?**
    a. Yes
    b. No

89. **Does your cooling system keep your home comfortable in summer?**
    a. Yes
    b. No

90. **Do you have a programmable thermostat?**
    a. Yes
    b. No

91. **What temperature is your thermostat set to on a typical summer weekday afternoon?**
    a. Less than 69 degrees
    b. 69-72 degrees
    c. 73-78 degrees
    d. Higher than 78 degrees
    e. Off
    f. DK

92. **What temperature is your thermostat set to on a typical winter weekday afternoon?**
    g. Less than 67 degrees
    h. 67-70 degrees
    i. 71-73 degrees
    j. 74-77 degrees
    k. Higher than 78 degrees
    l. Off
    m. DK

93. **Do You Have a Swimming Pool or Spa?**
    a. Yes
    b. No

94. **Would a two-degree increase in the summer afternoon temperature in your home affect your comfort….**
    a. Not at all
    b. Slightly
    c. Moderately, or
    d. Greatly

95. **How many people live in this home?**

    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

g) 7
h) 8 or more

96. **How many persons are usually home on a weekday afternoon?**

a) 0
b) 1
c) 2
d) 3
e) 4
f) 5
g) 6
h) 7
i) 8 or more

97. **Are you planning on making any large purchases to improve energy efficiency in the next 3 years?**
    a. Yes
    b. No
    c. Not sure

The following questions are for classification purposes only and will not be used for any other purpose than to help Duke Energy continue to improve service.

98. **What is your age group?**

a. 18-34
b. 35-49
c. 50-59
d. 60-64
e. 65-74
f. Over 74

99. **Please indicate your annual household income.**

a. **Under $15,000**
b. **$15,000-$29,999**
c. **$30,000-$49,999**
d. **$50,000-$74,999**
e. **$75,000-$100,000**
f. **Over $100,000**
g. Prefer Not to Answer

That completes our survey. As I mentioned at the start of the survey, we'd like to send you $20 for your time. Should we send it to [name] **at** [address]**?**

In addition, we are looking for customers to participate in a research study in which a Duke Energy representative will visit homes for 20 to 30 minutes and place small lighting monitors on 4 or 5 light fixtures which would remain in place for 2 to 3 weeks. The monitors are smaller than a bar of soap and help us measure how often lights are turned on and off during the week. We plan on starting this study in mid-January 2012, and if your home is selected for the study you will receive $50 for participating. Are you interested in participating?

a. Yes
b. No

If no, **Thank you for your time and feedback today! You will receive your $20 within 3 weeks.**

If yes, **Thank you, a Duke representative will call you in January to discuss the study in more detail and set up the two appointments to install and remove the light loggers. You will receive your $20 for you time today within 3 weeks.**

Thank you for your time and feedback today! (*politely end call*)

Appendix C: Non-Redeemer Survey

Use four attempts at different times of the day and different days before dropping from contact list. Call times are from 10:00 a.m. to 8:00 p.m. EST or 9-7 CST Monday through Saturday. No calls on Sunday. (Targeted sample size for completed surveys=50 non-participants and 50 Low Income non-participants)

SURVEY

Introduction

Note: Only read words in bold type.

for answering machine 1st through penultimate attempts:
Hello, my name is ___ and I'm calling on behalf of Duke Energy to conduct a survey about Compact Fluorescent Light bulbs. I'm sorry I missed you. I'll try again another time.

for answering machine - Final Attempt:
Hello, this is ____ calling again on behalf of Duke Energy with a customer survey. This is my last attempt at reaching you, my apologies for any inconvenience.

If person answers:
Hello, my name is ______. I am calling on behalf of Duke Energy to conduct a customer survey about the Duke Energy CFL Coupon Program. This was a program that provided a coupon for a discount on compact fluorescent light bulbs. May I speak with _____________ please?

If person talking, proceed. If person is called to the phone reintroduce.
If not home, ask when would be a good time to call and schedule the call-back:

Call 1:	Date: ___________,	Time: _______________	❑AM or ❑PM
Call back 2:	Date: ___________,	Time: _______________	❑AM or ❑PM
Call back 3:	Date: ___________,	Time: _______________	❑AM or ❑PM
Call back 4:	Date: ___________,	Time: _______________	❑AM or ❑PM

❑ Contact dropped after fourth attempt.

We are conducting this survey to obtain your opinions about the Duke Energy CFL Coupon Program. Duke Energy's records indicate that you received coupons from Duke Energy for a six-pack of CFLs. We are not selling anything. Your responses to our survey questions will be confidential, and will help us to make improvements to the program to better serve others. May we begin the survey?

If yes or questioning how long it will take...
If you qualify, the survey will take about 15-20 minutes, but when we are done with the survey I will confirm your address and we will send you $10 for your time today.

Survey ID__________

Note: If this is not a good time, ask if there is a better time to schedule a callback.

1. **Do you recall receiving an $8 CFL coupon from Duke Energy?**

    1. ❑ Yes, *begin* → *Skip to Q3.*
    2. ❑ No,
    99. ❑ DK/NS

    This program was provided through Duke Energy. In this program, Duke Energy provided you with a coupon for $8 savings on a six-pack of 13-watt CFLs.

    Do you remember receiving this coupon?

    1. ❑ Yes, *begin* → *Go to Q2.*
    2. ❑ No,
    99. ❑ DK/NS

If No or DK/NS terminate interview and go to next participant.

2. **Did you use the coupon**?
    a. Yes
    b. No
    c. DK/NS

If yes to Q2, mark participant as ineligible for a non-participant survey and proceed with a participant survey.

3. **Did you give the coupon to someone else**?
    a. Yes
    to whom? —*ask question 3a*
        i. Family
        ii. Friend/coworker
        iii. neighbor
        iv. Other: ____________________
    b. No

    3a. **Did the person you gave the coupon to use it?**
        a. Yes – *ask question 3b*
        b. No
        c. DK

3b. **Did the person you gave the coupon to install any CFLs?**
  a. Yes (**how many?**_____)
  b. No
  c. Don't Know

4. **Would you say that receiving the CFL coupon increased your awareness of how you could save energy by using compact fluorescent light bulbs…**
   a. **Very Much**
   b. **Somewhat, or**
   c. **Not at all**

5. **Why did you decide not to use the CFL coupon from Duke Energy**?
   a. Too much hassle
   b. Do not use CFLs (*go to question 5a then skip to Q11*)
   c. Do not shop at participating stores
   d. Did not understand program
   e. Don't like CFLs (*go to question 5a*)
   f. Attempted to use, but was unsuccessful (**why?**_____)
   g. Other (Specify________)

5a. Could you please tell me why you don't like/use CFLs (*check all that apply*)?

i. ___I don't like the color
ii. ___ I don't like the appearance/shape of the bulbs
iii. ___They are too expensive
iv. ___Not bright enough
v. ___Too bright
vi. ___Take too long to "warm up"
vii. ___Mercury/disposal concerns
viii. ___I require specialty bulbs for my lighting
ix. ___Landlord has incandescent bulbs installed
___ Other: ________________________

6. **Do you currently have any CFLs installed in your home**?

   a. Yes
   b. No – *skip to question 11*
   c. DK

6a. Please list the location, quantity and wattage of all installed CFLs? *PROBE TO GET EXACT TYPE AND QUANTITY AND LOCATION*

Wattage 1: ____________________ Quantity 1: ______ Location 1:____________
Wattage 2: ____________________ Quantity 2: ______ Location 2:____________
Wattage 3: ____________________ Quantity 3: ______ Location 3:____________
Wattage 4: ____________________ Quantity 4: ______ Location 4:____________

Enter response: ________________

6b. **How long have you been using CFLs?**

g. Never purchased until now
h. 1 year or less
i. 12 to 24 months (2 years)
j. 25 to 36 months (3 years)
k. 37 to 48 months (4 years)
l. 4 or more years

7. **Did the CFL coupon inspire you to purchase CFLs without using the coupon?**
   a. Yes (**How many?**________)
   b. No – *skip to question 11*

8. **On a scale from 1-10, with 1 indicating that you were very dissatisfied, and 10 indicating that you were very satisfied, please rate your satisfaction with CFL(s) that you have purchased (without the Duke Coupon).**

very dissatisfied									very satisfied	
1	2	3	4	5	6	7	8	9	10	DK

If 7 or less, 8a. **Why were you dissatisfied with the CFLs?**

____

____

9. **At which store did you purchase the CFLs without the coupon?** ___________

10. **On a scale from 1-10, with 1 indicating that the factor was not at all influential, and 10 indicating that the factor was very influential, please rate the level of influence of the following factors on your decision to purchase CFLs without the coupon from Duke Energy.**

10a. **The coupon from Duke Energy**

Not at all influential								very influential		
1	2	3	4	5	6	7	8	9	10	DK

10b. **In-store CFL displays and signs**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10 DK

10c. **Non-in-store advertising, such as TV, radio, or newspaper ads**

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

10d. **Sales associates at the store**

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

10e. **CFL brand** (offered brand was GE Smart Energy 13w Bulb)

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

10f. **Other non-Duke Energy advertising**

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

10g. **Friends or family**

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

10h. **Desire to save energy or utility costs**

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

10i. **Desire to be environmentally responsible.**

Not at all influential ... very influential

1 2 3 4 5 6 7 8 9 10 DK

11. **Since April 2011,**

   e. **have you purchased and installed any energy efficiency equipment (such as high efficiency appliances, windows or heating and cooling equipment?**

      d. ❑ Yes
      e. ❑ No
      f. ❑ Don't Know

   f. **have you made energy efficiency improvements in your home, such as?**

a. **-----Wall or ceiling insulation**
b. **-----Caulking**
c. **-----Faucet aerators**
d. **-----Outlet or switch gaskets**
e. **-----Low flow showerhead**
f. **-----Programmable thermostat**
g. **-----Weather stripping**
h. **-----None of these**
i. DK

g. **Have you changed any of your habits related to energy use?**

d. ❑ Yes
e. ❑ No
f. ❑ Don't Know

If any of the responses to questions 11a - 11c are "yes", continue. If all responses are "no" or "Don't Know", skip to question #14.

12. **What type and quantity of high efficiency equipment did you install on your own?** *PROBE TO GET EXACT TYPE AND QUANTITY AND LOCATION*

Type 1: ____________________ Quantity 1: ______ Location 1:____________
Type 2: ____________________ Quantity 2: ______ Location 2:____________
Type 3: ____________________ Quantity 3: ______ Location 3:____________
Type 4: ____________________ Quantity 4: ______ Location 4:____________

13. *For each type listed in Q12 above,* **How do you know that this equipment is high efficiency? For example, was it Energy Star rated?**

Type 1: ____
Type 2: ____
Type 3: ____
Type 4: ____

14. **How often do you use the Duke Energy Web Site?**
   a. Often, once a month or more
   b. Sometimes, less than once a month
   c. Never

15. **Have you added any major electrical appliances to your home in the past year?**

a. Yes
b. No

16. **Are you aware of the ENERGY STAR label?**
    a. Yes
    b. No.

17. **Do you typically look for the ENERGY STAR label when purchasing an appliance?**
    a. Yes
    b. No

18. **Do you typically buy appliances with the ENERGY STAR label?**
    a. Yes, all of the time
    b. Yes, some of the time
    c. No, never

19. **Why do you believe that Duke Energy is providing discount CFLs to their customers**
    g. ___Duke Energy wants to save their customers money
    h. ___Duke Energy wants to save energy for environmental reasons
    i. ___Duke Energy wants to save energy for economic reasons
    j. ___Duke Energy wants to look good (PR)
    k. ___The government is forcing Duke Energy to do it
    l. ___Other (specify)

20. **Considering any future CFL purchases, how many CFL bulbs would you purchase in the next year if they were…**
    a. **The same price as standard bulbs (___)**
    b. **$1 more than standard bulbs (___)**
    c. **$2 more than standard bulbs (___)**
    d. **$3 more than standard bulbs (___)**
    e. **Free, but you had to mail in a rebate form to get your money back (___)**
    f. **Free, but you had to fill out a form online (__)**

On a 1-to-10 scale with 1 being very unlikely and 10 being very likely, please rate your likelihood of participating in a CFL program that:

Note: Half of the surveyed participants will be asked this series of questions with "free", and half will be surveyed with "discounted". If a customer asks about the level of discounting, tell them to assume half off normal CFL cost.

21. **Offers free** [or discounted] **CFLs by direct-mail sent to your home**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10 DK

22. **Offers free** [or discounted] **CFLs through a retailer or store coupon**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10 DK

23. **Offers free** [or discounted] **CFLs through a manufacturers coupon that can be used at any store where that brand is sold)**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10 DK

24. **Offers free** [or discounted] **CFLs at a stand at a community event such as a fair**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10 DK

25. **Offers free** [or discounted] **CFLs at a stand in a public parking lot**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10 DK

26. **Offers free** [or discounted] **CFLs through an online vendor such as Amazon.com**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10 DK

27. **On a scale from 1-10, with 1 indicating that you feel your home is not energy efficient at all, and 10 indicating that your home is very energy efficient: How would you rate your level of energy efficiency in your home?**

not at all efficient very efficient

1 2 3 4 5 6 7 8 9 10 DK

On a 1-to-10 scale with 1 being not at all important and 10 being very important, please rate the importance of each of the following characteristics on choosing a light bulb for your home

28. **Mercury content of the bulb**

1	2	3	4	5	6	7	8	9	10	DK

29. **Ability to dim the lighting level**

1	2	3	4	5	6	7	8	9	10	DK

30. **Speed of which the bulb comes up to full lighting level**

1	2	3	4	5	6	7	8	9	10	DK

31. **Purchase price of the bulb**

1	2	3	4	5	6	7	8	9	10	DK

32. **Availability of the bulb in stores you normally shop**

1	2	3	4	5	6	7	8	9	10	DK

33. **Selection of wattage and light output levels available**

1	2	3	4	5	6	7	8	9	10	DK

34. **Cost savings on your utility bill**

1	2	3	4	5	6	7	8	9	10	DK

35. **Energy savings**

1	2	3	4	5	6	7	8	9	10	DK

36. **Attractiveness or appearance of the bulb**

1	2	3	4	5	6	7	8	9	10	DK

37. **Recommendations from family and friends**

1	2	3	4	5	6	7	8	9	10	DK

38. **Recommendations from the utility company**

1	2	3	4	5	6	7	8	9	10	DK

39. **Availability of utility programs or services that offer the bulbs to you directly**

1	2	3	4	5	6	7	8	9	10	DK

40. **Ease of bulb disposal**

1	2	3	4	5	6	7	8	9	10	DK

I'm going to read a statement. On a scale from 1-10, with 1 indicating that you strongly disagree, and 10 indicating that you strongly agree, please rate the following statement.

41. **I am satisfied with the dollar savings amount of the Duke Energy CFL coupon**

1 2 3 4 5 6 7 8 9 10

❑ Don't Know

If 7 or less, **How could this be improved?**____

____

42. **Overall I am satisfied with Duke Energy.**

1 2 3 4 5 6 7 8 9 10

❑ Don't Know

If 7 or less, **How could this be improved?**____

____

43. **What other services could Duke Energy provide to help improve home energy efficiency?**

Response: ____

Finally, we have some general demographic questions…

44. **In what type of building do you live?**
    - g. **Single-family detached building**
    - h. **Mobile Home/Manufactured home**
    - i. **Condominium**
    - j. **Duplex/two-family**
    - k. **Multi-family building (3 or more units)**
    - l. **Townhouse**
    - m. **Other**

45. **What year was your residence built?**

i. 1959 and before
j. 1960 to 1979
k. 1980 to 1989
l. 1990 to 1997
m. 1998 to 2000
n. 2001 to 2007
o. 2008 to present
p. Don't Know

46. **How many rooms are in your home (excluding bathrooms, but including finished basements)?**

j. None
k. 1 to 3
l. 4
m. 5
n. 6
o. 7
p. 8
q. 9
r. 10 or more

47. **What is the primary fuel used in your heating system?**
l. Electricity
m. Natural Gas
n. Oil
o. Propane
p. Other(specify?______)

48. **Is there a secondary fuel used by your heating system?** *If yes,* **What is the secondary fuel used in your primary heating system, if applicable?**
q. Electricity
r. Natural Gas
s. Oil
t. Propane
u. Other (specify?______)
v. None

49. **Which of the following best describes your home's heating system?**
g. None
h. Central forced air furnace
i. Electric Baseboard
j. Heat Pump
k. Geothermal Heat Pump

l. Other

50. **How old is your heating system?**

h. 0 to 4 years
i. 5 to 9 years
j. 10 to 14 years
k. 15 to 19 years
l. more than19 years
m. Don't know
n. Do not have

51. **Do you use one or more of the following to cool your home?** ***(Mark all that apply)***

___None, do not cool the home
___**Heat pump for cooling**
___**Central air conditioning**
___**Through the wall or window air conditioning unit**
___**Geothermal Heat pump**
___Other (specify?______)

52. **What is the fuel used in your cooling system?**

a. Electricity
b. Natural Gas
c. Oil
d. Propane
e. Other (specify?______)
f. None

53. **How old is your cooling system?**

h. 0-4 years
i. 5-9 years
j. 10-14 years
k. 15-19 years
19 years or older
l. Don't know
m. Do not have

54. **How many window-unit or "through the wall" air conditioner(s) do you use?**

j. None
k. 1
l. 2

m. 3
n. 4
o. 5
p. 6
q. 7
r. 8 or more

55. **What is the fuel used by your water heater?** *(Mark all that apply)*
g. ___Electricity
h. ___Natural Gas
i. ___Oil
j. ___Propane
k. ___Other (specify?______)
l. ___No water heater

56. **How old is your water heater?**
f. 0 to 4 years
g. 5 to 9 years
h. 10 to 14 years
i. 15 to 19 years
j. more than19 years

57. **What type of fuel do you use for indoor cooking on the stovetop or range?** *(Mark all that apply)*
a.___Electricity
b. ___Natural Gas
c.___Oil
d. ___Propane
e.___Other (specify?______)
f.___No stovetop or range

58. **What type of fuel do you use for indoor cooking in the oven?** *(Mark all that apply)*
g. ___Electricity
h. ___Natural Gas
i.___Oil
j.___Propane
k. ___Other (specify?______)
l.___No oven

59. **What type of fuel do you use for clothes drying?** *(Mark all that apply)*
g. ___Electricity
h. ___Natural Gas
i. ___Oil
j. ___Propane

k. ___Other (specify?______)
l. ___No clothes dryer

60. **About how many square feet of living space are in your home? (Do not include garages or other unheated areas)**

Note: A 10 foot by 12 foot room is 120 square feet

k. Less than 500
l. 500 to 999
m. 1000 to 1499
n. 1500 to 1999
o. 2000 to 2499
p. 2500 to 2999
q. 3000 to 3499
r. 3500 to 3999
s. 4000 or more
t. Don't know

61. **Do you own or rent your home?**
a. Own
b. Rent

62. **Does your home have a heated or unheated basement?**
a. Heated
b. Unheated
c. No basement

63. **Does your home have an attic?**
a. Yes
b. No

64. **Are your central air/heat ducts located in the attic?**
a. Yes
b. No
c. Not applicable

65. **Does your house have cold drafts in the winter?**
a. Yes
b. No

66. **Does your house have sweaty windows in the winter?**
a. Yes
b. No

67. **Do you notice uneven temperatures between the rooms in your home?**

a. Yes
b. No

68. **Does your heating system keep your home comfortable in winter?**
    a. Yes
    b. No

69. **Does your cooling system keep your home comfortable in summer?**
    a. Yes
    b. No

70. **Do you have a programmable thermostat?**
    c. Yes
    d. No

71. **What temperature is your thermostat set to on a typical summer weekday afternoon?**
    n. Less than 69 degrees
    o. 69-72 degrees
    p. 73-78 degrees
    q. Higher than 78 degrees
    r. Off
    s. DK

72. **What temperature is your thermostat set to on a typical winter weekday afternoon?**
    a. Less than 67 degrees
    b. 67-70 degrees
    c. 71-73 degrees
    d. 74-77 degrees
    e. Higher than 78 degrees
    f. Off
    g. DK

73. **Do You Have a Swimming Pool or Spa?**
    a. Yes
    b. No

74. **Would a two-degree increase in the summer afternoon temperature in your home affect your comfort....**
    a. Not at all
    b. Slightly
    c. Moderately, or
    d. Greatly

75. **How many people live in this home?**

i) 1
j) 2
k) 3
l) 4
m) 5
n) 6
o) 7
p) 8 or more

76. **How many persons are usually home on a weekday afternoon?**

j) 0
k) 1
l) 2
m) 3
n) 4
o) 5
p) 6
q) 7
r) 8 or more

77. **Are you planning on making any large purchases to improve energy efficiency in the next 3 years?**
a. Yes
b. No
c. Not sure

The following questions are for classification purposes only and will not be used for any other purpose than to help Duke Energy continue to improve service.

78. **What is your age group?**

g. **18 to 34**
h. **35 to 49**
i. **50 to 59**
j. **60 to 64**
k. **65 to 74**
l. **Over 74**

79. **Please indicate your annual household income.**

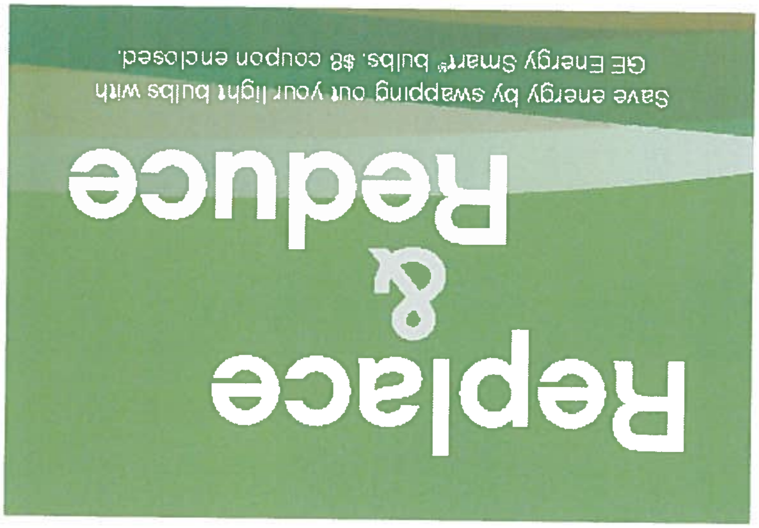
h. **Under $15,000**
i. **$15,000 to $29,999**

j. **$30,000 to $49,999**
k. **$50,000 to $74,999**
l. **$75,000 to $100,000**
m. **Over $100,000**
n. Prefer Not to Answer
o. Don't Know

That completes our survey. As I mentioned at the start of the survey, we'd like to send you $10 for your time. Should we send it to <name> **at** <address>**?**

Thank you for your time and feedback today! *(politely end call)*

Appendix E: Coupons



Duke Energy.

Sample A. Sample
1234 Any Street
Anytown, USA 12345

Save energy & money
$8 Coupon for Light Bulbs Enclosed

Duke Energy.

Use our coupon to save:

$8 TODAY on the purchase of GE Energy Smart® light bulbs

$35 IN A YEAR on energy costs

$169 OVER THE LIFE of your new bulbs

This offer expires on June 15, 2011, so hurry to Walmart or Kroger today!

Replace. Reduce.
Recycle.

Recycling your CFLs is good for the environment. Visit our website or your local home improvement store for more information.

CURL UP TO SOME BIG SAVINGS

If you're like most people, you're on the lookout for great deals – because getting the most "bang for your buck" is human nature. We're here to help.

Check out the coupon below. It may look like other coupons. But it saves you money now AND in the future. Here's how it works:

REDEEM your coupon at participating Walmart or Kroger for $8 off a 6-pack of GE Energy Smart® 13-watt bulbs. You'll save instantly.

INSTALL the bulbs in the most frequently used areas of your home, like the kitchen, living room, family room and bedrooms. Don't wait for the old bulbs to burn out – install the new bulbs immediately. Doing so can save you over $35 a year in electricity costs.*

ENJOY your sustained savings. Over the course of their lifetimes, your new bulbs will save you over $169 in energy costs compared to incandescent bulbs.†

Learn more about compact fluorescent light (CFL) bulbs and the offer at: Duke-Energy.com/CFL-KY.

*Based on current Duke Energy Kentucky rates, using the lights an average of four hours a day and data from Life Cycle Cost Estimate Calculator on energystar.gov
†Source: Life Cycle Cost Estimate Calculator on energystar.gov

MANUFACTURER'S COUPON REDEEMABLE AT PARTICIPATING WALMART & KROGER STORES | EXPIRES JUNE 15, 2011

$8 OFF

Good for $8 off one 6-pack of GE Energy Smart® 13-watt bulbs

[illegible]

Duke Energy. Kroger. Walmart. GE.

0043168-047731

Duke Energy.

Use our coupon to save:

$8 TODAY on the purchase of GE Energy Smart® light bulbs

$35 IN A YEAR on energy costs

$169 OVER THE LIFE of your new bulbs

This offer expires on June 15, 2011, so hurry to Walmart or Kroger today!

Replace. Reduce. **Recycle.**

Recycling your CFLs is good for the environment. Visit our website or your local home improvement store for more information.

NEW BULBS = NEW SAVINGS

Most coupons offer an instant discount. The one below does that, too. Plus, it can save you money on your energy bill for years to come AND help protect the environment. Here's how it works:

REDEEM your coupon at participating Walmart or Kroger stores for $8 off a 6-pack of GE Energy Smart® 13-watt bulbs. You'll save instantly!

INSTALL the bulbs in the most frequently used areas of your home, like the kitchen, living room, family room and bedrooms. Don't wait for the old bulbs to burn out – install the new bulbs immediately. Doing so can save you over $35 a year in electricity costs.*

ENJOY your sustained savings. Over the course of their lifetimes, your new bulbs will save you over $169 in energy costs compared to incandescent bulbs. And you'll reduce your carbon footprint by 3,474 lbs. of CO2*

Learn more about compact fluorescent light (CFL) bulbs and the offer at: Duke-Energy.com/CFL-KY.

*Based on current Duke Energy Kentucky rates, using the lights an average of four hours a day and data from Life Cycle Cost Estimate Calculator on energystar.gov.
Source: Life Cycle Cost Estimate Calculator on energystar.gov.

MANUFACTURER'S COUPON REDEEMABLE AT PARTICIPATING WALMART & KROGER STORES

EXPIRES JUNE 15, 2011

$8 OFF

Good for $8 off one 6-pack of GE Energy Smart® 13-watt bulbs

Duke Energy. Kroger Walmart GE

Duke Energy.

Use our coupon to save:

$8 TODAY on the purchase of GE Energy Smart® light bulbs

$35 IN A YEAR on energy costs

$169 OVER THE LIFE of your new bulbs

This offer expires on June 15, 2011, so hurry to Walmart or Kroger today!

Replace. Reduce.
Recycle.

Recycling your CFLs is good for the environment. Visit our website or your local home improvement store for more information.

A NEW TWIST ON SAVINGS

HDTVs. E-books. Smartphones. New technologies change the way you live. We have a new gadget to add to your list – a compact fluorescent light (CFL) bulb. CFLs use 75 percent less energy and last up to 10 times as long as traditional bulbs. For a limited time, we're offering you a major incentive to switch to CFLS. Here are the details:

REDEEM the coupon below at participating Walmart or Kroger for $8 off a 6-pack of GE Energy Smart® 13-watt bulbs.

INSTALL the bulbs in the most frequently used areas of your home, like the kitchen, living room, family room and bedrooms. Don't wait for the old bulbs to burn out – install the new bulbs immediately. Doing so can save you over $35 a year in electricity costs.*

ENJOY your sustained savings. Over the course of their lifetimes, your new bulbs will save you over $169 in energy costs compared to incandescent bulbs.†

Learn more about compact fluorescent light (CFL) bulbs and the offer at: Duke-Energy.com/CFL-KY.

*Based on current Duke Energy Kentucky rates, using the lights an average of four hours a day and data from Life Cycle Cost Estimate Calculator on energystar.gov.
†Source: Life Cycle Cost Estimate Calculator on energystar.gov

MANUFACTURER'S COUPON REDEEMABLE AT PARTICIPATING WALMART & KROGER STORES | EXPIRES JUNE 15, 2011

$8 OFF

Good for $8 off one 6-pack of GE Energy Smart® 13-watt bulbs

[illegible]

Duke Energy. Kroger Walmart GE

Appendix F: Household Characteristics and Demographics

Type of Housing * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Type of Housing		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	Condominium	Count	3	5	8
		% of Total	1.4%	2.3%	3.7%
	Duplex/two-family	Count	6	5	11
		% of Total	2.7%	2.3%	5.0%
	Mobile Home/Manufactured home	Count	3	3	6
		% of Total	1.4%	1.4%	2.7%
	Multi-family building (3 or more units)	Count	12	15	27
		% of Total	5.5%	6.8%	12.3%
	Single-family detached building	Count	64	96	160
		% of Total	29.2%	43.8%	73.1%
	Townhouse	Count	1	2	3
		% of Total	.5%	.9%	1.4%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Year Built * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Year Built		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	1959 and before	Count	37	41	78
		% of Total	16.9%	18.7%	35.6%
	1960 to 1979	Count	19	21	40
		% of Total	8.7%	9.6%	18.3%
	1980 to 1989	Count	5	13	18
		% of Total	2.3%	5.9%	8.2%

	1990 to 1997	Count	4	22	26
		% of Total	1.8%	10.0%	11.9%
	1998 to 2000	Count	3	7	10
		% of Total	1.4%	3.2%	4.6%
	2001 to 2007	Count	9	17	26
		% of Total	4.1%	7.8%	11.9%
	2008 to present	Count	2	2	4
		% of Total	.9%	.9%	1.8%
	Don't Know	Count	10	3	13
		% of Total	4.6%	1.4%	5.9%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Number of Rooms e (excluding bathrooms, but including finished basement) * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Number of Rooms e (excluding bathrooms, but including finished basement)		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	1 to 3	Count	7	10	17
		% of Total	3.2%	4.6%	7.8%
	10 or more	Count	10	11	21
		% of Total	4.6%	5.0%	9.6%
	4	Count	6	15	21
		% of Total	2.7%	6.8%	9.6%
	5	Count	21	17	38
		% of Total	9.6%	7.8%	17.4%
	6	Count	13	22	35
		% of Total	5.9%	10.0%	16.0%
	7	Count	12	24	36
		% of Total	5.5%	11.0%	16.4%
	8	Count	14	20	34
		% of Total	6.4%	9.1%	15.5%
	9	Count	6	7	13

		% of Total	2.7%	3.2%	5.9%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Primary fuel used in heating system * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Primary fuel used in heating system		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	Electricity	Count	28	39	67
		% of Total	12.8%	17.8%	30.6%
	Natural Gas	Count	55	84	139
		% of Total	25.1%	38.4%	63.5%
	Oil	Count	2	0	2
		% of Total	.9%	.0%	.9%
	Other	Count	2	0	2
		% of Total	.9%	.0%	.9%
	Propane	Count	1	3	4
		% of Total	.5%	1.4%	1.8%
	wood	Count	1	0	1
		% of Total	.5%	.0%	.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Home has a secondary fuel used by the heating system * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Home has a secondary fuel used by the heating system		Count	3	4	7
		% of Total	1.4%	1.8%	3.2%
	don't know	Count	0	2	2
		% of Total	.0%	.9%	.9%
	Electricity	Count	3	0	3
		% of Total	1.4%	.0%	1.4%

	Natural Gas	Count	5	0	5
		% of Total	2.3%	.0%	2.3%
	No	Count	0	113	113
		% of Total	.0%	51.6%	51.6%
	None	Count	76	0	76
		% of Total	34.7%	.0%	34.7%
	Oil	Count	1	0	1
		% of Total	.5%	.0%	.5%
	Other	Count	4	0	4
		% of Total	1.8%	.0%	1.8%
	Yes	Count	0	8	8
		% of Total	.0%	3.7%	3.7%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Secondary fuel used in primary heating system * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Secondary fuel used in primary heating system		Count	88	114	202
		% of Total	40.2%	52.1%	92.2%
	dk	Count	1	0	1
		% of Total	.5%	.0%	.5%
	Electricity	Count	0	6	6
		% of Total	.0%	2.7%	2.7%
	heat pump	Count	1	0	1
		% of Total	.5%	.0%	.5%
	Natural Gas	Count	0	1	1
		% of Total	.0%	.5%	.5%
	None	Count	0	3	3
		% of Total	.0%	1.4%	1.4%
	Other	Count	0	2	2
		% of Total	.0%	.9%	.9%
	Propane	Count	0	1	1
		% of Total	.0%	.5%	.5%

	wood	Count	1	0	1
		% of Total	.5%	.0%	.5%
	Wood	Count	1	0	1
		% of Total	.5%	.0%	.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Home Heating System * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Home Heating System		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	Central forced air furnace	Count	60	92	152
		% of Total	27.4%	42.0%	69.4%
	don't know	Count	5	4	9
		% of Total	2.3%	1.8%	4.1%
	Electric Baseboard	Count	4	2	6
		% of Total	1.8%	.9%	2.7%
	Geothermal Heat Pump	Count	1	3	4
		% of Total	.5%	1.4%	1.8%
	Heat Pump	Count	9	20	29
		% of Total	4.1%	9.1%	13.2%
	hybrid forced air furnace & heat pump	Count	1	0	1
		% of Total	.5%	.0%	.5%
	None	Count	3	0	3
		% of Total	1.4%	.0%	1.4%
	Propane	Count	0	1	1
		% of Total	.0%	.5%	.5%
	radiator	Count	0	1	1
		% of Total	.0%	.5%	.5%
	radiator (hot water)	Count	5	3	8
		% of Total	2.3%	1.4%	3.7%
	Wood burning stove w/ heat pump; oil backup	Count	1	0	1
		% of Total	.5%	.0%	.5%

Total	Count	92	127	219
	% of Total	42.0%	58.0%	100.0%

Age of heating system * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Age of heating system		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	0 to 4 years	Count	19	38	57
		% of Total	8.7%	17.4%	26.0%
	10 to 14 years	Count	18	22	40
		% of Total	8.2%	10.0%	18.3%
	15 to 19 years	Count	4	14	18
		% of Total	1.8%	6.4%	8.2%
	5 to 9 years	Count	19	25	44
		% of Total	8.7%	11.4%	20.1%
	Do not have	Count	0	1	1
		% of Total	.0%	.5%	.5%
	Don't know	Count	18	10	28
		% of Total	8.2%	4.6%	12.8%
	more than19 years	Count	11	16	27
		% of Total	5.0%	7.3%	12.3%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Cooling System * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Cooling System		Count	3	2	5
		% of Total	1.4%	.9%	2.3%
	Central air conditioning	Count	58	82	140
		% of Total	26.5%	37.4%	63.9%
	Geothermal Heat pump	Count	1	3	4

		% of Total	.5%	1.4%	1.8%
	Heat pump for cooling	Count	10	23	33
		% of Total	4.6%	10.5%	15.1%
	None, do not cool the home	Count	1	1	2
		% of Total	.5%	.5%	.9%
	Through the wall or window air conditioning unit?	Count	19	16	35
		% of Total	8.7%	7.3%	16.0%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Cooling System Fuel * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Cooling System Fuel		Count	5	3	8
		% of Total	2.3%	1.4%	3.7%
	Electricity	Count	83	120	203
		% of Total	37.9%	54.8%	92.7%
	Natural Gas	Count	4	4	8
		% of Total	1.8%	1.8%	3.7%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Age of Cooling System * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Age of Cooling System		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	0 to 4 years	Count	30	44	74
		% of Total	13.7%	20.1%	33.8%
	10 to 14 years	Count	10	22	32
		% of Total	4.6%	10.0%	14.6%
	15 to 19 years	Count	3	14	17
		% of Total	1.4%	6.4%	7.8%

	19 years or older	Count	5	9	14
		% of Total	2.3%	4.1%	6.4%
	5 to 9 years	Count	23	26	49
		% of Total	10.5%	11.9%	22.4%
	Do not have	Count	1	1	2
		% of Total	.5%	.5%	.9%
	Don't know	Count	17	10	27
		% of Total	7.8%	4.6%	12.3%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Number of Window Cooling Units * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Number of Window Cooling Units		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	1	Count	14	13	27
		% of Total	6.4%	5.9%	12.3%
	2	Count	7	10	17
		% of Total	3.2%	4.6%	7.8%
	3	Count	8	2	10
		% of Total	3.7%	.9%	4.6%
	4	Count	0	2	2
		% of Total	.0%	.9%	.9%
	5	Count	1	0	1
		% of Total	.5%	.0%	.5%
	None	Count	59	99	158
		% of Total	26.9%	45.2%	72.1%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Water Heater Fuel * CFL Coupon Crosstabulation

	CFL Coupon	Total

			Non-Redeemer	Redeemer	
Water Heater Fuel		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	DK/NS	Count	9	6	15
		% of Total	4.1%	2.7%	6.8%
	Electricity	Count	28	49	77
		% of Total	12.8%	22.4%	35.2%
	Natural Gas	Count	52	70	122
		% of Total	23.7%	32.0%	55.7%
	Propane	Count	0	1	1
		% of Total	.0%	.5%	.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Age of Water Heater * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Age of Water Heater		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	0 to 4 years	Count	34	38	72
		% of Total	15.5%	17.4%	32.9%
	10 to 14 years	Count	11	25	36
		% of Total	5.0%	11.4%	16.4%
	15 to 19 years	Count	4	2	6
		% of Total	1.8%	.9%	2.7%
	5 to 9 years	Count	20	50	70
		% of Total	9.1%	22.8%	32.0%
	DK/NS	Count	19	8	27
		% of Total	8.7%	3.7%	12.3%
	more than 19 years	Count	1	3	4
		% of Total	.5%	1.4%	1.8%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Stovetop/Range Fuel * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Stovetop/Range Fuel		Count	4	1	5
		% of Total	1.8%	.5%	2.3%
	Electricity	Count	63	88	151
		% of Total	28.8%	40.2%	68.9%
	Natural Gas	Count	25	37	62
		% of Total	11.4%	16.9%	28.3%
	Propane	Count	0	1	1
		% of Total	.0%	.5%	.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Oven Fuel * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Oven Fuel		Count	3	2	5
		% of Total	1.4%	.9%	2.3%
	Electricity	Count	67	92	159
		% of Total	30.6%	42.0%	72.6%
	Natural Gas	Count	22	33	55
		% of Total	10.0%	15.1%	25.1%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Type of clothes dryer * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Type of clothes dryer		Count	4	1	5
		% of Total	1.8%	.5%	2.3%
	Electricity	Count	70	100	170

		% of Total	32.0%	45.7%	77.6%
	Natural Gas	Count	11	21	32
		% of Total	5.0%	9.6%	14.6%
	No clothes dryer	Count	7	5	12
		% of Total	3.2%	2.3%	5.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Square feet of living space (excluding garages and other unheated areas) * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Square feet of living space (excluding garages and other unheated areas)		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	1000 to 1499	Count	14	19	33
		% of Total	6.4%	8.7%	15.1%
	1500 to 1999	Count	8	18	26
		% of Total	3.7%	8.2%	11.9%
	2000 to 2499	Count	7	14	21
		% of Total	3.2%	6.4%	9.6%
	2500 to 2999	Count	5	10	15
		% of Total	2.3%	4.6%	6.8%
	3000 to 3499	Count	6	5	11
		% of Total	2.7%	2.3%	5.0%
	3500 to 3999	Count	3	0	3
		% of Total	1.4%	.0%	1.4%
	4000 or more	Count	5	1	6
		% of Total	2.3%	.5%	2.7%
	500 to 999	Count	8	14	22
		% of Total	3.7%	6.4%	10.0%
	Don't know	Count	33	43	76
		% of Total	15.1%	19.6%	34.7%
	Less than 500	Count	0	2	2
		% of Total	.0%	.9%	.9%

Total	Count	92	127	219
	% of Total	42.0%	58.0%	100.0%

Own or Rent * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Own or Rent		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	Own	Count	65	103	168
		% of Total	29.7%	47.0%	76.7%
	Rent	Count	24	23	47
		% of Total	11.0%	10.5%	21.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Basement Heat * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Basement Heat		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	Heated	Count	43	75	118
		% of Total	19.6%	34.2%	53.9%
	No basement	Count	20	28	48
		% of Total	9.1%	12.8%	21.9%
	Unheated	Count	26	23	49
		% of Total	11.9%	10.5%	22.4%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Attic * CFL Coupon Crosstabulation

	CFL Coupon		
	Non-Redeemer	Redeemer	Total

Attic		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	38	55	93
		% of Total	17.4%	25.1%	42.5%
	Yes	Count	51	71	122
		% of Total	23.3%	32.4%	55.7%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Central air/heat ducts located in the attic * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Central air/heat ducts located in the attic		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	39	62	101
		% of Total	17.8%	28.3%	46.1%
	Not applicable	Count	40	56	96
		% of Total	18.3%	25.6%	43.8%
	Yes	Count	10	8	18
		% of Total	4.6%	3.7%	8.2%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Do You Have a Swimming Pool or Spa? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Do You Have a Swimming Pool or Spa?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	82	118	200
		% of Total	37.4%	53.9%	91.3%
	Yes	Count	7	8	15
		% of Total	3.2%	3.7%	6.8%
Total		Count	92	127	219

Do You Have a Swimming Pool or Spa? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Do You Have a Swimming Pool or Spa?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	82	118	200
		% of Total	37.4%	53.9%	91.3%
	Yes	Count	7	8	15
		% of Total	3.2%	3.7%	6.8%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

A two-degree increase in the summer afternoon temperature in your home affect your comfort.... * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
A two-degree increase in the summer afternoon temperature in your home affect your comfort....		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	DK/NS	Count	5	9	14
		% of Total	2.3%	4.1%	6.4%
	Greatly	Count	12	22	34
		% of Total	5.5%	10.0%	15.5%
	Moderately, or	Count	26	25	51
		% of Total	11.9%	11.4%	23.3%
	Not at all	Count	30	44	74
		% of Total	13.7%	20.1%	33.8%
	Slightly	Count	16	26	42
		% of Total	7.3%	11.9%	19.2%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Number of people living in home * CFL Coupon Crosstabulation

	CFL Coupon	Total

			Non-Redeemer	Redeemer	
Number of people living in home		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	1	Count	20	25	45
		% of Total	9.1%	11.4%	20.5%
	2	Count	34	55	89
		% of Total	15.5%	25.1%	40.6%
	3	Count	12	13	25
		% of Total	5.5%	5.9%	11.4%
	4	Count	12	16	28
		% of Total	5.5%	7.3%	12.8%
	5	Count	4	15	19
		% of Total	1.8%	6.8%	8.7%
	6	Count	4	2	6
		% of Total	1.8%	.9%	2.7%
	7	Count	2	0	2
		% of Total	.9%	.0%	.9%
	Prefer Not to Answer	Count	1	0	1
		% of Total	.5%	.0%	.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Number of people usually home on a weekday afternoon * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Number of people usually home on a weekday afternoon		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	0	Count	16	24	40
		% of Total	7.3%	11.0%	18.3%
	1	Count	33	42	75
		% of Total	15.1%	19.2%	34.2%
	2	Count	22	41	63
		% of Total	10.0%	18.7%	28.8%
	3	Count	11	12	23

		% of Total	5.0%	5.5%	10.5%
	4	Count	2	4	6
		% of Total	.9%	1.8%	2.7%
	5	Count	1	2	3
		% of Total	.5%	.9%	1.4%
	6	Count	2	1	3
		% of Total	.9%	.5%	1.4%
	Prefer Not to Answer	Count	2	0	2
		% of Total	.9%	.0%	.9%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Planning to make a large purchase to improve energy efficiency in the next 3 years * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Planning to make a large purchase to improve energy efficiency in the next 3 years		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	58	90	148
		% of Total	26.5%	41.1%	67.6%
	Not sure	Count	9	8	17
		% of Total	4.1%	3.7%	7.8%
	Yes	Count	22	28	50
		% of Total	10.0%	12.8%	22.8%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Age Group * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Age Group		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	18 to 34	Count	17	19	36

		% of Total	7.8%	8.7%	16.4%
	35 to 49	Count	21	26	47
		% of Total	9.6%	11.9%	21.5%
	50 to 59	Count	16	22	38
		% of Total	7.3%	10.0%	17.4%
	60 to 64	Count	13	12	25
		% of Total	5.9%	5.5%	11.4%
	65 to 74	Count	14	29	43
		% of Total	6.4%	13.2%	19.6%
	Over 74	Count	8	18	26
		% of Total	3.7%	8.2%	11.9%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Annual Household Income * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Annual Household Income		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	$15,000-$29,999	Count	15	19	34
		% of Total	6.8%	8.7%	15.5%
	$30,000-$49,999	Count	17	24	41
		% of Total	7.8%	11.0%	18.7%
	$50,000-$74,999	Count	13	23	36
		% of Total	5.9%	10.5%	16.4%
	$75,000-$100,000	Count	9	15	24
		% of Total	4.1%	6.8%	11.0%
	DK/NS	Count	1	0	1
		% of Total	.5%	.0%	.5%
	Over $100,000	Count	7	17	24
		% of Total	3.2%	7.8%	11.0%
	Prefer Not to Answer	Count	16	20	36
		% of Total	7.3%	9.1%	16.4%
	Under $15,000	Count	11	8	19

	% of Total	5.0%	3.7%	8.7%
Total	Count	92	127	219
	% of Total	42.0%	58.0%	100.0%

Comfort Series

Does your house have cold drafts in the winter? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Does your house have cold drafts in the winter?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	48	84	132
		% of Total	21.9%	38.4%	60.3%
	Yes	Count	41	42	83
		% of Total	18.7%	19.2%	37.9%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Does your house have sweaty windows in the winter? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Does your house have sweaty windows in the winter?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	62	91	153
		% of Total	28.3%	41.6%	69.9%
	Yes	Count	27	35	62
		% of Total	12.3%	16.0%	28.3%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Do you notice uneven temperatures between the rooms in your home? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Do you notice uneven temperatures between the rooms in your home?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	38	61	99
		% of Total	17.4%	27.9%	45.2%
	Yes	Count	51	65	116
		% of Total	23.3%	29.7%	53.0%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Does your heating system keep your home comfortable in winter? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Does your heating system keep your home comfortable in winter?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	12	14	26
		% of Total	5.5%	6.4%	11.9%
	Yes	Count	77	112	189
		% of Total	35.2%	51.1%	86.3%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Does your cooling system keep your home comfortable in sum1mer? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
Does your cooling system keep your home comfortable in sum1mer?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	6	11	17
		% of Total	2.7%	5.0%	7.8%
	Yes	Count	83	115	198

	% of Total	37.9%	52.5%	90.4%
Total	Count	92	127	219
	% of Total	42.0%	58.0%	100.0%

Do you have a programmable thermostat? * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
Do you have a programmable thermostat?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	No	Count	37	52	89
		% of Total	16.9%	23.7%	40.6%
	Yes	Count	52	74	126
		% of Total	23.7%	33.8%	57.5%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

What temperature is your thermostat set to on a typical summer weekday afternoon? * CFL Coupon Crosstabulation

			CFL Coupon		
			Non-Redeemer	Redeemer	Total
What temperature is your thermostat set to on a typical summer weekday afternoon?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	69 to 72 degrees	Count	24	30	54
		% of Total	11.0%	13.7%	24.7%
	73 to 78 degrees	Count	38	66	104
		% of Total	17.4%	30.1%	47.5%
	DK/NS	Count	4	0	4
		% of Total	1.8%	.0%	1.8%
	don't know	Count	0	2	2
		% of Total	.0%	.9%	.9%
	Higher than 78 degrees	Count	2	7	9
		% of Total	.9%	3.2%	4.1%
	Less than 69 degrees	Count	10	4	14

		% of Total	4.6%	1.8%	6.4%
	Off	Count	11	17	28
		% of Total	5.0%	7.8%	12.8%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

What temperature is your thermostat set to on a typical winter weekday afternoon? * CFL Coupon Crosstabulation

			CFL Coupon		Total
			Non-Redeemer	Redeemer	
What temperature is your thermostat set to on a typical winter weekday afternoon?		Count	3	1	4
		% of Total	1.4%	.5%	1.8%
	67 to 70 degrees	Count	42	58	100
		% of Total	19.2%	26.5%	45.7%
	71 to 73 degrees	Count	19	24	43
		% of Total	8.7%	11.0%	19.6%
	74 to 77 degrees	Count	11	19	30
		% of Total	5.0%	8.7%	13.7%
	Don't Know	Count	1	1	2
		% of Total	.5%	.5%	.9%
	Higher than 78 degrees	Count	0	2	2
		% of Total	.0%	.9%	.9%
	Less than 67 degrees	Count	16	20	36
		% of Total	7.3%	9.1%	16.4%
	Off	Count	0	2	2
		% of Total	.0%	.9%	.9%
Total		Count	92	127	219
		% of Total	42.0%	58.0%	100.0%

Appendix G: Impact Algorithms

CFLs

General Algorithm

Gross Summer Coincident Demand Savings

$$\Delta kW_S = ISR \times units \times \left[\frac{Watts_{base} - Watts_{ee}}{1000}\right] \times CF \times (1 + HVAC_d)$$

Gross Annual Energy Savings

$$\Delta kWh = ISR \times units \times \left[\frac{(Watts \times HOU)_{base} - (Watts \times HOU)_{ee}}{1000}\right] \times 365 \times (1 + HVAC_c)$$

where:

ΔkW	= gross coincident demand savings
ΔkWh	= gross annual energy savings
units	= number of units installed under the program
$Watts_{ee}$	= connected load of energy-efficient unit = 13
$Watts_{base}$	= connected (nameplate) load of baseline unit(s) displaced
HOU	= Average daily hours of use (based on connected load)
CF	= coincidence factor = 0.1876
$HVAC_c$	= HVAC system interaction factor for annual electricity consumption = -0.0058
$HVAC_d$	= HVAC system interaction factor for demand = 0.167

$HVAC_c$ - the HVAC interaction factor for annual energy consumption depends on the HVAC system, heating fuel type, and location. The HVAC interaction factors for annual energy consumption were taken from DOE-2 simulations of the residential prototype building described at the end of this Appendix.

Table 38. Covington, KY HVAC System Interaction Factors

Heating Fuel	Heating System	Cooling System	Weight	HVACc
Other	Any except Heat Pump	Any except Heat Pump	0.0029	0.079
		None	0.0002	0
Any	Heat Pump	Heat Pump	0.0760	-0.16
Gas Propane Oil	Central Furnace	None	0.0111	0
		Room/Window	0.7571	0.079
		Central AC		0.079

Electricity	Electric baseboard/ central furnace	None	0.0046	-0.45
		Room/Window	0.1433	-0.36
		Central AC		-0.36
N one	None	Any	0.0049	0
Total Weighted Average			1	-0.0058

$HVAC_d$ - the HVAC interaction factor for demand depends on the cooling system type. The HVAC interaction factors for summer peak demand were taken from DOE-2 simulations of the residential prototype building described at the end of this Appendix.

Covington, KY

Cooling System	HVACd
None	0
Room/Window	.17
Central AC	.17
Heat Pump	.17

Prototypical Building Model Description

The impact analysis for many of the HVAC related measures are based on DOE-2.2 simulations of a set of prototypical residential buildings. The prototypical simulation models were derived from the residential building prototypes used in the California Database for Energy Efficiency Resources (DEER) study (Itron, 2005), with adjustments make for local building practices and climate. The prototype "model" in fact contains 4 separate residential buildings; 2 one-story and 2 two-story buildings. The each version of the 1 story and 2 story buildings are identical except for the orientation, which is shifted by 90 degrees. The selection of these 4 buildings is designed to give a reasonable average response of buildings of different design and orientation to the impact of energy efficiency measures. A sketch of the residential prototype buildings is shown in Figure 23.

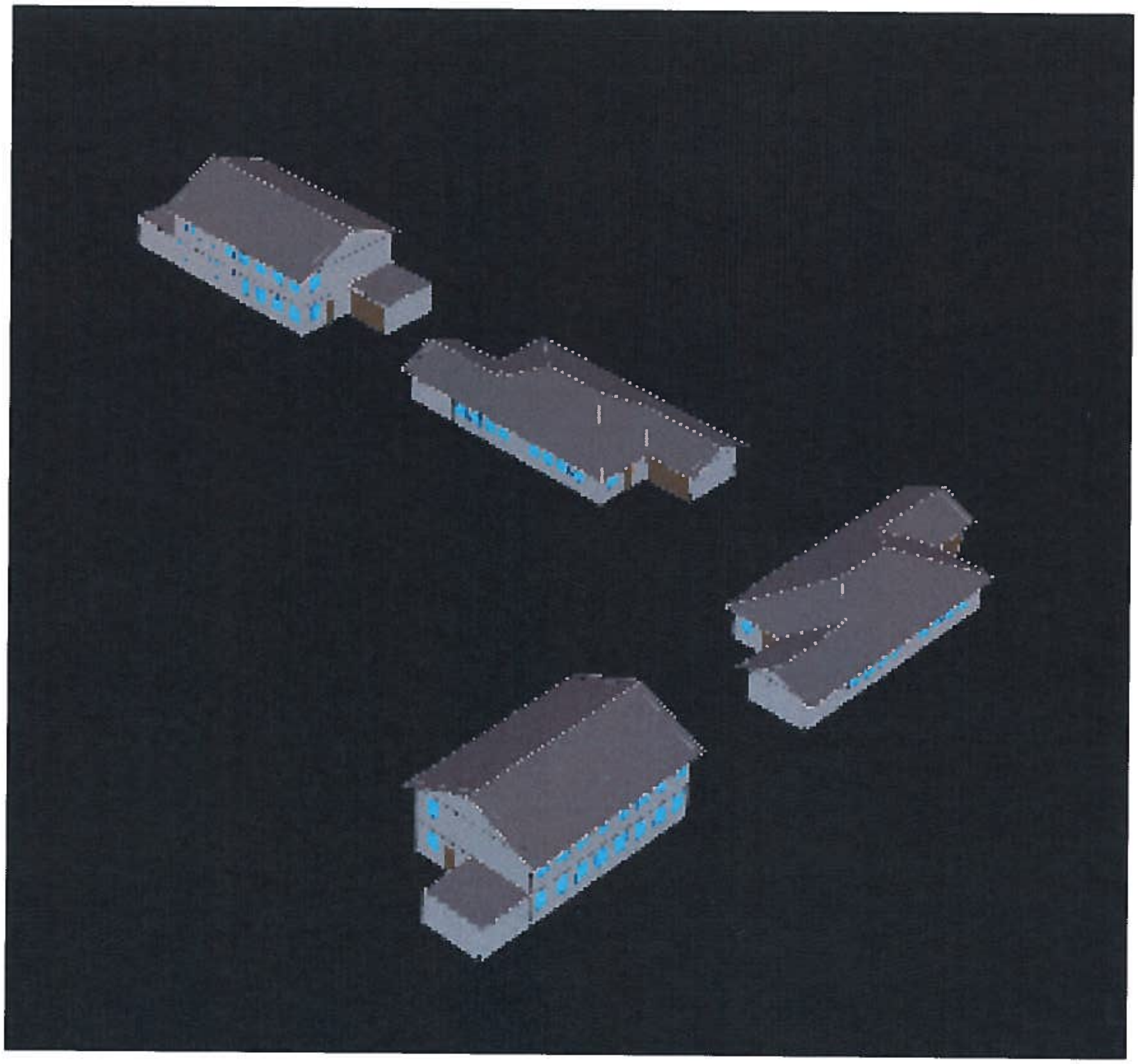


Figure 23. Computer Rendering of Residential Building Prototype Model

The general characteristics of the residential building prototype model are summarized below:

Residential Building Prototype Description

Characteristic	Value
Conditioned floor area	1 story house: 1465 SF 2 story house: 2930 SF
Wall construction and R-value	Wood frame with siding, R-11
Roof construction and R-value	Wood frame with asphalt shingles, R-19
Glazing type	Single pane clear
Lighting and appliance power density	0.51 W/SF average
HVAC system type	Packaged single zone AC or heat pump
HVAC system size	Based on peak load with 20% oversizing. Average 640 SF/ton
HVAC system efficiency	SEER = 8.5
Thermostat setpoints	Heating: 70°F with setback to 60°F Cooling: 75°F with setup to 80°F

Characteristic	Value
Duct location	Attic (unconditioned space)
Duct surface area	Single story house: 390 SF supply, 72 SF return Two story house: 505 SF supply, 290 SF return
Duct insulation	Uninsulated
Duct leakage	26%; evenly distributed between supply and return
Cooling season	Charlotte – April 17th to October 6th Covington – April 27th to October 12th
Natural ventilation	Allowed during cooling season when cooling setpoint exceeded and outdoor temperature < 65°F. 3 air changes per hour

References

Itron, 2005. "2004-2005 Database for Energy Efficiency Resources (DEER) Update Study, Final Report," Itron, Inc., J.J. Hirsch and Associates, Synergy Consulting, and Quantum Consulting. December, 2005. Available at http://eega.cpuc.ca.gov/deer

Appendix H: DSMore Table

Impacts Technology	Product code	State	EM&V gross savings (kWh/unit)	EM&V gross kW (customer peak/unit)	EM&V gross kW (coincident peak/unit)	Unit of measure	Combined spillover less freeridership adjustment	EM&V net savings (kWh/unit)	EM&V net kW (customer peak/unit)	EM&V net kW (coincident peak/unit)	EM&V load shape (yes/no)	EUL (whole number)
CFLs		Kentucky	56.3	0.0458	0.0086	lamp	21.32%	44.3	0.0360	0.0068	yes	5
Program wide			**56.3**	**0.0458**	**0.0086**		**21.32%**	**44.3**	**0.0360**	**0.0068**		**5**

Appendix I: Required Savings Tables

The required table showing measure-level participation counts and savings is below.

Measure	Participation Count	Verified Per unit kWh impact	Verified Per unit kW impact	Gross Verified kWh Savings	Gross Verified kW Savings
CFLs	2,282	56.3	0.0086	770,490	123.2

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Memorandum

To: Ashlie Ossege and Bruce Sailers, Duke Energy
From: Michael Ozog, Integral Analytics and Nick Hall, TecMarket Works
Date: December 19, 2012
Subject: Methodology of PowerShare Impact Evaluations in Indiana and Kentucky

Duke Energy's impact evaluation of the PowerShare programs in Indiana and Kentucky will follow the same procedure that was used in their evaluation of the PowerShare program in other states.[1] Therefore, based on our review of the Duke Energy's impact evaluation of the PowerShare program in the other states,[2] we believe that the conclusions in that report apply to the PowerShare evaluation in Indiana and Kentucky as well. Specifically, Duke Energy's impact evaluation for the PowerShare program is a very complete and innovative approach, and it should result in accurate estimates of Event impacts (i.e., settlement with customers, M&V results for an event, capability values, and P&L values). The rest of this memo re-affirms the conclusions and observations from our review of the PowerShare as it relates to Duke Energy's evaluation of the program in Indiana and Kentucky.

In general, the model specifications in all the components of Duke Energy's evaluation includes the key determinates of energy usage, so there is little likelihood of any bias in the results from omitted variables. One particularly noteworthy feature is that Duke Energy uses an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches. In addition, using a multivariate regression model in the Capabilities, P&L, and M&V processes is generally preferred over approaches that are based on average loads from a pre-event period.

In addition, the technical approach used by Duke Energy in developing settlement calculations for the customer day-ahead Pro forma load (PFL) and the M&V event impacts are very well thought out and developed. The use of multiple methods and determining the Best of Breed (BoB) in the PFL is noteworthy in that it assures that the most accurate approach will be used in developing the PFL – a step which, to the best of our knowledge, is not used by any other entity.

The one concern we have is that there are multiple processes that essentially measure the same thing. For example, the PFL and M&V processes both measure the impacts for a specific event day (i.e., the effect of the event on load shapes). Likewise, the P&L and Capability processes are essentially both measuring the peak normalized load reduction capability of participants. This appears to be inefficient, as well as confusing.

[1] Bruce Sailers, personal communication.
[2] "Impact Evaluation and Review of the 2011 PowerShare® Program in the Carolinas System." TecMarket Works, September 7, 2012.

In addition, for some programs under the PowerShare umbrella, there appears to be no direct link between the customer payments (based on the day-ahead PFL) and the overall program impacts (based on the M&V and Capability process). Since the day-ahead PFL is based on the BoB approach for PowerShare CallOption, Mandatory, and Voluntary, while the other processes are based on regression models, it may be that there is a marked difference between the two estimates of load impacts. Therefore, it is our recommendation that Duke Energy investigate a mechanism that will produce all the required reports for customers, internal use, and regulatory requirements, using a single, unified process for the PFLs and the other reports. An example might be to store the day ahead PFLs associated with an event for developing the Capability and M&V processes for appropriate programs.

Relatedly, it is not clear why different processes must be involved. While there appears to be a specific purpose for each process, there may be efficiencies captured by consolidating the processes. While it is obvious that a distinction be made between actual weather and peak normal weather, it is not clear why that requires two distinct processes. It seems possible to combine the Capability and M&V process into one process, where the regression models are estimated once, and for the weather sensitive customers, estimates of both actual and weather normal impacts are estimated from the same model (just using different weather values). In addition, the difference between the Capability and P&L process is that the P&L includes customers who have enrolled after the summer. Duke Energy clearly wants to capture these post-summer enrollments and start collecting revenues for them during the current year. However, it is our opinion that P&L process may overstate the actual *capability* of the program, if for example you are talking about the *capability* of the program during the summer of 2011, since post-summer enrollments were not enrolled during the summer event period. Therefore, our recommendation is that the impacts should be based on the Capability calculations, and Duke Energy should review the need for each process to see if they are truly required. In terms of P&L process results, the use of these results may be appropriate in the revenue recovery process but that is best addressed by Duke Energy and the state regulatory entities.

Overall, based on our review, Duke Energy's approach to the impact evaluation of the PowerSmart program across all jurisdictions is a very complete and innovative approach, and it should result in accurate estimates of event impacts.

Final Report

Process Evaluation of the Non-Residential Smart $aver® Prescriptive Program in Ohio and Kentucky: Lighting, Occupancy Sensors, and VFDs

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

March 22, 2013

Submitted by

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TABLE OF CONTENTS

Executive Summary

Significant Process Evaluation Findings

Key Findings from the Management Interviews

- Ohio's history of successful prescriptive rebate programs seems to have the consequence of declining participation, and this is pushing Duke Energy to develop pilots to test innovative approaches.
  - Please see *Program challenges* on page 24.
- The Smart $aver website is being successfully used as the key repository of information about Smart $aver, as well as the source for the latest information on any program or measure changes.
  - Please see *Website* on p. 15, *Call Center* on p. 16.

Key Findings from the Participant Surveys

- Most of the Non-Residential Smart $aver Prescriptive participants surveyed installed Fluorescent Lighting (65.4% or 34 out of 52), while the remainder installed Occupancy Sensors (23.1% or 12 out of 52) or Variable Frequency Drives (11.5% or 6 out of 52). Most participants surveyed were based in Ohio (80.8% or 42 out of 52), with the remainder in Kentucky (19.2% or 10 out of 52).
  - Please see *Participant Surveys* on page 32, and *Table 2. Equipment Installation Which Received a Smart $aver Rebate* on page 32.
- Overall, the average rebate received by participants in this survey was $1038 per organization, with a median rebate of $502. The median rebate received for Fluorescent Lighting installations was $270, for Occupancy Sensors installations it was $1290, and the median rebate for Variable Frequency Drive installations was $800.
  - Please see *Table 3. Amount of Smart $aver Incentive Rebate* on page 33.
- Twenty-two participants in Ohio received bonus rebates, but only a minority of them (36.4% or 8 out of 22) were aware that they had received a bonus rebate.
  - Please see *Table 7. Awareness of Bonus Rebates from the Smart $aver Program (Ohio Only)* on page 34.
- The most frequent channels for learning about the Smart $aver program were through trade allies (50.0% or 26 out of 52), the information provided by the program (19.2% or 10 out of 52), and from past experience with the program (11.5% or 6 out of 52).
  - Please see *Table 8. Sources of Awareness of Non-Residential Smart $aver Program* on page 35.
- Most participants who installed Fluorescent Lighting (61.8% or 21 out of 34) and Occupancy Sensors (50.0% or 6 out of 12) got their rebate applications from trade allies, though none (0.0% or 0 out of 6) of the Variable Frequency Drive rebate applications came from trade allies. Most Variable Frequency Drive rebate recipients got their applications online (83.3% or 5 out of 6), which was also the second most common source of applications for Fluorescent Lighting installations (23.5% or 8 out of 34) and Occupancy Sensor installations (25.0% or 3 out of 12).
  - Please see *Table 9. Source of Rebate Application* on page 35.

- Overall, fewer than one in ten (7.7% or 4 out of 52) Smart $aver participants surveyed reported problems receiving their rebates, and among those who installed Occupancy Sensors no one reported problems (0.0% or 0 out of 12).
    - Please see *Table 13. Problems Receiving Smart $aver Rebates* on page 37.
- The most common reason for purchasing the energy efficient equipment was to reduce energy costs, mentioned by 73.1% (38 out of 52), while the incentive rebate itself was a distant second, mentioned by 36.5% (19 out of 52).
    - Please see *Table 14. Reasons for Purchasing Smart $aver-Rebated Equipment* on page 38.
- Nearly every participant in this survey who installed Fluorescent Lighting was replacing an existing unit (97.1% or 33 out of 34), while this was the case with just over half (58.3% or 7 out of 12) for Occupancy Sensor installations and two-thirds (66.7% or 4 out of 6) Variable Frequency Drive installations. For the other 41.7% (5 out of 12) of the Occupancy Sensor installations, it was the first equipment of its type installed by the organization. For about half of the replacement installations (53.3% or 24 out of 45 respondents who replaced existing equipment), the equipment that was replaced was described as being in "good" working condition.
    - Please see *Table 15. Replacing Existing Units and First-Time Installations* on page 39, and *Table 17. Condition of Units Replaced by Smart $aver Installation* on page 40.
- Less than a third of participants (28.8% or 15 out of 52) say that without Smart $aver, they would have purchased exactly the same equipment at exactly the same time, while another third (32.7% or 17 out of 52) say that without Smart $aver they would have continued to use their existing equipment.
    - Please see *Table 18. Actions Taken If Smart $aver Program Had Not Been Available* on page 41.
- Nearly half of respondents (46.2% or 24 out of 52) have installed more high efficiency equipment since participating in Smart $aver: most frequently mentioned were further lighting upgrades (by 66.7% or 16 out of 24 who made additional high efficiency installations), occupancy sensor upgrades (by 25.0% or 6 out of 24) and HVAC system upgrades (by 25.0% or 6 out of 24).
    - Please see *Table 21. Other High Efficiency Installations since Smart $aver* on page 44, and *Table 22. Other Energy Efficient Installations Which Were Influenced by Smart $aver* on page 44.
- Overall satisfaction with the Smart $aver program was high: among all participants surveyed, 90.4% (47 out of 52) rated their satisfaction an "8" or higher on a 10-point scale. Ohio participants were asked an additional question using a 5-point scale, and 81.0% (34 out of 42) gave the highest rating of "very satisfied".
    - Please see *Figure 4. Overall Satisfaction with Smart $aver Program* on page 48, and *Table 25. Satisfaction with the Smart $aver Program Overall (5-point scale for Ohio only)* on page 48.
- The specific aspect of the program that participants were most satisfied with was the amount of the rebate (73.1% or 38 out of 52 rated this aspect an "8" or higher on a 10-point scale). When asked to name their favorite thing about participating in the program, a majority (57.7% or 30 out of 52) said it was receiving an immediate rebate.

    - Please see *Figure 10. Satisfaction with the Rebate Levels Provided by the Program* on page 54, and *Table 26. What Do You Like Most About The Non-Residential Smart $aver Program?* on page 55.
- The aspect of Smart $aver that participants were least satisfied with was understanding and completing the rebate form (only 48.1% or 25 out of 52 rated this aspect an "8" or higher, though another 25.0% or 13 out of 52 did not know enough about the forms to give a rating). When asked about their least favorite aspect of the program, the most common complaints had to do with applications and paperwork (mentioned by 26.9% or 14 out of 52).
    - Please see *Figure 5. Satisfaction with the Smart $aver Rebate Form Being Easy to Understand and Complete* on page 49, and *Table 27. What Do You Like Least About The Non-Residential Smart $aver Program?* on page 56.
- Participants surveyed are generally satisfied with Duke Energy overall: 71.2% (37 out of 52) rated their satisfaction at "8" or higher on a 10-point scale, while only one respondent (1.9% of 52) rated their satisfaction with Duke Energy at "5" or lower on a 10-point scale.
    - Please see *Figure 11. Satisfaction with Duke Energy Overall* on page 57.
- When asked what additional services would improve the Smart $aver program, more than half offered no suggestions (53.8% or 28 out of 52). Among those that did have suggestions, the most common response was that more types of equipment should be covered by the program, mentioned by 15.4% (8 out of 52).
    - Please see *Table 28. What Additional Services Would You Like the Smart $aver Program to Provide?* on page 58.

Recommendations

1) When Duke Energy is faced with a difference in opinion over more than one outreach approach, Duke Energy should develop analysis plans for testing the comparative effectiveness of the different approaches. This may require that each approach be tested in a different region, or that Duke Energy defines, a priori, what should be the baseline performance against which a new outreach approach should be tested. Developing an analysis plan prior to gathering research will help define what kinds of data should be gathered in order to make a sound program-wide decision.
2) Duke Energy should consider formally structuring a market intelligence effort that leverages existing outreach efforts to the trade allies. The benefit of a structured information gathering effort will allow Duke Energy to have quantitative data on past trade ally behavior that can be used to prioritize future trade ally outreach strategies.

Introduction and Purpose of Study

Overview and Objective

This document presents the process evaluation report for Duke Energy's Non-Residential Smart Program as it was administered in Ohio and Kentucky. The evaluation was conducted by TecMarket Works and Yinsight, Inc. The objective of this process evaluation is to document program operations and identify if there are any areas of improvement for future program implementation.

Summary of the Evaluation Data

The findings presented in this report were analyzed using survey data from participants and stakeholders in the Smart $aver program as presented in Table 1 below.

Table 1. Evaluation Date Ranges

Evaluation Component	Start Date of EMV Participation	End Date of EMV Participation[1]	Dates of Analysis[2]
Participant Surveys	August 1, 2011	February 29, 2012	May 14, 2012 – May 30, 2012
Trade Ally Surveys	August 1, 2011	February 29, 2012	May 2012
Program Manager and Vendor Interviews	August 1, 2011	February 29, 2012	Apr 16, 2012 – August 25, 2012

[1] Cut-off date for when customer became a participant in Smart $aver, and last date of pre consumption data before post EE measure install data can be used in the EMV analysis.
[2] Start date is the date that data collection began, and the end date is the last day of data collection.

Description of Program

The Smart $aver Prescriptive program is designed to motivate Duke Energy's commercial and industrial customers to install high efficiency equipment that they otherwise might not have chosen, by offering rebates up to 50% of the project cost on selected equipment. The Smart $aver Prescriptive program is offered in conjunction with a Custom program, which will be evaluated in a separate study. The measures offered through the prescriptive program have pre-calculated ex ante energy savings, while the measures eligible for the custom program requires project-specific energy savings calculations to be submitted with each application. The combination of both programs allows Duke Energy customers a flexible range of options to meet their individual needs for energy efficient equipment.

The Smart $aver program achieves their objectives through a two-pronged approach. First, Duke Energy's Large Account Management Team provides a channel by which Duke Energy is able to communicate to their large customers any programs that may help with that customer's current needs. Second, for other customers, the Smart $aver program is designed to stimulate the market through "trade allies", the distributors and contractors offering high efficiency equipment. This marketing approach through nurturing a network of trade allies has been found successful in past evaluations. The Smart $aver program has been run by one program manager in the past, who has since moved on. In June and September of 2010, Duke Energy brought on two new program managers so that the Smart $aver prescriptive program had one program manager for the Carolinas and another for the Midwest states.

Methodology

Overview of the Evaluation Approach

This process evaluation had three components: management interviews, trade ally interviews, and participant surveys.

Study Methodology

Management Interviews

Management interviews were conducted with program implementation staff and management in order to capture their insights about the programs operations and challenges. We interviewed:

- Three Duke Energy Managers and two Duke Energy Smart $aver program managers
- Two Duke Energy account managers
- Three WECC program staff and one WECC trade ally representative
- Two project managers from CustomerLink
- One technical consultant

Trade Ally Interviews

Nine Non-Residential Smart $aver trade allies were interviewed in May of 2012. All of the interviews were conducted with a sales manager within the firm or an equivalent representative. Each of the respondents indicated that they were the individual within their company who had the most experience and was the most acquainted with the program. The interview protocol used during these interviews can be found in Appendix B: Trade Ally Interview Instrument.

The interviews were written to cover various aspects of the program, such as program operations, aspects of trade allies' involvement, incentive levels applied, covered technologies, and program effects from the trade allies' perspectives.

Participant Surveys

The sample list provided by Duke Energy consisted of 636 installations in Ohio and 120 installations in Kentucky, representing 155 participating organizations in total. TecMarket Works attempted to contact all 155 organizations (100%) and completed interviews with 52 organizations for a total response rate of 33.5% (52 out of 155). Of the completed surveys, 42 interviews (90.4% of 52) with usable responses were completed for organizations in Ohio and 10 interviews (9.6% of 52) were completed for organizations in Kentucky. Most respondents' organizations received incentives for purchasing Fluorescent Lighting (65.4% or 34 out of 52), while the rest received incentives for purchasing Occupancy Sensors (23.1% or 12 out of 52) or Variable Frequency Drives (11.5% or 6 out of 52).

Data collection methods, sample sizes, and sampling methodology

Management Interviews

Interviews were conducted with program implementation staff and management in order to capture their insights about the programs operations and challenges. We interviewed:

- Three Duke Energy Managers and two Duke Energy Smart $aver program managers
- Two Duke Energy account managers
- Three WECC program staff and one WECC trade ally representative
- Two project managers from CustomerLink
- One technical consultant

Trade Ally Interviews

Nine Non-Residential Smart $aver trade allies were interviewed in May of 2012 from a random selection of 94 trade allies with contact information.

Participant Surveys

The sample list provided by Duke Energy consisted of 155 organizations in Ohio and Kentucky. Out of these 155 organizations in Ohio and Kentucky, all 155 were called (100%), and of those 52 completed the survey for a total response rate of 33.5% (52 out of 155). Of the completed surveys, 42 interviews (90.4% of 52) with usable responses were completed for organizations in Ohio and 10 interviews (9.6% of 52) were completed for organizations in Kentucky. Most respondents' organizations received incentives for purchasing Fluorescent Lighting (65.4% or 34 out of 52), while the rest received incentives for purchasing Occupancy Sensors (23.1% or 12 out of 52) or Variable Frequency Drives (11.5% or 6 out of 52).

Number of completes and sample disposition for each data collection effort

Trade Ally Interviews

From the list of 94 records, 9 trade allies were contacted for interviews in May of 2012.

Participant Surveys

The sample list provided by Duke Energy consisted of 155 organizations in Ohio and Kentucky. Out of these 155 organizations in Ohio and Kentucky, all 155 were called (100%), and of those 52 completed the survey for a total response rate of 33.5% (52 out of 155). Of the completed surveys, 42 interviews (90.4% of 52) with usable responses were completed for organizations in Ohio and 10 interviews (9.6% of 52) were completed for organizations in Kentucky. Most respondents' organizations received incentives for purchasing Fluorescent Lighting (65.4% or 34 out of 52), while the rest received incentives for purchasing Occupancy Sensors (23.1% or 12 out of 52) or Variable Frequency Drives (11.5% or 6 out of 52).

Expected and achieved precision

Participant Surveys

The survey sample methodology had an expected precision of 90% +/- 7.6% and an achieved precision of 90% +/-9.3%.

Description of measures and selection of methods by measure(s) or market(s)

The process evaluation focused on linear lighting measures, occupancy sensors, and VFDs that were eligible for a Smart $aver rebate in Ohio during the dates of August 1, 2011 through February 29, 2012.

Management Interviews

Program Background & Objective

The Smart $aver Prescriptive program is designed to motivate Duke Energy's commercial and industrial customers to install high efficiency equipment that they otherwise might not have chosen, by offering rebates up to 50% of the project cost on selected equipment. The Smart $aver Prescriptive program is offered in conjunction with a Custom program, which will be evaluated in a separate study. The measures offered through the prescriptive program have pre-calculated energy savings, while the measures eligible for the custom program requires project-specific energy savings calculations to be submitted with each application. The combination of both programs allows Duke Energy customers a flexible range of options to meet their individual needs for energy efficient equipment.

The Smart $aver program achieves its objectives by stimulating the market through "trade allies", the distributors and contractors offering high efficiency equipment. This marketing approach through nurturing a network of trade allies has been found successful in past evaluations. Prior to 2010, the Smart $aver program had been run by one program manager, who moved on. In June and September of 2010, Duke Energy brought on two new program managers so that the Smart $aver prescriptive program had one program manager for the Carolinas and another for the Midwest states.

There was a non-residential prescriptive rebate program in the MW since 2000, reports a Duke Energy manager, and some incarnation of this program has been offered on and off in the past decade. More recently, this program was offered as Smart $aver under the Save-A-Watt model in Ohio[3]. There have been a number of changes in Smart $aver program since the fall of 2011. One WECC staff reports that the number of allowable measures has expanded, with many measures moved from the Smart $aver Custom program to the Smart $aver Prescriptive program. Duke Energy is also offering a pilot program, the Mercantile Self Direct rebate program), which allows customers to apply for Smart $aver rebates, retroactively, for equipment installed within the past three years.

Duke Energy recently was allowed to offer the Smart $aver Custom program in Kentucky on a pilot basis. One Duke Energy staff member reports, "*That's very positive and new to the program.*" One account manager reports that Duke Energy has filed a proposal to augment the Smart $aver prescriptive program in Kentucky so that it includes all measures currently being offered in the Ohio market.

[3] In Ohio, the Save-A-Watt model was filed for 2009-2011 and has ended. Duke has proposed to offer their programs under a shared earnings model, which at the time of these interviews was still under commission consideration. Until the new earnings mechanism is approved, Duke is continuing to offer programs in OH under the Save-A-Watt model.

Program Operations

Duke Energy implements the Smart $aver program through a third party vendor, the Wisconsin Energy Conservation Corporation (WECC)[4]. WECC has a number of responsibilities, including managing a network of trade allies (including vendors, distributors and manufacturers), processing the applications, processing the incentives, and conducting site inspections on a sample of the installations to verify that the equipment received for the incentive was actually installed. WECC reports that their compensation structure has changed as of April 2011 with the start of their new contract with Duke Energy: WECC now has a kWh goal for both the Smart $aver Prescriptive and Custom programs for each state in Duke Energy's service territory. One WECC interviewee remarks, "*This compensation structure provides us with incentives to meet and exceed impact goals and encourages us to go after bigger [higher savings] projects*."

Duke Energy also uses a vendor, CustomerLink, for their Smart $aver call center, and a technical consulting team led by Morgan Marketing Partners for assistance in their annual technical review of the program's measures. Each of these vendors will be discussed below[5].

Trade Ally Network

The Smart $aver program is primarily marketed through a network of trade allies, including vendors, distributors, and contractors. This network is managed by WECC, and allows Duke Energy to position the Smart $aver option to customers who may be faced with urgent or early replacement equipment replacement needs, and/or who may not have assigned account representatives at Duke Energy.

A WECC interviewee reports that while application and rebate processing are similar for each state in Duke Energy's territory, the specific outreach differs because each region has its own unique customer base and climate. The outreach efforts also leverage campaigns independently initiated by the trade allies. A WECC interviewee reports, "*Right now Trane has a promotion on high efficiency cooling, so we try to piggy back on the manufacturer's promotion so allies and customers are hearing it from all sides*."

WECC reaches out to trade allies through direct contact, interviews, seminars, phone calls and emails about program requirements and the benefits of promoting efficiency for both the trade ally's business and their customers. These efforts include making presentations at meetings held by manufacturers for their contractors and attending trade conferences.

WECC identifies contractors and distributors that sell equipment/products in each technology market including, for example, lighting, chillers, pumps, drives, and compressed air technologies. Once identified, WECC encourages the trade ally to become a registered Duke trade ally, which includes being listed as a registered trade ally on the Duke web site. For their

[4] As of Jan. 1, 2013, the third party vendor Ecova took over all responsibilities except for management of the outreach team, which was assumed by Duke Energy staff.

[5] Duke Energy does engage other vendors in lesser capacities, but they are not documented in this report.

outreach efforts, WECC organizes the trade allies by technology offered and according to company size and participation in the program. WECC then initiates a structured calling effort with those targeted trade allies to make sure they are informed about the program and its benefits.

Account Managers

Duke Energy has an account management team with approximately 60-70 representatives assigned to the large commercial customers across the five states. These account managers are in regular communication with the large customers about their needs and actively recruit them to participate in the Smart $aver Prescriptive program, as well as the other energy efficiency and demand response programs. As an account manager explains, "*A lot of it is individual work with the customer, building relationships.*"

The account managers report that they sometimes have the pleasure of personally delivering incentive checks to the customers, and that they have used this opportunity to suggest that the incentive check might be used as seed money for the next energy efficiency retrofit. TecMarket Works notes that this is a commendable approach, and helps to instill a mindset that more opportunities for savings are out there. When asked, an account manager reports that Duke Energy has not formally tracked whether these incentive checks have been used as seed money for subsequent retrofits.

Duke Energy may want to conduct a one-time survey of their past Smart $aver participants to see if any have used their Smart $aver incentives as seed money for their next energy efficiency retrofit project or check participation records to determine if customers are re-enrolling for other technologies after they receive their incentive payment. Due to the state of the economy, there may not be very many customers that can afford to do this, at this time; on the other hand, customers may be looking for ways in which they can reduce their utility bills to deal with the current economic pressures. However, Duke Energy can consider constructing case studies specifically about those customers who do use incentives as seed money, or at least obtain testimonials from those customers to share with others.

One account manager reports that they are always on the lookout for case studies about their customers: "*If any of us have a really good story to tell, we are always encouraged to bring that up and suggest that as a potential case study.*" He also reports that the account managers may receive requests for case studies around certain technologies, with a recent request coming from a manufacturing segment manager. In addition to the account managers, these Duke Energy segment managers work with the Smart $aver program to help reach customers in their respective segments. These segments include manufacturers, data centers, hospitals, government, commercial real estate, water/waste-water, education (K-12 as well as colleges and universities) and national accounts.

Each account manager has both personal kWh goals and team kWh goals. "*If we all make our goal we'll make the team goal.*" Both account managers interviewed mentioned that these were aggressive "stretch" goals that have doubled since the previous year (across all their states), and that they were on track with the current participation rates.

One account manager suggests that to improve program operations, they might be allowed to access the database showing the status of their customers' Prescriptive applications. The account manager explains that sometimes his customers will tell him they checked one box on the application but not another, and he would like to double check both their applications and the files they've submitted, as well as access past participation data for customers so he can provide examples of what projects have occurred in the past. Currently, the account manager says he has to "pester" the program manager for this information. Further inquiry with the Duke Energy program managers revealed that Duke Energy's Business Service Center (BSC) team provides support to the account managers, and it is the BSC representatives who have direct access to WECC's reporting portal and information on application status.

Small Business Team

Duke Energy has designed a Small Business Strategy Team of four staff members to reach out to their small to medium business customers in all five states. For these unassigned customers, the small business team conducts webinars and holds regional meetings where customers are invited to learn about Duke Energy's nonresidential programs. They leverage other Duke Energy outbound telephone and mail campaigns, and are using social media to reach their audience. Although the Smart $aver prescriptive program has been benefitting the large business customers, Duke Energy recognizes that it has not been fully utilized by small and medium businesses. A Duke program manager reports that they are "*heading in a new direction;, there's a focus on small and medium business customers now...so that they have a similar type of experience that large customers get, regarding energy efficiency*". The small and medium business market is considered to include all business customers who have less than $250,000 in annual energy costs. The team lead reports that they target businesses according to a number of characteristics. These may include billing data, their business revenue, and other information from Duke Energy's Market Analytics group and the Customer Data group. The team will call the business, try to identify who the decision maker is, and talk to the decision-maker about the Smart $aver's prescriptive incentives. This outreach occurs year round, and the level of effort in each state depends on the availability of Smart $aver funds.

The Small Business Strategy Team sets internal objectives for their outreach efforts, in terms of both participation "lift" and kWh impacts. The team lead reports that they currently have a 5% lift above prior participation rates. The team also ran a successful pilot where they provided the customer with leads to trade allies who in the past have been frequent participants.

Website

The Duke Energy website serves as the primary means of disseminating updated information about the program to both the customers and the trade allies. The website includes lists of qualifying measures, their associated incentives, and updated applications that need to be filled out. The program manager reports, "*We are always trying to drive customers to that site because we make frequent changes. We add and remove measures only once a year, but we make frequent clarifications [in response to new questions]*".

In addition to the current list of measures, the website includes video demos on how to fill out the application and an example of a completed application. Prominently featured on every page is a link to contact information should the applicant have either technical or application-related questions.

A couple of Duke Energy staff acknowledged that information about the Smart $aver program was hard to navigate to; no others had any complaints or suggestions for improving the content of the web site.

Call Center

Duke Energy contracts with a third party call center, CustomerLink, to answer questions from trade allies and customers[6]. CustomerLink reports that they will lead the customer to the website and online application and show them what kinds of incentives they would receive for the measures they are considering. CustomerLink tracks and reports on these calls in two different ways. They track calls at the phone switch level, reporting how many calls were offered for the program, how many seconds it took to answer the call, how long the average call lasted, and other service level statistics. They also track and report on the content of the calls including, for example, whether the caller was a customer or new trade ally, whether they were calling to obtain an application, to check an application status, or if they had a technical versus an application-related question. This information is posted to Duke Energy's data system on a daily basis. According to one CustomerLink project manager, approximately 60% of the calls are from Duke Energy customers and 40% are from vendors. For the vendors, CustomerLink maintains a trade ally participation list that is listed on the Duke Energy Smart $aver website. When vendors call, CustomerLink uses that opportunity to promote the participation list as a benefit of becoming a registered trade ally with Duke Energy.

Applications and Rebates

Completed applications can be mailed, faxed, or emailed to Duke Energy. Duke Energy also provides an application that can be filled out online, and then printed out for submission. Duke Energy has also been considering the feasibility of accepting applications directly from an online form. Many applicants have requested this feature in the past. One program manager reports that some of the hurdles to offering online submission include IT cost constraints and data security concerns. Although Duke Energy has begun accepting emailed applications, the issue of customer data security has already arisen with email. To resolve this, Duke Energy has established a secure email connection with WECC so that emailed applications can be transmitted securely to WECC for processing. Duke Energy reports that they are continuing to work on the hurdles and that "*an online application is completely possible*" in the future.

WECC responsibilities also include assisting trade allies with filling out the application, identifying incomplete or missing information, and in general, "*to overcome any barriers to participation by the trade allies.*" WECC makes a special effort to assist trade allies who have submitted incomplete applications, noting that these efforts are most valuable because often the

[6] Starting in 2013, these responsibilities were contracted to a new third party call center, Ecova.

incomplete applications are only lacking a specification sheet or an invoice. A WECC program manager reports that "*Historically, the trade ally service representatives would follow up on the incomplete applications in an effort to convert them into completed applications, but earlier this spring WECC initiated a new process that begins with WECC fulfillment staff making the initial follow up call, unless the WECC Trade Ally Representative opts to personally follow up.*"

WECC receives the applications and reviews each one to make sure all program requirements are met. Duke Energy requires WECC to enter the application in their database within 3 days of receipt, with a data-entry accuracy level of 100%, along with a classification of whether the application is complete, incomplete, or rejected. To achieve the 100% accuracy service level, WECC reports they have a dedicated staff member who double-checks the paper applications with a printout of the day's entries. For complete applications, WECC will send out a rebate check within 8 business days. WECC also sends out letters for rejected applications.

A WECC program manager reports that they upload paid applications to the Duke hub bi-weekly. WECC then e-mails Duke Energy program managers, Duke Energy account managers, and WECC trade ally service representatives a listing of all applications that have been completed, marked incomplete or rejected from the previous day. "*This ensures that not only is everyone aware of the measures processed but also that the customer and the trade allies receive the help they need to complete their current application and to acquire a deeper knowledge for future opportunities.*" Duke Energy calculates program impacts based on participation entered by WECC and the deemed savings developed by Duke Energy for those measures.

In the past evaluation of the Smart $aver program, TecMarket Works found that WECC's fulfillment service levels at 100% accuracy constituted best in class. For this evaluation period, however, the Duke Energy program managers have reported that WECC's fulfillment team had suffered a recent drop in performance for several months, from June through September. The errors ranged from processing an application twice, to incorrectly denying the eligibility of some measures. According to a Duke Energy program manager, WECC had attributed the drop in performance to staffing changes, but still were unable to resolve the issues and return to their former service levels.

Site Verifications

WECC conducts field verifications on at least 5% of the applications from each state to verify that the equipment listed on the application matches what is installed at the customer's premise. The sample is roughly stratified by technology, incentive amount, region, and tries to cover a diverse group of trade allies, including customers who self-install.

A Duke Energy program manager reports that it is rare for verifications to fail. In the few cases that do fail verifications, customers have been responsive and corrected their application for the correct measures. In some cases, the customers are appreciative of the verification results because they had been overcharged by the vendor for uninstalled measures. The program manager says that when warranted, Duke Energy may ask WECC to conduct a pre-inspection, but those cases are rare.

Communication and Coordination

Duke Energy reports that they hold two different biweekly meeting with their vendors, WECC and Customer Link. One set of meetings address trade ally outreach. At these meetings, all team members have an opportunity to discuss changes or other hot topics. This is also an opportunity that WECC takes to bring issues to Duke Energy, keeping them apprised of what their trade ally representatives hear from the trade allies. At the other set of meetings, Duke Energy discusses fulfillment issues with WECC management, and WECC provides Duke Energy with weekly score cards that provide a report of performance versus goals. In some meetings, Customer Link's call center manager identifies information that they need from the fulfillment team, and the Duke Energy Program manager acknowledges the usefulness of the meetings in establishing a channel for regular communications. In addition to these biweekly meetings, formal quarterly review meetings are also conducted where all program metrics and performance aspects are discussed.

A WECC staff member reports that many members of the WECC implementation team are in contact with the Smart $aver program managers on a daily basis, producing reports that Duke Energy requests, responding to questions and ensuring that the program is operating smoothly. As the WECC interviewee reports, his role is "*making sure that the client gets what they want*".

Duke Energy concurs that the communications and coordination with the WECC program team have been successful and reports that, "*We have a great relationship with the fulfillment team. The person responsible is Katie, we think the world of her. They are very proactive with their communications and very consistent with how they apply the requirements.*"

This sentiment is shared by WECC as well. One trade ally service representative says about Duke: "*They're a real good team to work with. The program managers are great; they're easily accessible and I've enjoyed it.*"

Program Achievements

At the time of these interviews, WECC, who tracks energy savings for the prescriptive Smart $aver, reports the prescriptive Smart $aver is under its goals for the program in Ohio (but ahead of the goals for the Custom program). The Duke Energy program manager reports that kWh objectives are set according to Ohio's mandates for Duke Energy's program.

WECC reports that the prescriptive Smart $aver program is meeting its goals in Kentucky. The Duke Energy program manager reports that program kWh objectives are set after calculating potential impacts for each measure, depending on participation rates that are extrapolated over the next few years.

A Duke Energy program manager reports that they have improved their methods of targeting small, medium, and unassigned customers, and have been developing outreach that presents energy savings "*in a humorous way, not with engineering terms.*" As part of these efforts, Duke Energy developed videos about energy savings opportunities that are now on Duke Energy's website, including one video on ninja-proof occupancy sensors that has recently won an advertising award[7].

Duke Energy has continued to be a contributor to their peers in energy efficiency, by sharing their lessons learned and their expertise. They have participated in DOE projects and in the nation-wide Consortium for Energy Efficiency, an organization of energy efficiency program administrators from utilities and federal agencies. The program manager also reports that he is in the process of creating a resource group that will include public and municipal utilities, energy cooperatives, and other energy efficiency program administrators that may be interested in sharing resources and technical information on measures.

Program Planning

Annual Review

Duke Energy conducts an annual review of the Smart $aver Prescriptive measures. At this time, updates to baselines are made, obsolete measures are removed, and new measures are proposed for the program. Duke Energy engages a consulting company, Morgan Marketing Partners (MMP) along with their subcontractor Franklin Energy, to assist with the technical review. This technical review team conducts engineering analysis and building simulation modeling that is used in determining which measures would be cost effective, a role they have played since the days before the Save-A-Watt initiative was developed. They also provide inputs needed for the DSMore analysis and provides suggested guidelines/language to use for the measure rebate applications.

MMP reports that the team's general process involves reviewing measures that are being used by other energy efficiency programs in the country, identified through market potential studies. MMP selects those technologies for which there is a good understanding of their applications and available data on their savings. For weather sensitive measures, energy savings are calculated across 11 different building types and by weather zone using the DOE2 model. For non-weather sensitive measures, engineering analysis is completed using the best available information. MMP conducts multiple runs of their model for each building type to obtain an energy savings estimate that can be generalized across the mix of buildings that are expected to participate. The technical review team uses the State of Ohio Technical Reference Manual (TRM) when appropriate; in cases where MMP believes they have more specific data, they will use those estimates instead. MMP reports that the technical review team prefers to be conservative with their estimates: "*If we have good documentation that we believe has better numbers, we recommend that instead.*" When asked why MMP recommends more conservative estimates, the interviewee explained that there are enough variables in the estimates that "*the conservative number is defensible in any filing*". This helps to ensure that Duke Energy would not overstate goals, so that Duke "*is not at risk for not accomplishing goals*". MMP reports that they are often asked to include "emerging technologies" in their technology updates, and that MMP will do so

[7] This video can be viewed at: http://www.duke-energy.com/ohio-business/smart-saver/customer/lighting-incentives.asp

when there is a body of data for that technology's performance across a number of similar applications.

Both the two new Duke Energy program managers and MMP acknowledge that the recent annual review was not easy, with tight timelines leading to a number of errors in the report, which were then corrected over a number of months with much discussion before the annual review was shared with state regulators. MMP reports that the technical review team has already identified some "lessons learned" to make the process easier in the future, including more regular communications with the Duke Energy program managers to better understand and identify upcoming needs earlier. The review process also allowed the technical review team to better understand the new program managers' expectations for the report content and the full scope of work that they would like the technical review team to take on.

Duke Energy occasionally brings in engineering consultants to supplement existing efforts. A Duke Energy manager reports that these may include targeted analyses to allow Duke Energy to obtain a different and more detailed perspective on possible measures for certain technology areas such as lighting and HVAC. The Duke Energy manager also believes this will help make the programs more effective by allowing the Smart $aver program to consider different tiers of incentives based upon the different efficiency levels of a particular technology or upon the different operating parameters that are reported by the customers. In the previous evaluation of Smart $aver, TecMarket Works made a recommendation for a similar course of action, and supports this current exploration of different incentive levels for different levels of efficiency.

In addition to technical reviews, Duke Energy also considers measures that are submitted through the Smart $aver Custom program: if measures are being submitted through the Custom program with increasing frequency, Duke Energy will consider the cost effectiveness of including it in the Prescriptive program.

Ohio's regulatory agency allows the Smart $aver program flexibility to propose the new measures to the Ohio Collaborative. If the Collaborative recommends including the proposed measures, the Ohio regulators "*are comfortable with the Collaborative's Decisions*."

Outreach strategy

Duke Energy has contracted with WECC to design the outreach plan for the trade ally network.

A Duke Energy manager reports that the Smart $aver program managers at Duke Energy have shared with WECC several approaches that they believe would help them guide Smart $aver marketing and outreach efforts:

- Identify what the high-participation trade allies do differently from low-participation trade allies.

- Tailor individual outreach plans for the needs of individual market segments in each state or region.

- Target upstream market actors such as distributors and manufacturers and those trade allies that are most active in the market place.

TecMarket Works notes that the previous Smart $aver evaluation study report contained a recommendation to "*specifically focus on barriers for a particular key market segment.*" We agree that Duke Energy's approach to focus on individual market segments in each region is an improvement upon the original recommendation.

Both Duke Energy Smart $aver program managers report that they had asked WECC management to define their outreach approach, repeatedly, but they did not receive a description of a viable strategy. When the evaluation team followed up with WECC to find out what outreach approach was used, a WECC manager reported that their proposed approach was to first classify trade allies into groups of a) those who used the program regularly, b) those who use the program occasionally, and c) those who use the program infrequently. Then, the outreach efforts would be directed to those who most need additional support, namely the trade allies who use the program occasionally or infrequently. WECC reports they completed the ranking at the beginning of 2012, and while they have increased outreach efforts to the occasional and infrequent participants, they have continued to reach out to the frequent participants as well. WECC also reports that they do not target trade allies by the different technologies, but may do so in the future. Currently, at the time of the interview in August 2012, a WECC staff member reports that they are targeting trade allies "*according to their contribution to the program*" resulting in more outreach to lighting trade allies, then HVAC, then motors and then food services. WECC has not formally evaluated this approach, but reports that they plan to conduct an evaluation at the end of the third quarter.

While this seems to be a reasonable approach, it is unclear why WECC did not successfully communicate to Duke Energy that WECC was using an approach different from what Duke Energy program managers have suggested. Nor is it clear why, if this approach was in use since the beginning of 2012, why Duke Energy had not learned of this approach at the time of the evaluation interviews in mid-2012. There is clearly a barrier that has been impeding communication and perhaps collaboration. While it is not within the scope of this evaluation to address specific communication issues, the evaluation team identifies this as a problem in the program's implementation. Furthermore, the evaluation team points out that it is a fundamental responsibility of the implementer of any program to clearly communicate their methods and approaches to all stakeholders. In this case, this responsibility lies with WECC, as the implementer of the trade ally network, to have successfully communicated their outreach approach to Duke Energy, their primary stakeholder.

Moving forward, TecMarket Works offers several thoughts to consider. First, there is an opportunity that may be lost if any outreach efforts are not also used to gather data on the trade allies. This data can be used to support Duke Energy's approach of identifying key drivers of those trade allies who are frequent participants. Second, targeting trade allies on the basis of their contribution to the program may yield the unintentional result of getting "more of the same", that is, a continued dominance of lighting over other measures. If one were to use WECC's reasoning that less-frequent participants may derive more benefit from outreach efforts, it should follow that WECC should also be targeting trade allies in those technology areas that are less frequently utilized by customers. This is not necessarily what TecMarket Works recommends but we want to point out that in this case as well, there is an opportunity to gather data on the drivers for the trade allies in different technology markets. No matter what the approach, if an outreach effort were to also be used to gather information about the trade allies' characteristics in a structured way, Duke Energy would gain useful information for future outreach efforts.

RECOMMENDATION: If Duke Energy is faced with a difference in opinion over more than one outreach approach, Duke Energy should develop analysis plans for testing the comparative effectiveness of the different approaches. This may require that each approach be tested in a different region, or that Duke Energy defines, a priori, what should be the baseline performance against which a new outreach approach should be tested. Developing an analysis plan prior to gathering research will help define what kinds of data should be gathered in order to make a sound conclusion.

RECOMMENDATION: Duke Energy should consider formally structuring a market intelligence effort that leverages existing outreach efforts to the trade allies. The benefit of a structured information gathering effort will allow Duke Energy to have quantitative data on past trade ally behavior that can be used to prioritize future trade ally outreach strategies. Special attention will need to be focused on keeping such a system efficient and streamlined so that it does not overly impact the program's cost effectiveness.

We acknowledge that much of this intelligence already resides within the Smart $aver program managers, account managers, and trade ally representatives, gathered from their own experiences and expertise as well as shared anecdotes and any previous quantitative market characterizations.

A "structured market intelligence effort" could mean anything from asking a market intelligence expert to design an information gathering plan and to implement a knowledge management system for sharing that information, to simply asking trade ally representatives to ask all trade allies they talk to within a certain period (say, a week) three or four questions about key issues such as their most useful tactic for selling energy efficiency, their key drivers for participating, etc, and summarizing that information[8]. Duke Energy already regularly conducts focus groups with trade allies (discussed below), separate from an outreach effort.

Program Improvements Under Consideration

Existing program improvement efforts

Early replacement incentives: In order to help identify ways in which the Smart $aver program might be improved, Duke Energy program staff periodically conduct focus groups with trade allies. Focus groups were conducted with trade allies in the HVAC and lighting markets in the winter of 2011. Duke Energy was able to identify very different needs from each of these groups. The lighting trade allies "*really own the application process*" and the application process seems to be "*almost automatic*", reports a Duke Energy program manager. The lighting incentive offered by the Smart $aver program also seemed sufficient to drive early replacement decisions. However, the HVAC trade allies shared that the Smart $aver incentive was too small to drive early replacements of existing HVAC equipment. Duke Energy is using this feedback to consider

[8] This information can also be obtained through a standard telephone survey, but implementing an in-house market intelligence effort has different pros and cons.

whether potential savings from early replacement of HVAC equipment might justify higher incentives.

Incentives for trade allies

The issue of incentives to the trade allies is an issue that periodically arises, reports a Duke Energy program manager. While there has been much discussion of this option, overall the Smart $aver program is meeting its objectives. However, there seem to be differences in whether incentives may be needed, depending on the technology market. Based upon findings from focus groups, Duke Energy has learned from the lighting trade allies that they would just pass any trade ally incentive on to the customer; that the additional trade ally incentive would not change the lighting trade allies' behavior or recommendations. The program manager reports that feedback from the HVAC trade allies was different: these trade allies report that they would be more interested in the Smart $aver program if Duke Energy paid them a fee. TecMarket Works suggests that this reinforces other feedback Duke Energy has received, that the existing HVAC incentives might be too low for early replacements. It is also not always clear whether a trade ally incentive would truly be more effective than an increased customer incentive for targeted markets. While a higher customer incentive may reduce freeridership because it allows more customers to participate who could not have participated with the original incentive, a trade ally incentive may increase freeridership by increasing trade ally's efforts to "push" the program and search harder to find those who had already decided to take action, without affecting the underlying market demand or "pull".

If Duke Energy changes the program incentives during a down economy in order to move the market, this change should be accompanied by a clear explanation of the underlying economic reasons, so that Duke Energy may manage expectations about whether the incentive is permanent. Managing these expectations may help prevent customers from delaying projects until the next round of expected bonus incentives. In these conditions it will be important to set any such system up so that there are appropriate sunset conditions that act to trigger such applications of variable incentive structures. Likewise, attention will need to be place on keeping the programs cost effective.

Program Needs

One Duke Energy manager reports that there is a need for tools that can help customers evaluate different energy efficiency project alternatives and submit applications online. Duke Energy is currently putting together tools that will help evaluate different project alternatives. These spreadsheets can take a list of measures, allow the input of a customer's marginal rate for energy costs, and generate savings impacts in terms of the lifecycle costs to the customer. "*It's complicated stuff, but it's those spreadsheets that will become on-line tools.*" Furthermore, this manager believes that such a tool would be particularly important because customers and even some account managers have difficulty understanding lifecycle costs: "*they are guilty of focusing on "here's the incentive, here's the capital costs" but they don't bring into account lifecycle costs.*"

If Duke Energy has not yet done so, Duke Energy may wish to consider whether it would be useful to allow for two baselines for calculating the lifecycle costs in their spreadsheets. The vendor could identify the instances in which the baseline for comparison will be the current standard (or code) for the measure, and instances in which the existing equipment will be used as the baseline. Calculations using the current standard for energy efficiency may be easier to automate. However, customers who are uncertain about the full benefits of energy efficiency equipment may develop a better appreciation when considering the lifecycle costs that are calculated from the baseline of their existing equipment.

Other recommendations

In the previous Smart $aver Prescriptive evaluation report, the evaluation team made a number of recommendations. Reported below are ones that the evaluation team feels remain relevant for the current program[9].

#4) Duke Energy should explore the feasibility of developing a coordinated marketing campaign for one market segment, implementing it as a pilot, and evaluating its effectiveness. A small pilot would allow Duke Energy to assess whether targeting marketing to one segment would be a more effective approach for future program efforts.

#8) Explore whether it is feasible to create marketing and outreach campaigns that focus on lifecycle costs. This may allow customers to look beyond consideration about a measure's capital cost and its incentive, and understand the energy savings that would be delivered over the measure's effective useful life.

#11) (If not already being done through the Small Business Strategy Team that has been formed) Duke Energy should consider the feasibility of designing, implementing, and evaluating a pilot program to help <500 kW customers to prioritize energy efficient projects. This may allow more Duke Energy customers to achieve greater savings by providing them with a more complete picture of their energy efficiency options.

#12) Duke Energy should consider the potential benefits of increased market segment penetration if marketing were structured to specifically focus on barriers for a particular key market segment. Duke Energy may want to do this by identifying one high priority market and conducting a characterization study about that market. Duke Energy might then identify that market's specific barriers to participation and develop a logic model that specifies a strategic approach toward overcoming those barriers. Duke Energy can then evaluate the effectiveness of the approach at the end of the program cycle. This would allow Duke Energy to see if they would be able to successfully drive greater activity in a particular segment if there arose a need for doing so in the future.

Program challenges

The biggest program challenges faced by the Smart $aver Prescriptive program are ones being faced by most other energy efficiency programs across the country: Poor economic climate and a need for new measures to replace ones that have transitioned to code or have been made standard.

[9] Since the time of the process evaluation interviews, Duke Energy has begun addressing some of these recommendations. Those actions will be documented in a future evaluation study.

Duke Energy periodically reviews the incentives being offered to see if they are enough to drive customer participation. The Duke Energy program manager reports that they have gotten consistent feedback from customers that the incentives for HVAC measures are not high enough to cover the incremental cost between the high efficiency qualifying measure and the lower efficiency measure. One Duke Energy manager explains the balance they are trying to achieve with incentives:

"This is not our money, we give it out but it's the ratepayers who fund it. It is really incumbent upon us to be good stewards of our customers' money. This means we want to try to keep costs as low as possible, we want to make incentive payments just as much as needed to move the market. We're trying to spend the money as wisely as possible."

The program manager reports that in Ohio, participation is declining. This is due in part to the prescriptive program's long history of successes in Ohio. The program manager reports that they are facing the same challenge that other energy efficiency program administrators are facing, that is finding lighting measures that are more efficient than T8 and T5 fixtures, once T12 fixtures cease production after July 14, 2012. Part of the declining participation rates is due to the poorer state of the economy in Ohio, compared to Duke Energy's other states. The program manager believes that while there is a need to keep up with changes in technology and add to the list of new prescriptive measures, they need to consider the impact of new measures on the Custom program, which is ahead of its goals.

The program manager reports that from July through December of 2009, Duke Energy had offered a limited-time bonus incentive for selected measures in Ohio. Duke offered the bonus incentive again from July through December of 2010, with a smaller market uptake. However, the program manager reports that when the bonus had ended their customers kept asking when the bonus incentives would be offered again. One Duke Energy account manager says, "*In the past we used to offer incentives for a portion of the year, then we discovered customers would wait until the incentives were there. We abolished that by offering the higher incentives all the time to keep people moving all year round.*"

Because the earnings mechanism is still under commission review, one account manager explains that Duke Energy is uncertain which rate the financial repercussions are for providing Smart $aver incentives to their customers

At the time of these interviews, Duke Energy is proposing a direct install pilot door to door with small customers. There will be no free measures: customers will have to make a contribution. At the time of these interviews in April, this pilot is still under consideration by the public utilities commission.

In Kentucky, the Smart $aver program is currently not able to add or remove measures because Duke's request to expand the program is under regulatory review[10]. However, the program manager expects that the measures will be revised to reflect the change in standards. At the time of these interviews, the KY Smart $aver prescriptive program was being implemented at a

[10] In July, 2012, Duke Energy received approval from the Kentucky Public Service Commission to expand the Smart $aver program. The expanded program includes over 60 new measures and no longer has annual incentive caps for commercial and industrial customers, and for K-12 schools.

smaller scale, and has placed annual incentive caps of $50,000 for each industrial facility and $100,000 for each K-12 school. These caps were designed to ensure that more customers could have access to some incentives until the program can be expanded.

Trade Ally Interviews

Nine Smart $aver trade allies from Ohio were interviewed in May 2012. All of the interviews were conducted with a sales manager within the firm or an equivalent representative. Each of the respondents indicated that they are the individual within their company who has the most experience and is the most acquainted with the program. The interview protocol used during these interviews can be found in Appendix B: Trade Ally Interview Instrument.

Five of the trade allies interviewed dealt primarily with lighting measures. Three dealt primarily with HVAC measures, and one dealt equally with HVAC measures and VFDs.

The interviews were written to cover various aspects of the program, such as program operations, aspects of trade allies' involvement, incentive levels applied, covered technologies, and program effects from the trade allies' perspectives. The results of the process interviews are reported by the response categories presented below.

Program Materials

We asked the trade allies if they had enough program materials such as brochures, applications, and program documentation to effectively sell the program to their customers. All nine trade allies indicated that they had enough program forms and applications for their use.

Problems That Have Come Up

All trade allies interviewed said that their experiences with the program were currently free of any major problems and that they were pleased with the program.

When we asked about customer complaints from the trade allies' perspective; in response to our question, trade allies reported that there have been very few customer complaints. In fact, trade allies could recall no specific customer complaints.

Wait Time for Incentive

The length of time that passes from when the application forms are submitted, to the arrival of the rebate check are described as very reasonable by all trade allies. The stated average length of time to wait for a rebate check varied very little from 1 to 2 weeks.

What About Smart $aver Works Well

Each interviewed trade ally was asked what they think works well about the program. This question was then followed with a question about what changes should be made to the progam. The trade allies responded to the question of what works well about the program with a variety of responses. Seven out of nine trade allies mentioned ease of completing the forms as an aspect of Smart $aver that works well.

- Six trade allies mentioned that they are pleased with the current online/electronic versions of the forms.
- Four trade allies mentioned the quick turnaround of the application process.

- Three of the five trade allies who focus on lighting measures also mentioned the recent additions to the program incentives that include LED fixtures and allowing for delamping as very positive.

Specific responses include:

- "I've asked for LEDs, and my clients are asking me for them. I think Duke Energy realizes that this technology is evolving."
- "It's good to know the communication is going both ways."
- "Right now customer energy savings is our product, and the new incentives give us more options to meet our customers' needs."

What Should Change About Smart $aver

The responses to the question of what should be changed varied among the trade allies, with some providing multiple responses.

One of the common responses received among lighting trade allies is that they would like to see a more streamlined and simplified rebate system that is based solely on watts reduced rather than differing incentives for specific technology retrofits. These trade allies feel that a rebate system based on the number of watts reduced would allow them to more easily estimate the customers' incentive amount and present a more accurate ROI to the customer.

Three of the five lighting trade allies mentioned that they would prefer a watts-reduced based system.

The interviewed trade ally that also deals with VFDs said he would prefer the prescriptive program to cover drives up to 200 horse power as he is often installing multiple drives at the same location and sometimes must apply for incentives through both the Custom and Prescriptive Smart $aver programs.

Communications with Duke Energy Staff

All of the trade allies interviewed said that communication with Duke Energy staff was fine, though limited. All of the trade allies said that they were aware of the Smart $aver program information available on the Duke Energy Web Site. Six of the trade allies said they had used the Web Site and all six were satisfied with the information provided.

Customer Awareness of Smart $aver

Trade allies were asked how they made customers aware of the Smart $aver program and then to describe the customers' initial reaction to the program.

All of the trade allies said they tell their customers about the program during normal sales communications and present it as a way to achieve a faster return on investment for the incented high efficiency technology. All trade allies said that customers respond positively or very positively to the idea of the incentive and the savings.

Customer awareness of the Smart $aver incentive varied. Five trade allies reported that they had received Smart $aver customer leads directly from Duke Energy's vendor portal. Two trade allies estimated that "about half" of customers were already aware of the Smart $aver program before contacting the trade ally. All of these trade allies also felt that awareness of the program had increased in the last year and that Duke Energy's general advertising of the program had led to this increase.

Two trade allies were unsure of the amount of customers who were already aware of the Smart $aver program before contacting the trade ally.

Market Transformation

Trade allies were asked what the incentive level would have to be for more than 80 percent of the market to elect to upgrade to the energy efficient model.

The responses varied by measure type:

- Two of the five lighting trade allies felt that the current level of incentives would be sufficient to reach this goal for equipment replacement. One lighting trade ally felt that an incentive equaling 75% of the material cost of the equipment would lead to an 80% upgrade rate.
    - Two lighting trade allies declined to answer this question.
- Two of four trade allies that deal with HVAC measures thought that incentives for peripheral equipment, such as programmable thermostats, were currently adequate to reach 80% of the market. One trade ally further stated that it was impossible to estimate the level of incentives needed for major HVAC equipment upgrades since a majority of his installations are to replace failed equipment which presents budget and time constraints that are unique for every client and situation.
    - Two of the four trade allies that deal with HVAC measures declined to answer this question.

Why Trade Allies Participate

Why trade allies participate varies from the basics (increased sales/profit) to the altruistic (doing the right thing for their customers).

- "It helps our customers to be "lean and green" in a challenging marketplace."
- "It's been a great tool for generating and closing sales."
- "Increasingly, the energy efficient option is a total improvement over the standard efficiency technology. I couldn't have said that five years ago, and the program helps to educate our team and customers."

Program Technologies and Incentives

We also talked to the trade allies about the technologies offered in the program, and the incentives that are provided. The technologies currently covered are supported by everyone we spoke with.

Technologies and Equipment Covered
All nine trade allies interviewed thought that no technologies currently covered by the program should be removed.

Incentive Levels
Six trade allies interviewed indicated that they were satisfied with all current incentive levels. Two lighting and one HVAC trade ally asked for higher incentives but all three declined to give an amount. One lighting trade ally felt that the incentives on LED fixtures were "a little low" but also thought that downward price pressure on LEDs would make these incentives attractive within the next 12 months.

Other Technologies That Should Be Included
No lighting trade allies mentioned any new technologies to be included at this time. However, two HVAC trade allies would like to see compressor controller incentives added.

Suggestions for Streamlining Participation Process
The suggestions offered by the trade allies to streamline the participation process came from the lighting trade allies who suggested that the program utilize a watts-reduced-based incentive structure, and the VFD trade ally who would like to see larger drives moved from the Custom to the Prescriptive program.

Program's Influence on Business Practices
We asked the trade allies about the benefits of their participation in the program to them and to their customers, and how the program has altered their business by changing what equipment they offer.

All trade allies interviewed see the program as a way to encourage customers to upgrade their equipment to a higher efficiency level. In addition, these trade allies noted that the current rebates do provide an incentive for their customers to buy the more efficient product.

Several of contractors have made significant changes to their marketing or stocking strategies since beginning their participation in the Smart $aver program.

- Three of the lighting trade allies report that 80% or more of their stock is now high efficiency.
- One HVAC trade ally states that sales of high efficiency equipment has increased by 50% since beginning participation.

We asked the trade allies if their business would change if the Smart $aver program were no longer offered. We posed the question: *"If the program were to be discontinued, what would happen to the volume of sales of the high efficiency models?"* All nine trade allies indicated that sales would decline despite a large remaining market for lighting retrofits. This response indicates that these allies think that a substantial part of their company's total sales are program induced. Specific responses include:

- "We would have at least a 90% drop in HVAC high efficiency equipment failure replacement sales without the program. Probably a 50-75% drop in new construction or planned retrofits."

- "Most of these programs would be off the table."

- "Our current priority of maximizing lighting energy savings for customers would have to be revisited."

- "I think we'd see at least an 80% drop."

None of the trade allies said they would change their high efficiency model pricing structure if the program were no longer available, suggesting that the program has not had an impact on product pricing. This also indicates that the customers are getting the full advantage of the rebates because the trade allies are not up-pricing.

Taken together, these influences on business practices suggest that the Smart $aver program is a major driver of current high efficiency lighting installations as well as a strong influencer of the overall awareness and availability of high efficiency lighting measures.

Participant Surveys

This survey focused on customers whose organizations, according to program tracking records, received a rebate from Duke Energy for the purchase of new Linear Fluorescent Lighting, light-controlling Occupancy Sensors or Variable Frequency Drives. After filtering for qualifying dates, installations and "do not call" lists, the sample provided by Duke Energy consisted of 636 installations in Ohio and 120 installations in Kentucky, representing 155 organizations in total. Out of these 155 organizations in Ohio and Kentucky, all 155 were called (100%), and of those 52 completed the survey for a total response rate of 33.5% (52 out of 155). Of the completed surveys, 42 interviews (90.4% of 52) with usable responses were completed for organizations in Ohio and 10 interviews (9.6% of 52) were completed for organizations in Kentucky. Most respondents' organizations received incentives for purchasing Fluorescent Lighting (65.4% or 34 out of 52), while the rest received incentives for purchasing Occupancy Sensors (23.1% or 12 out of 52) or Variable Frequency Drives (11.5% or 6 out of 52).

Non-Residential Smart $aver Prescriptive Equipment Installations

The customer data provided by Duke Energy specified the equipment installation which resulted in a Smart $aver rebate for respondents, which is characterized in Table 2. About half of the respondents who received rebates for Fluorescent Lighting installed T8 4-foot 4 lamps (47.1% or 16 out of 34), and most of the rest installed T8 4-foot 2 lamps (29.4% or 10 out of 34). Only 2.9% (1 out of 34) of Fluorescent Lighting rebate recipients installed T5 lamps, the remainder (97.1% or 33 out of 34) installed some type of T8 lamp. Among Occupancy Sensor installations, 100% (12 out of 12) received rebates for systems under 500 watts, while among Variable Frequency Drive installations, 83.3% (5 out of 6) received rebates for fans and 16.7% (1 out of 6) received rebates for a pump.

Table 2. Equipment Installation Which Received a Smart $aver Rebate

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
T8 4ft 1 lamp	2.9%	NA	NA	1.9%
T8 4ft 2 lamp	29.4%	NA	NA	19.2%
T8 4ft 3 lamp	8.8%	NA	NA	5.8%
T8 4ft 4 lamp	47.1%	NA	NA	30.8%
T8 2ft 2 lamp	2.9%	NA	NA	1.9%
T8 lamp (unspecified)	5.9%	NA	NA	3.8%
T5 4 lamp	2.9%	NA	NA	1.9%
Occupancy sensor under 500W	NA	100.0%	NA	23.1%
Occupancy sensor over 500W	NA	0.0%	NA	0.0%
Variable frequency drive - fan	NA	NA	83.3%	9.6%
Variable frequency drive - pump	NA	NA	16.7%	1.9%

Table 3 indicates the average amount of rebates received for Fluorescent Lighting ($507), Occupancy Sensor ($2278) and Variable Frequency Drive ($1567) installations. However for all three types of rebates, the majority of installations received less than the average rebate, as seen by the medians for Fluorescent Lighting ($270), Occupancy Sensors ($1290) and Variable Frequency Drives ($800) all being substantially lower than their respective averages. The range of rebate amounts was greatest for Occupancy Sensor installations (minimum $80, maximum $12,040) and smallest for Fluorescent Lighting (minimum $12, maximum $3200).

Table 3. Amount of Smart $aver Incentive Rebate

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
$60 or less	32.4%	16.7%	0.0%	25.0%
$61 to $300	32.4%	0.0%	33.3%	25.0%
$301 to $999	23.5%	25.0%	33.3%	25.0%
$1000 or more	11.8%	58.3%	33.3%	25.0%
Minimum rebate	$12.00	$80.00	$300.00	$12.00
Maximum rebate	$3200	$12,040.00	$4000.00	$12,040.00
Median rebate	$270.25	$1289.64	$800.00	$502.00
Average rebate	$507.02	$2277.90	$1566.67	$1037.95

The total hours of operation of the rebated Smart $aver equipment is shown in Table 4 (scaled as average hours per day over an entire year). Overall, nearly half (44.2% or 23 out of 52) of participants are using their Smart $aver-rebated equipment the equivalent of 10 or more hours per day all year long.

Table 4. Operation Hours of Smart $aver Installation

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Average of 16+ hours/day over entire year	5.9%	16.7%	16.7%	9.6%
Average of 10-16 hours/day over entire year	35.3%	33.3%	33.3%	34.6%
Average of 8-10 hours/day over entire year	17.6%	0.0%	16.7%	13.5%
Average of 6-8 hours/day over entire year	26.5%	41.7%	33.3%	30.8%
Average of less than 6 hours/day over entire year	14.7%	8.3%	0.0%	11.5%
Not specified	0.0%	0.0%	0.0%	0.0%

Participation in the Non-Residential Smart $aver Program

As seen in Table 5, most respondents in this survey represented organizations in Ohio (80.8% or 42 out of 52), with the remainder being in Kentucky (19.2% or 10 out of 52). None of the Occupancy Sensor installations were performed in Kentucky (0.0% or 0 out of 12), while 26.5% (9 out of 34) of Fluorescent Lighting installations and 16.7% (1 out of 6) of Variable Frequency Drive installations being performed in Kentucky.

Table 5. Distribution of Smart $aver Installations across States

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Ohio	73.5%	100.0%	83.3%	80.8%
Kentucky	26.5%	0.0%	16.7%	19.2%

Table 6 shows that all respondents were aware that their companies participated in the Smart $aver program (aided awareness 100% or 52 out of 52), and all respondents (100% or 52 out of 52) confirmed that the equipment for which they received a Smart $aver rebate matched the information on the participant list supplied by Duke Energy which was used to recruit respondents for this survey.

Table 6. Awareness of the Non-Residential Smart $aver Program

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Unaided awareness	91.2%	91.7%	83.3%	90.4%
Aided awareness	100.0%	100.0%	100.0%	100.0%
Confirmed rebated item matched recruiting list	100.0%	100.0%	100.0%	100.0%

Twenty-two participants in Ohio received bonus incentive rebates, and were asked if they were aware of this. As seen in Table 7, only a minority (36.4% or 8 out of 22) were aware of receiving this bonus rebate.

Table 7. Awareness of Bonus Rebates from the Smart $aver Program (Ohio Only)

Base: Ohio respondents who received a bonus incentive rebate.	Linear Fluorescent Lighting N=14	Occupancy Sensors N=8	Variable Frequency Drives N=0	Total N=22
Aware of increased bonus incentive	28.6%	50.0%	NA	36.4%

Not aware of increased bonus incentive	42.9%	50.0%	NA	45.5%
Not sure if aware of increased bonus incentive	28.6%	0.0%	NA	18.2%

The most commonly mentioned sources of awareness of the Non-Residential Smart $aver program are trade allies (50.0% or 26 out of 52), the information provided with the program (19.2% or 10 out of 52), and past experience with the program (11.5% or 6 out of 52). Respondents who received rebates for installing Variable Frequency Drives were significantly less likely to mention trade allies (16.7% or 1 of 6), and more likely to mention Duke Energy employees (33.3% or 2 out of 6) as a source of awareness when compared to other rebate recipients (statistically significant at $p<.10$ using student's t-test). Very few respondents (1.9% or 1 out of 52) did not know how their company became aware of Smart $aver.

Table 8. Sources of Awareness of Non-Residential Smart $aver Program

Percentage mentioning factor	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Recommendation of trade allies	52.9%	58.3%	16.7%	50.0%
The information provided by the Program	20.6%	8.3%	33.3%	19.2%
Past experience with this program	8.8%	16.7%	16.7%	11.5%
From a Duke Energy employee / account manager / marketing rep	5.9%	8.3%	33.3%	9.6%
Duke Energy training / presentation / seminar	5.9%	0.0%	16.7%	5.8%
From another employee or branch of my company	5.9%	0.0%	0.0%	3.8%
Recommendation of a friend or associate	2.9%	0.0%	0.0%	1.9%
Landlord / property manager	0.0%	8.3%	0.0%	1.9%
News media / advertising	0.0%	8.3%	0.0%	1.9%
Don't know	2.9%	0.0%	0.0%	1.9%

Multiple responses were accepted for this question, so columns total to more than 100%.

Applying for Rebates through the Smart $aver Program

Table 9 indicates that most Fluorescent Lighting rebate recipients (61.8% or 21 out of 34) and half of Occupancy Sensor rebate recipients (50.0% or 6 out of 12) got their application forms from a trade ally, while most Variable Frequency Drive rebate recipients got their applications online (83.3% or 5 out of 6) and none (0.0% or 0 out of 6) got their applications from trade allies. Overall, few participants (5.8% or 3 out of 52) received their applications directly from Duke Energy representatives.

Table 9. Source of Rebate Application

	Linear	Occupancy	Variable	Total

	Fluorescent Lighting N=34	Sensors N=12	Frequency Drives N=6	N=52
Website / online	23.5%	25.0%	83.3%	30.8%
Trade allies	61.8%	50.0%	0.0%	51.9%
Utility	2.9%	0.0%	0.0%	1.9%
Program staff / Duke Energy	2.9%	8.3%	16.7%	5.8%
Consultant or third party company	0.0%	0.0%	0.0%	0.0%
Don't know	8.8%	16.7%	0.0%	9.6%

There were significant differences in how program participants filled out the rebate applications. Every participant who received a Smart $aver rebate for installing a Variable Frequency Drive filled out the application themselves (100% or 6 out of 6), compared to only half of Fluorescent Lighting rebate recipients (50.0% or 17 out of 34) and a small minority of Occupancy Sensor rebate recipients (16.7% or 2 out of 12). For Occupancy Sensor installations, trade allies usually filled out the rebate forms (58.3% or 7 out of 12), and trade allies also filled out nearly half of the Fluorescent Lighting rebate forms as well (44.1% or 15 out of 34), but trade allies did not fill out any rebate forms for Variable Frequency Drives (0.0% or 0 out of 6). These differences are statistically significant at $p<.05$ using student's t-test.

Table 10. Who Filled Out the Rebate Application for Your Company?

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
I did (respondent)	50.0%	16.7%	100.0%	48.1%
Someone else from respondent's company	11.8%	0.0%	0.0%	7.7%
Trade allies	44.1%	58.3%	0.0%	42.3%
Building owner	0.0%	8.3%	0.0%	1.9%
Don't know	0.0%	16.7%	0.0%	3.8%

Multiple responses were accepted for this question, so columns total to more than 100%.

About one in ten respondents who filled out their own rebate forms reported that the application was not easy to understand (9.1% or 2 of 22), and another 27.3% (6 out of 22) found that only "some of it" was easy to understand. Overall, 59.1% (13 out of 22) reported that they had no problems filling out the application forms.

Table 11. Understandability of the Application

Base: respondents who filled the forms out themselves	Linear Fluorescent Lighting N=14	Occupancy Sensors N=2	Variable Frequency Drives N=6	Total N=22
Application was easy to understand	64.3%	50.0%	50.0%	59.1%
"Some of it" was easy to understand	21.4%	50.0%	33.3%	27.3%
The application was not easy to	7.1%	0.0%	16.7%	9.1%

understand				
Don't Know/Not Sure	7.1%	0.0%	0.0%	4.5%

The 8 respondents (36.4% of 22) who thought the applications were not easy to understand were asked what was difficult about the forms. Their responses are listed below.

- *"It had a lot of technical detail and it wasn't very cut-and-dried as to the various options."*
- *"It was difficult because I was unfamiliar with the equipment we were purchasing. I had to learn about efficiency ratings and other technical details to complete the application.*
- *"The "N, C, or R" section needed definition."*
- *"The 50% incentive section at the bottom of the page was difficult."*
- *"The Custom Incentive section."*
- *"The Non-Prescriptive incentive section was very difficult."*
- *"The Prescriptive form is easy. The Custom rebate process is long and arduous."*
- *"No."* (don't remember)

As Table 12 indicates, most (53.8% or 28 out of 52) respondents submitted the application for Smart $aver themselves, and in another 9.6% (5 out of 52) cases someone else from their company did the paperwork. Trade allies submitted the application for 44.1% (15 out of 34) of Fluorescent Lighting rebates and 33.3% (4 out of 12) of Occupancy Sensor rebates, but none (0.0% or 0 out of 6) of the Variable Frequency Drive rebates (significant at p<.10 using student's t-test).

Table 12. Who Submitted the Application to Duke Energy?

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
I did (respondent)	52.9%	41.7%	83.3%	53.8%
Someone else from respondent's company	5.9%	16.7%	16.7%	9.6%
Trade allies	44.1%	33.3%	0.0%	36.5%
Building owner	0.0%	8.3%	0.0%	1.9%
Don't know	0.0%	0.0%	0.0%	0.0%

Multiple responses were accepted for this question, so columns total to more than 100%.

According to Table 13, overall nearly one in ten respondents in this survey (7.7% or 4 out of 52) reported problems receiving their Smart $aver rebate, although none of the respondents who installed Occupancy Sensors (0.0% or 0 out of 12) had problems receiving their rebates.

Table 13. Problems Receiving Smart $aver Rebates

	Linear Fluorescent Lighting	Occupancy Sensors N=12	Variable Frequency Drives	Total N=52

	N=34		N=6	
Had problems receiving Smart $aver rebate	8.8%	0.0%	16.7%	7.7%
Did not have problems receiving Smart $aver rebate	82.4%	100.0%	83.3%	86.5%
Don't know	8.8%	0.0%	0.0%	5.8%

Four respondents (7.7% of 52) reported problems receiving their Smart $aver rebates. Their descriptions of these problems and whether or not they were resolved are listed below:

- *"I've had to re-submit rebate forms with additional information. This has occurred more often with Custom rebates. Most, but not all, of these problems have been resolved satisfactorily."*
- *"It turned out the majority of the new fixtures failed to meet some of the energy efficiency criteria. We had to go back and forth with Duke to clear it up. It was mostly my misunderstanding and my contractor's mistake. It was not resolved to my satisfaction, in that I was not able to receive rebates on all of the lighting that I had installed. I feel Duke should have helped us out, even if some of our fixtures fell a bit short of the required efficiency rating. They could have pro-rated the rebate, instead of denying it entirely."*
- *"One of the applications had to be re-submitted, and it was resolved, but it did take a long time."*
- *"The Prescriptive rebate typically has a quick 2-3 week turnaround. This is in sharp contrast to the Custom rebate, which can take an unacceptable 7 or 8 months."*

Reasons for Participating in Non-Residential Smart $aver

Table 14 shows that the most frequently mentioned reason for organizations' participation in Non-Residential Smart $aver was to reduce energy costs, mentioned by nearly 3 out of 4 respondents (73.1% or 38 out of 52). The rebate incentive itself was also mentioned by more than a third of respondents (36.5% or 19 out of 52). Among respondents whose organizations installed Fluorescent Lighting, some additional factors included T12 lighting being phased out (mentioned by 23.5% or 8 out of 34) and wanting better lighting (mentioned by 20.6% or 7 out of 34). "Old equipment working poorly" was also mentioned by 25.0% (3 out of 12) of Occupancy Sensor rebate recipients and 33.3% (2 out of 6) of Variable Frequency Drive rebate recipients. Another 33.3% (2 out of 6) of Variable Frequency Drive rebate recipients mentioned issues with their HVAC system.

Table 14. Reasons for Purchasing Smart $aver-Rebated Equipment

Percentage mentioning factor	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Wanted to reduce energy costs	64.7%	91.7%	83.3%	73.1%
The program incentive	35.3%	25.0%	66.7%	36.5%
Old lighting being phased out (T12)	23.5%	8.3%	0.0%	17.3%
Wanted better lighting	20.6%	16.7%	0.0%	17.3%

Old equipment working poorly	11.8%	25.0%	33.3%	17.3%
Organization is trying to "go green" / environmental concerns	5.9%	8.3%	0.0%	5.8%
Recommendation of trade ally	11.8%	0.0%	0.0%	7.7%
Remodeling / making improvements / part of a package	0.0%	16.7%	0.0%	3.8%
HVAC system issues	0.0%	0.0%	33.3%	3.8%
Drawbacks of old equipment	2.9%	0.0%	0.0%	1.9%
Tax incentive	2.9%	0.0%	0.0%	1.9%
ARRA grant / federal stimulus	2.9%	0.0%	0.0%	1.9%
Past experience with this program	2.9%	0.0%	0.0%	1.9%
The information provided by the program	0.0%	8.3%	0.0%	1.9%
Could install the upgrade ourselves	2.9%	0.0%	0.0%	1.9%
Recommendation of customers	2.9%	0.0%	0.0%	1.9%
Don't know	2.9%	0.0%	0.0%	1.9%

Multiple responses were accepted for this question, so columns total to more than 100%.

Table 15 shows that almost every Fluorescent Lighting rebate recipient was replacing an existing system (97.1% or 33 out of 34), which is a significantly larger percentage than for Occupancy Sensors (58.3% or 7 out of 12) and Variable Frequency Drives (66.7% or 4 out of 6). Furthermore, none (0.0% or 0 out of 34) of the Fluorescent Lighting installations were the first time that type of unit had been installed at the respondent's organization, whereas for 41.7% (5 out of 12) of Occupancy Sensor installations and 16.7% (1 out of 6) of Variable Frequency Drive installations it was the first such unit installed by that organization. These differences are significant at $p<.05$ using student's t-test.

Table 15. Replacing Existing Units and First-Time Installations

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Newly installed unit replaced an existing unit	97.1%	58.3%	66.7%	84.6%
Newly installed unit did not replace an existing unit, but is not the first such unit installed by the company	2.9%	0.0%	16.7%	3.8%
Newly installed unit is the first such unit purchased by the company	0.0%	41.7%	16.7%	11.5%
Not sure if newly installed unit is the first such unit purchased by the company	0.0%	0.0%	0.0%	0.0%

Units Replaced by Smart $aver-rebated Equipment

As seen in Table 16, most installations that replaced existing systems replaced systems that were 10 to 20 years old (overall 51.1% or 23 out of 45). None of the Occupancy Sensors that replaced existing systems replaced systems that were less than 10 years old (0.0% or 0 out of 12), compared to 14.7% (5 out of 34) of Fluorescent Lighting installations and 25.0% (1 out of 4) of Variable Frequency Drive installations replacing systems less than 10 years old.

Table 16. Age of Units Replaced by Smart $aver Installation

Base: new unit replaced an existing unit	Linear Fluorescent Lighting N=34	Occupancy Sensors N=7	Variable Frequency Drives N=4	Total N=45
Replaced a unit less than 5 years old	2.9%	0.0%	0.0%	2.2%
Replaced a unit 5 to less than 10 years old	11.8%	0.0%	25.0%	11.1%
Replaced a unit 10 to less than 20 years old	47.1%	71.4%	50.0%	51.1%
Replaced a unit 20 years to less than 30 years old	14.7%	14.3%	25.0%	15.6%
Replaced a unit 30 or more years old	14.7%	14.3%	0.0%	13.3%
Don't know age of replaced unit	8.8%	0.0%	0.0%	6.7%

As seen in Table 17, 85.7% (6 out of 7) of Occupancy Sensor installations which replaced an existing system replaced systems that were in "good" condition, versus only 50.0% (17 out of 34) of Fluorescent Lighting installations and 25.0% (1 out of 4) of Variable Frequency Drives installations replacing an existing system described as being in "good" condition. Overall, just 22.2% (10 out of 45) of Smart $aver participants who replaced existing systems replaced systems that were in "poor" or non-functional condition.

Table 17. Condition of Units Replaced by Smart $aver Installation

Base: new unit replaced an existing unit	Linear Fluorescent Lighting N=34	Occupancy Sensors N=7	Variable Frequency Drives N=4	Total N=45
Replaced unit was in good condition	50.0%	85.7%	25.0%	53.3%
Replaced unit was in fair condition	26.5%	0.0%	50.0%	24.4%
Replaced unit was in poor condition	17.6%	14.3%	0.0%	15.6%
Replaced unit was not in working condition	5.9%	0.0%	25.0%	6.7%
Don't know replaced unit's condition	0.0%	0.0%	0.0%	0.0%

Influence of the Non-Residential Smart $aver Program

Table 18 indicates that overall 28.8% (15 out of 52) of the respondents in this survey say that without the Smart $aver program, their organizations would have purchased their new units when they did anyway. Among specific types of installation, this rate was highest among Variable Frequency Drive rebate recipients, with 50.0% (3 out of 6) saying they would have purchased the same equipment at the same time. Conversely, overall about a third (32.7% or 17 out of 52) of participants say they would have kept using their old equipment without the Smart $aver program, and this number is highest for Occupancy Sensor rebate recipients (50.0% or 6 out of 12).

Table 18. Actions Taken If Smart $aver Program Had Not Been Available

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Would have bought the new unit at the same time	29.4%	16.7%	50.0%	28.8%
Would have bought the new unit within less than a year	0.0%	0.0%	0.0%	0.0%
Would have bought the new unit one to three years from now	26.5%	16.7%	0.0%	21.2%
Would have bought the new unit more than three years from now	2.9%	8.3%	0.0%	3.8%
Would have replaced old units as they failed	8.8%	8.3%	0.0%	7.7%
Would have waited for budget to permit funding of new units	0.0%	0.0%	16.7%	1.9%
Would have waited to purchase new units, don't know how long	2.9%	0.0%	0.0%	1.9%
Would have purchased a used unit	0.0%	0.0%	16.7%	1.9%
Would have continued using the old unit	29.4%	50.0%	16.7%	32.7%

Figure 1 indicates that a slight majority of respondents in this survey believe the Duke Energy incentive payment was a significant factor in their company's choice to install more efficient equipment (51.9% or 27 out of 52 rated the influence of the incentive rebate an "8" or higher on a 10-point scale), with similar percentages for all three types of installation. Only 15.4% (8 out of 52) said the rebate had "no influence" on their installation decision. Respondents from companies with Variable Frequency Drive installations were more likely to rate the rebate as less influential than for other installations, with 50.0% (3 out of 6) either saying that the rebate had "no influence" or rating the influence a "5" or lower on a 10-point scale (compared to equivalent figures of 35.3% or 12 out of 34 for Fluorescent Lighting rebates, and 25.0% or 3 out of 12 for Occupancy Sensor rebates).

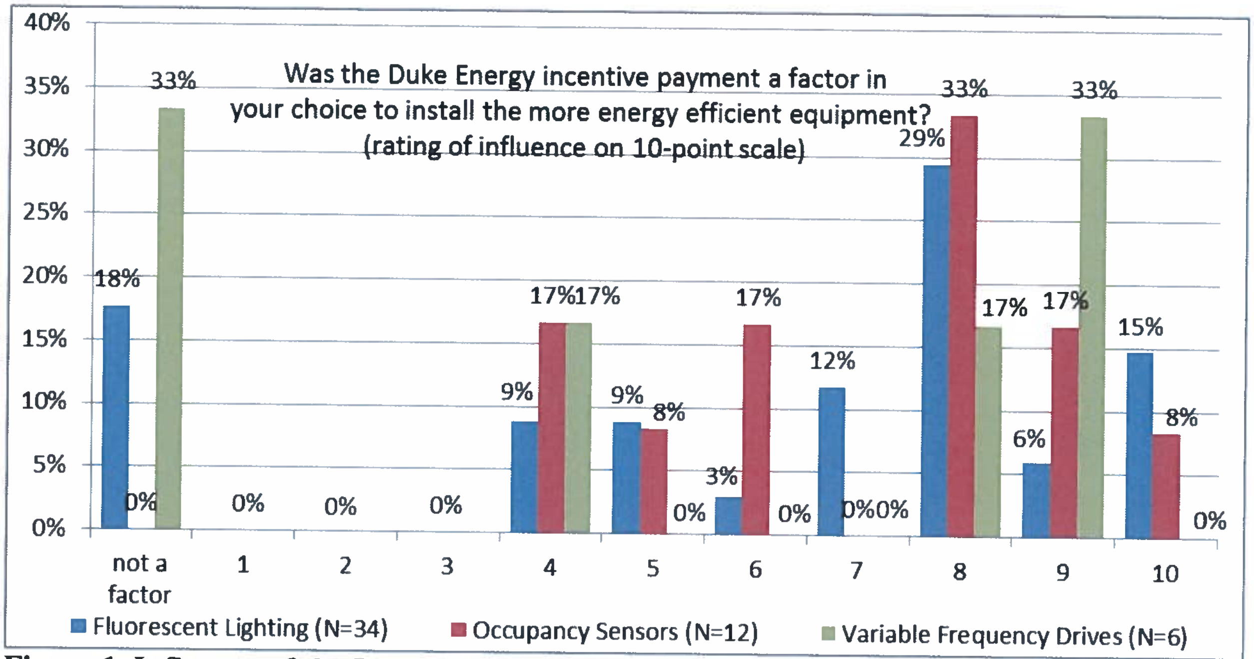

Figure 1. Influence of the Incentive Payment on Smart $aver Participation

According to Figure 2, a plurality of respondents in this survey (44.2% or 23 out of 52) felt the program information for Smart $aver had "no influence" on their company's participation, while overall only 28.8% (15 out of 52) rated the influence of the program information an "8" or higher on a 10-point scale.

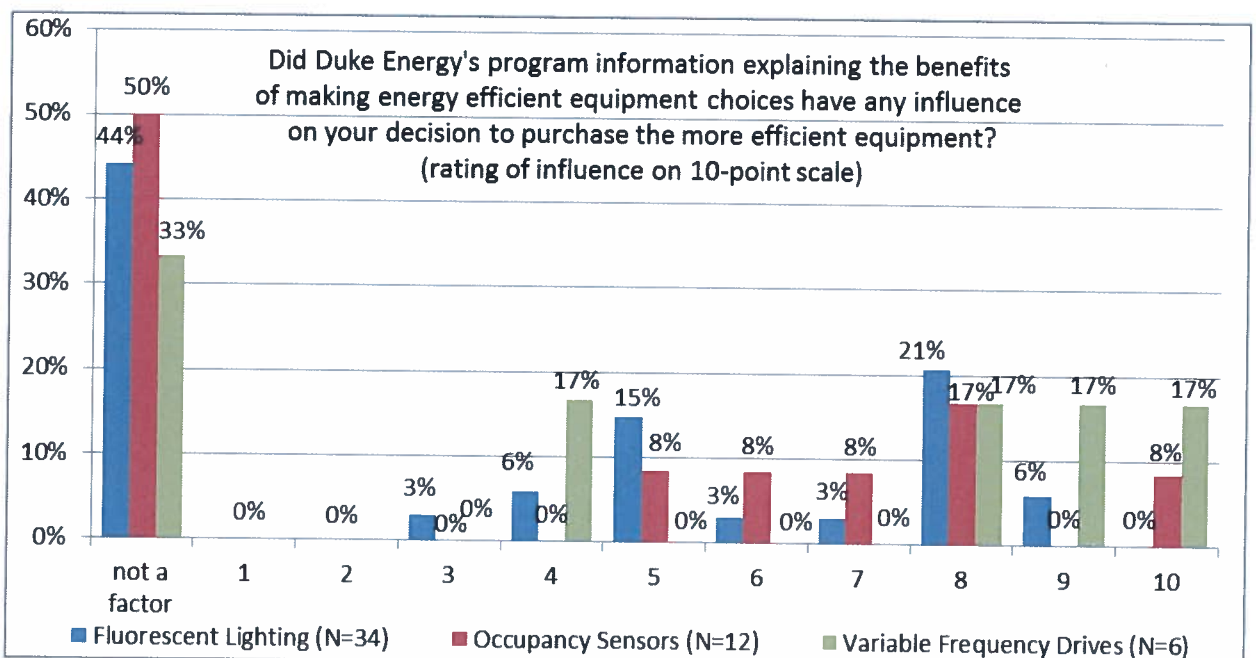

Figure 2. Influence of the Program Information on Smart $aver Participation

Most respondents (51.9% or 27 out of 52) say they would have purchased exactly the same equipment without the Smart $aver incentive rebate, as shown in Table 19. However, more than one in three (34.6% or 18 out of 52) are sure their company would have installed something different without the incentive payment. Compared to the other types of installations covered by the program, Occupancy Sensor rebate recipients were most likely to say they would have installed something different without the Smart $aver rebate (50.0% or 6 out of 12), and least likely to say they would have installed exactly the same equipment (33.3% or 4 out of 12; these differences are statistically significant at p<.10 using student's t-test).

Table 19. Actions Taken if Smart $aver Financial Incentive Had Not Been Available

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Would have selected exactly the same energy efficiency without the financial incentive	55.9%	33.3%	66.7%	51.9%
Would have selected a somewhat different energy efficiency without the financial incentive	32.4%	50.0%	16.7%	34.6%
Not sure what organization would have done without the financial incentive	11.8%	16.7%	16.7%	13.5%

Table 20 shows that most respondents (51.9% or 27 out of 52) also would have selected exactly the same equipment without the program technical assistance. However, Occupancy Sensor rebate recipients were more likely to say they would have purchased exactly the same equipment without the technical assistance (58.3% or 7 out of 12) compared to without the rebate incentive (33.3% or 4 out of 12, as seen in Table 19). Fluorescent Lighting rebate recipients were more likely to be unsure what their organization would have done without the technical assistance (29.4% or 10 out of 34) compared to without the rebate incentive (11.8% or 4 out of 34, as seen in Table 19; this difference is statistically significant for Fluorescent Lighting rebate recipients at p<.05 using student's t-test).

Table 20. Actions Taken if Smart $aver Technical Assistance Had Not Been Available

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Would have selected exactly the same energy efficiency without the technical assistance	47.1%	58.3%	66.7%	51.9%
Would have selected a somewhat different energy efficiency without the technical assistance	23.5%	25.0%	16.7%	23.1%
Not sure what company would have	29.4%	16.7%	16.7%	25.0%

done without the technical assistance				

Almost half of the respondents surveyed have installed more high efficiency equipment since participating in Smart $aver, including installations at the respondents' location and other locations (combined 46.2% or 24 out of 52). However, Table 21 also shows that 53.8% (28 out of 52) of companies surveyed have not installed more high energy efficiency equipment.

Table 21. Other High Efficiency Installations since Smart $aver

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Installed more high efficiency equipment – only at this location	26.5%	33.3%	33.3%	28.8%
Installed more high efficiency equipment – only at other locations	2.9%	8.3%	0.0%	3.8%
Installed more high efficiency equipment – at both this and other locations	11.8%	8.3%	33.3%	13.5%
Have not installed more high energy efficiency equipment	58.8%	50.0%	33.3%	53.8%
Don't know	0.0%	0.0%	0.0%	0.0%

Table 22 shows what types of equipment were installed by organizations that made other high efficiency installations after participating in Smart $aver. The most common category was lighting upgrades (66.7% or 16 out of 24 respondents who installed more high efficiency equipment), followed by HVAC upgrades (25.0% or 6 out of 24) and occupancy / motion sensors (25.0% or 6 out of 24). Respondents who received rebates for installing Occupancy Sensors were more likely to have installed more occupancy or motion sensors (66.7% or 4 out of 6), and recipients of rebates for Variable Frequency Drive installations were the most likely to have upgraded heavy industrial equipment (50.0% or 2 out of 4).

Table 22. Other Energy Efficient Installations Which Were Influenced by Smart $aver

Base: respondents who said they installed more high energy efficient equipment since participating in Smart $aver	Linear Fluorescent Lighting N=14	Occupancy Sensors N=6	Variable Frequency Drives N=4	Total N=24
Total lighting upgrades	64.3%	66.7%	75.0%	66.7%
LED lighting upgrades	7.1%	33.3%	25.0%	16.7%
Other lighting upgrades (including unspecified)	57.1%	50.0%	75.0%	58.3%
HVAC upgrades	28.6%	16.7%	25.0%	25.0%
Occupancy / motion sensors	14.3%	66.7%	0.0%	25.0%
Heavy industrial equipment (motors,	14.3%	0.0%	50.0%	16.7%

chillers, fans, etc.)				
Boiler / water heater upgrades	28.6%	0.0%	0.0%	16.7%
VFD / soft starters	14.3%	0.0%	0.0%	8.3%
Air compressor	0.0%	16.7%	0.0%	4.2%
Efficient appliances / office equipment / computers	7.1%	0.0%	0.0%	4.2%

Multiple responses were accepted for this question, so columns total to more than 100%.

Respondents were asked how they knew these installations were energy efficient; their responses are shown in Table 23. The most frequent response was "doing our own research", mentioned by half overall (50.0% or 12 out of 24 respondents who made other efficiency installations since participating in Smart $aver), but especially by Occupancy Sensor rebate recipients (83.3% or 5 out of 6). Standard efficiency ratings like Energy Star and SEER were also commonly mentioned (by 33.3% or 8 out of 24). For Fluorescent Lighting rebate recipients, information from trade allies (28.6% or 4 out of 14) and cost comparisons (21.4% or 3 out of 14) were also mentioned, though none of the other rebate recipients mentioned these. Half of Variable Frequency Drive rebate recipients (50.0% or 2 out of 4) mentioned previous experience with installing this type of equipment, which was not mentioned by the other two types of rebate recipient.

Table 23. How Do You Know This Equipment Is High Efficiency?

Base: respondents who said they installed more high energy efficient equipment since participating in Smart $aver	**Linear Fluorescent Lighting N=14**	**Occupancy Sensors N=6**	**Variable Frequency Drives N=4**	**Total N=24**
Did own research	42.9%	83.3%	25.0%	50.0%
Energy Star, SEER or other standard efficiency ratings	21.4%	66.7%	25.0%	33.3%
Information from trade allies	28.6%	0.0%	0.0%	16.7%
Cost comparison	21.4%	0.0%	0.0%	12.5%
Equipment specifications / literature / info from manufacturer	7.1%	0.0%	25.0%	8.3%
Based on past installations / previous experience	0.0%	0.0%	50.0%	8.3%
Information from Duke Energy	0.0%	0.0%	25.0%	4.2%
In-house experts / engineers	0.0%	0.0%	25.0%	4.2%

Multiple responses were accepted for this question, so columns total to more than 100%.

Figure 3 shows that more than half of participants believe that Smart $aver influenced their organization to install other high efficiency equipment: overall 54.2% (13 out of 24) of respondents whose organizations installed other high efficiency equipment rated the influence of Smart $aver on these other installation as an "8" or higher a 10-point scale.

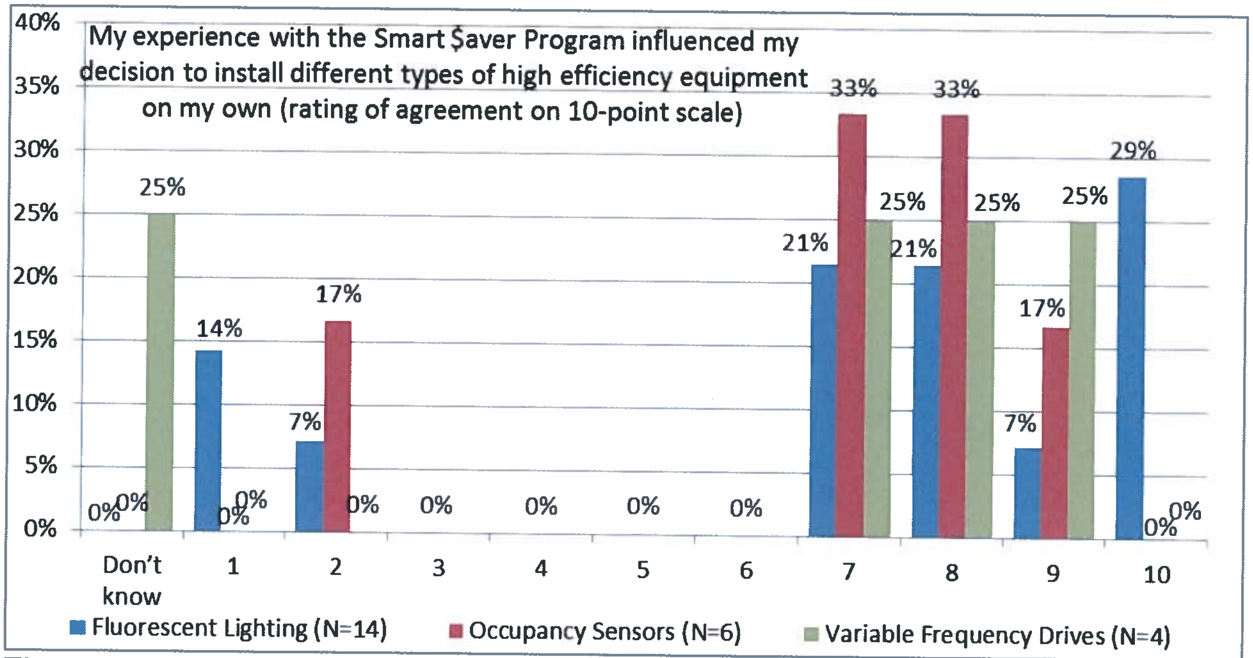

Figure 3. Influence of Smart $aver on Installation of Other High Efficiency Equipment
(Base: N=24 respondents who installed other high efficiency equipment since participating in Smart $aver)

Other efficiency actions taken by organizations that participated in Smart $aver are shown in Table 24. No category of action was mentioned by more than 10% of the respondents surveyed, so it is difficult to draw many conclusions. The most frequently mentioned actions were more lighting upgrades and occupancy sensor installations (each mentioned by 9.6% or 5 out of 52). The biggest difference between groups was that most Occupancy Sensor rebate recipients could not name any actions influenced by Smart $aver (66.7% or 8 out of 12 "don't know / nothing", compared to 32.4% or 11 out of 34 for Fluorescent Lighting rebates and 16.7% or 1 out of 6 for Variable Frequency Drive rebates).

Table 24. Other Efficiency Actions Taken Which Were Influenced by Smart $aver

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
More lighting upgrades	11.8%	0.0%	16.7%	9.6%
Occupancy sensors / motion sensors	11.8%	0.0%	16.7%	9.6%
Maintenance to improve performance / efficiency of equipment	5.9%	0.0%	16.7%	5.8%
Educating employees / tenants / students to save energy (turn things off)	5.9%	0.0%	16.7%	5.8%
Insulation / weatherization	5.9%	8.3%	0.0%	5.8%
More efficient windows / doors / roofs	5.9%	8.3%	0.0%	5.8%

HVAC upgrades	5.9%	0.0%	16.7%	5.8%
Adjusted temperature settings / HVAC usage	2.9%	8.3%	16.7%	5.8%
Upgraded heavy equipment (trucks, transformers, pump stations, etc.)	2.9%	8.3%	16.7%	5.8%
More closely monitoring energy usage	5.9%	0.0%	0.0%	3.8%
Using more natural ventilation	2.9%	0.0%	16.7%	3.8%
VFD upgrades	2.9%	8.3%	0.0%	3.8%
Unique actions (see list below)	17.6%	8.3%	0.0%	13.5%
Don't know / nothing	32.4%	66.7%	16.7%	38.5%

Multiple responses were accepted for this question, so columns total to more than 100%.

Seven respondents (13.5% of 52) mentioned unique actions they had done to improve energy efficiency. These are listed below.

- *"We've installed a 50 kW solar system."*
- *"In the winter, we shut down our warehouse and work out of a smaller facility, for heating purposes."*
- *"We've installed low-flow urinals and commodes."*
- *"Recycling programs."*
- *"We have switched our electric provider."*
- *"We now try to look into efficient options for any kind of upgrades or expansions."*
- *"We have evaluated several possibilities for energy savings at our plants, but have not implemented anything."*

Satisfaction with the Smart $aver Program

Figure 4 indicates that Smart $aver participants were generally very satisfied with the program as a whole: overall, 90.4% (47 out of 52) of respondents rated their overall satisfaction with Smart $aver an "8" or better on a 10-point scale, and nearly a quarter (23.1% or 12 out of 52) gave a "10 out of 10" rating. Only one respondent (1.9% or 1 out of 52) rated their experience with Smart $aver a "5" or less on a 10-point scale, and only one respondent (1.9% or 1 out of 52) didn't know enough to give an opinion.

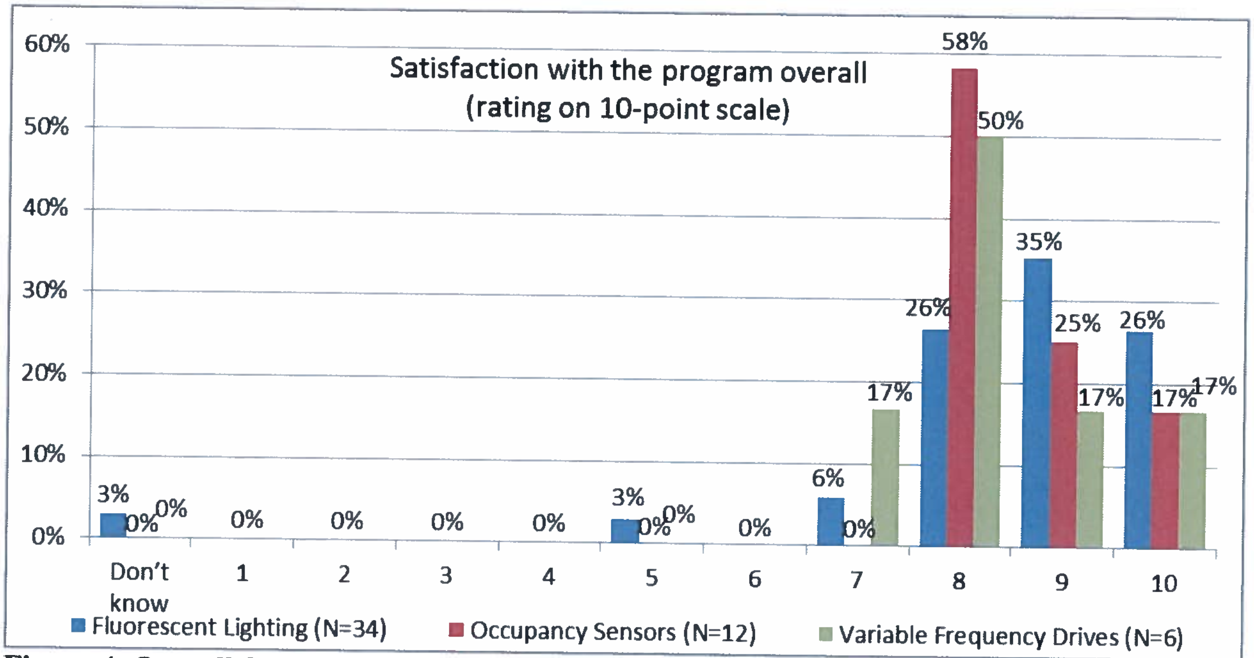

Figure 4. Overall Satisfaction with Smart $aver Program

Four respondents (7.7% of 52) rated their overall satisfaction with Smart $aver a "7" or less on a 10 point scale. They were asked what could be done to improve the program, and their answers are listed below.

- *"Duke could offer rebates on a greater variety of technologies."*
- *"Duke should be less strict about application deadlines. We didn't qualify for some other incentives on major purchases, and it was only because we missed some application deadlines."*
- *"The project could have resulted in greater energy savings."*
- *"The rebate could be increased."*

Participants in Ohio were asked the same question using a 5-point Likert scale to measure their response, as seen in Table 25. Fluorescent Lighting rebate recipients were the most satisfied, with 88.0% (22 out of 25) giving the highest possible rating of satisfaction, versus just 75% (9 out of 12) of Occupancy Sensor rebate recipients and 60.0% (3 out of 5) of Variable Frequency Drive rebate recipients. None (0.0% or 0 out of 42) said they were "dissatisfied" with the program.

Table 25. Satisfaction with the Smart $aver Program Overall (5-point scale for Ohio only)

Base: respondents in Ohio only	Linear Fluorescent Lighting N=25	Occupancy Sensors N=12	Variable Frequency Drives N=5	Total N=42
Very satisfied	88.0%	75.0%	60.0%	81.0%
Somewhat satisfied	8.0%	25.0%	40.0%	16.7%

Neither satisfied nor dissatisfied	4.0%	0.0%	0.0%	2.4%
Somewhat dissatisfied	0.0%	0.0%	0.0%	0.0%
Very dissatisfied	0.0%	0.0%	0.0%	0.0%
Don't know	0.0%	0.0%	0.0%	0.0%

The specific aspect of the Smart $aver program with the lowest level of participant satisfaction was the ease of understanding and completing the rebate form, shown in Figure 5 (compared to Figure 6 through Figure 10). Only 48.1% (25 out of 52) rated their satisfaction with this aspect of the program an "8" or higher on a 10-point scale. However, a substantial number of Fluorescent Lighting (29.4% or 10 out of 34) and Occupancy Sensor (25.0% or 3 out of 12) rebate recipients did not know enough about the rebate forms to answer the question (recall from Table 10 that all of the Variable Frequency Drive rebate recipients filled out their own application forms, unlike the Fluorescent Lighting and Occupancy Sensor rebate recipients).

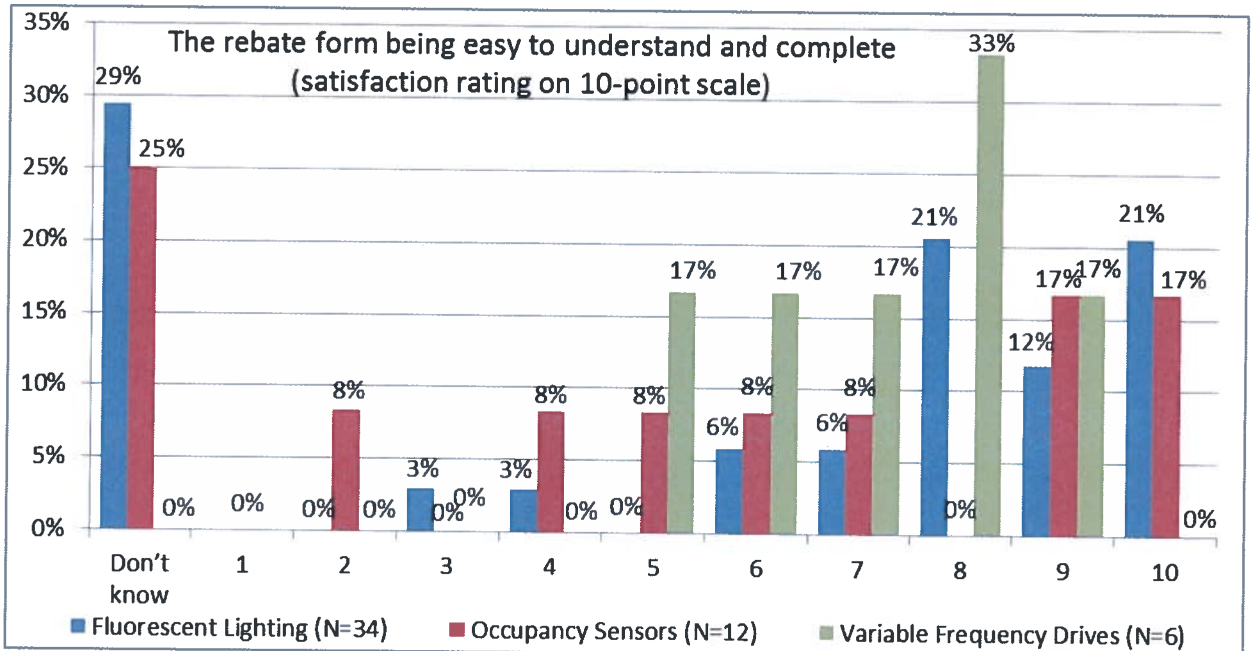

Figure 5. Satisfaction with the Smart $aver Rebate Form Being Easy to Understand and Complete

Fourteen respondents (26.9% of 52) rated their satisfaction with the rebate form being easy to understand and complete a "7" or less on a 10 point scale. They were asked what could be done to improve this aspect of the program, and their answers are listed below.

- *"Duke could provide better descriptions of the specific measures covered by the program."*
- *"Duke should simplify and clarify content if possible."*
- *"Duke should simplify the rebate form to require just the equipment model number and receipt."*
- *"It could be shorter and simpler to fill out."*
- *"The form could be clearer on what lighting upgrades qualify for the rebate."*

- *"The form could have been more layman-friendly."*
- *"The form could have less information on it. It was difficult to figure out which category our project fit into without an electrician's help."*
- *"The form needs simplification."*
- *"The people at Duke who took my questions could have been better trained. I knew more about the equipment than they did."*
- *"The program should add more options for LED lighting."*
- *"The wording could have been less confusing, but my electrician helped."*

- 3 respondents (5.8% of 52) had no specific suggestions for making the forms easier to understand.

Figure 6 shows that the number and kind of technologies covered by Smart $aver was another area with relatively less participant satisfaction. Only 57.7% (30 out of 52) of respondents rated this aspect of the program an "8" or higher on a 10-point scale, while 15.4% (8 out of 52) didn't know enough to answer the question.

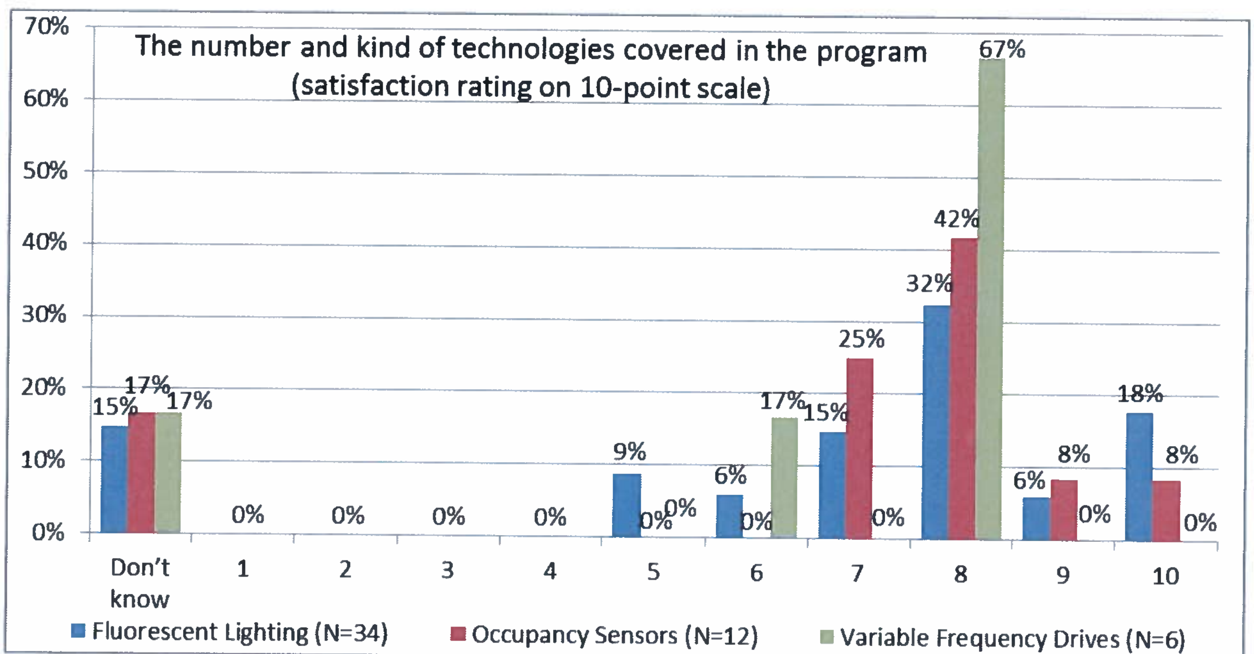

Figure 6. Satisfaction with the Number and Kind of Technologies Covered by the Program

Fourteen respondents (26.9% of 52) rated their satisfaction with the number and kind of technologies covered by Smart $aver a "7" or less on a 10 point scale. They were asked what could be done to improve this aspect of the program, and their answers are listed below.

- *"Duke could include more motors in the program."*
- *"Duke could make it easier to automatically re-set the demand."*
- *"Duke could share more information with customers."*
- *"Duke should constantly update the more efficient mechanical measures being offered."*

- *"Duke should have more coverage of LED, induction, and off-peak lighting technology."*
- *"The program could include more LED lighting rebates."*
- *"The program could offer some more choices."*
- *"Two-bulb fixtures should be covered by the program."*

- 6 respondents (11.5% of 52) had no specific suggestions about technologies covered by the program.

Figure 7 shows that satisfaction with interactions and communications with Duke Energy staff were generally high. Most participants (59.6% or 31 out of 52) rated their satisfaction with interactions with Duke Energy staff at an "8" or higher on a 10-point scale. Another 23.1% (12 out of 52) did not know enough about this aspect of the program to give a rating.

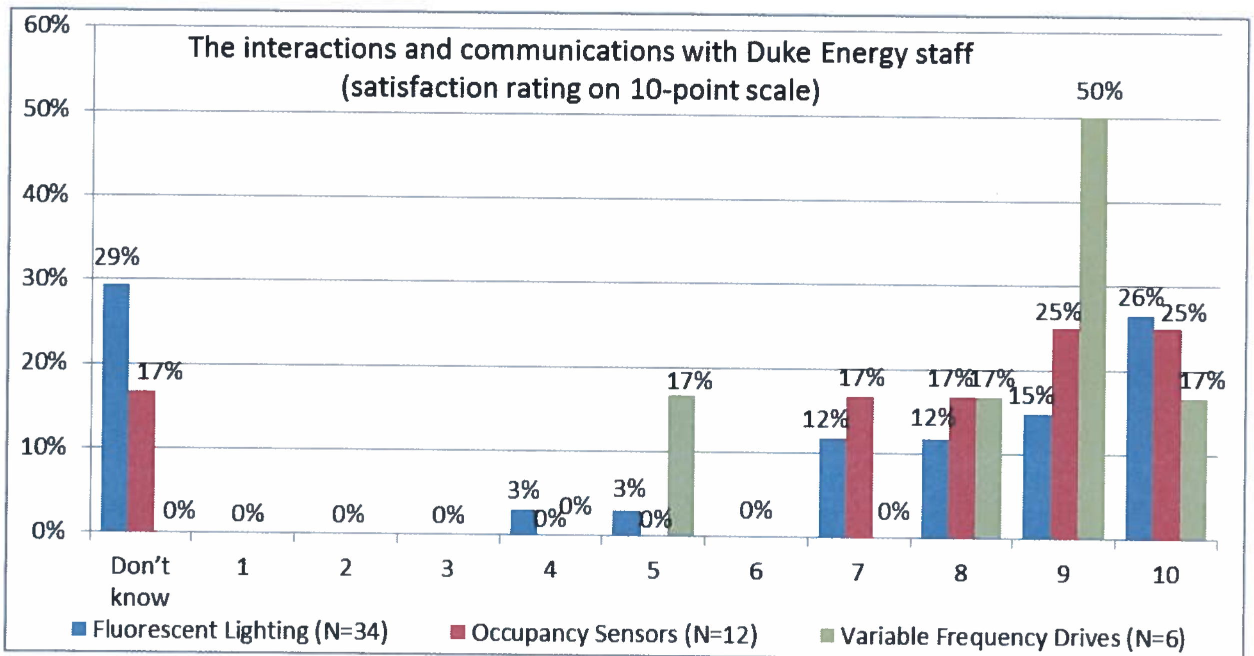

Figure 7. Satisfaction with Interactions and Communications with Duke Energy Staff

Nine respondents (17.3% of 52) rated their satisfaction with their interactions and communications with Duke Energy staff a "7" or lower on a 10 point scale. They were asked what could be done to improve this aspect of the program, and their answers are characterized below.

- *"Duke should have a greater sense of urgency when responding to customer inquiries."*
- *"The scrutiny of the forms was very intense. They could make it less difficult to get the rebate. It was difficult to provide the invoices staff asked for because we obtained the equipment through a federal grant."*
- *"The staff could be easier to get ahold of."*
- *"The staff could have been more clear in their terminology and communications."*

- 5 respondents (9.6% of 52) had no specific suggestions about how to improve communications and interactions with Duke Energy staff.

Satisfaction with the information provided explaining the program was generally high, as shown in Figure 8, with 61.5% (32 out of 52) rating this aspect of the program an "8" or higher on a 10-point scale. However, respondents who received Smart $aver rebates for Occupancy Sensors were somewhat less satisfied, with only 41.7% (5 out of 12) rating their satisfaction with the information supplied with the program at an "8" or higher, versus 67.6% (23 out of 34) of those who installed Fluorescent Lighting and 66.7% (4 out of 6) of those who installed Variable Frequency Drives. Overall, only three respondents (5.8% of 52) did not know enough about this aspect of the program to give a rating.

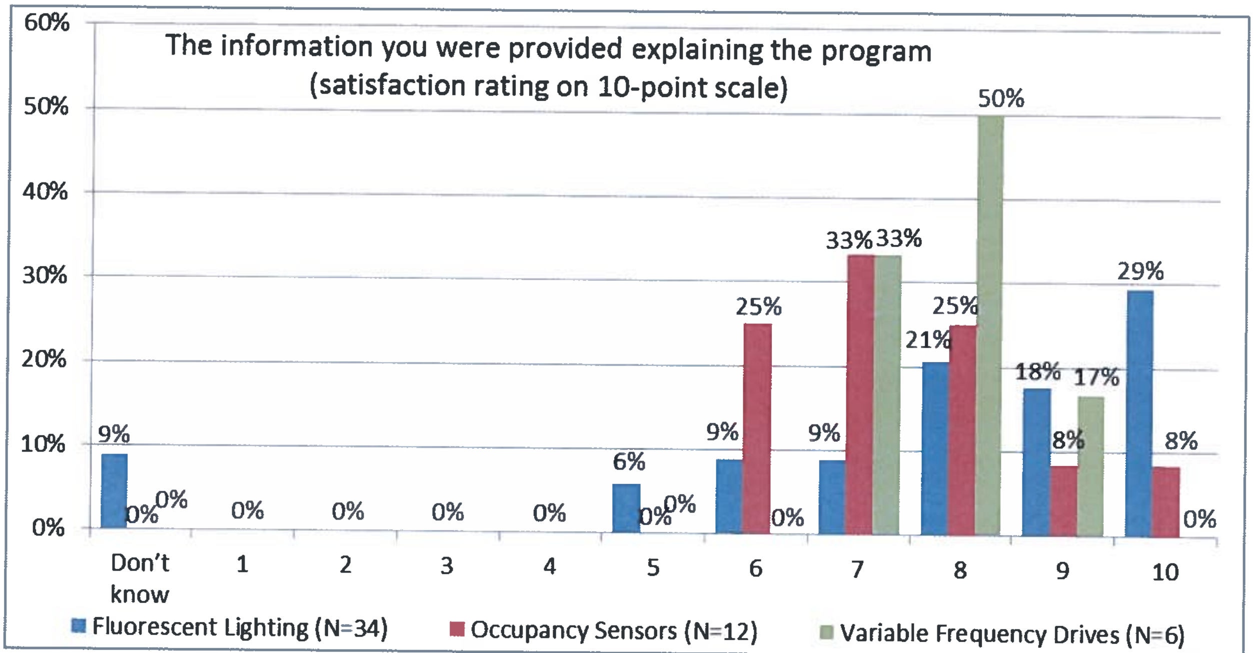

Figure 8. Satisfaction with the Information Provided Explaining the Program

Seventeen respondents (32.7% of 52) rated their satisfaction with information they were provided explaining the Smart $aver program at "7" or lower on a 10 point scale. They were asked what could be done to improve this aspect of the program, and their answers are listed below.

- "*It could be explained in more layman's terms.*"
- "*The information could be simpler.*"
- "*Duke could have provided more explanation of how the application process works and the information you need to apply.*"
- "*Duke could offer a greater variety of technologies to entice people to participate.*"
- "*Duke could provide people with more information. I did not see a lot of information from Duke.*"
- "*Duke should provide better phone communication and more informative literature.*"
- "*Duke should simplify the process and add more propaganda.*"

- *"I would like to see more clarity in the descriptions of what is covered."*
- *"I would like to see more promotion and communication from Duke Energy. All the information I received about the program was through my contractor."*
- *"The amount of information was overwhelming. I needed things explained to me in layman's terms."*
- *"There could have been a little more information."*
- *"There could have been more of a step-by-step explanation of how the process works."*
- *"We could have researched it more."*

- 4 respondents (7.7% of 52) had no specific suggestions about how to improve the information that explains the program.

Figure 9 indicates that participants who installed Variable Frequency Drives were less satisfied with the time it took to receive the rebate payment than participants who installed other equipment. Only 33.3% (2 out of 6) of respondents who received rebates for Variable Frequency Drive rated this aspect of the program an "8" or higher on a 10-point scale, compared to 73.5% (25 out of 34) for Fluorescent Lighting rebates and 75.0% (9 out of 12) for Occupancy Sensor rebates (these differences are significant at $p<.05$ using student's t-test).

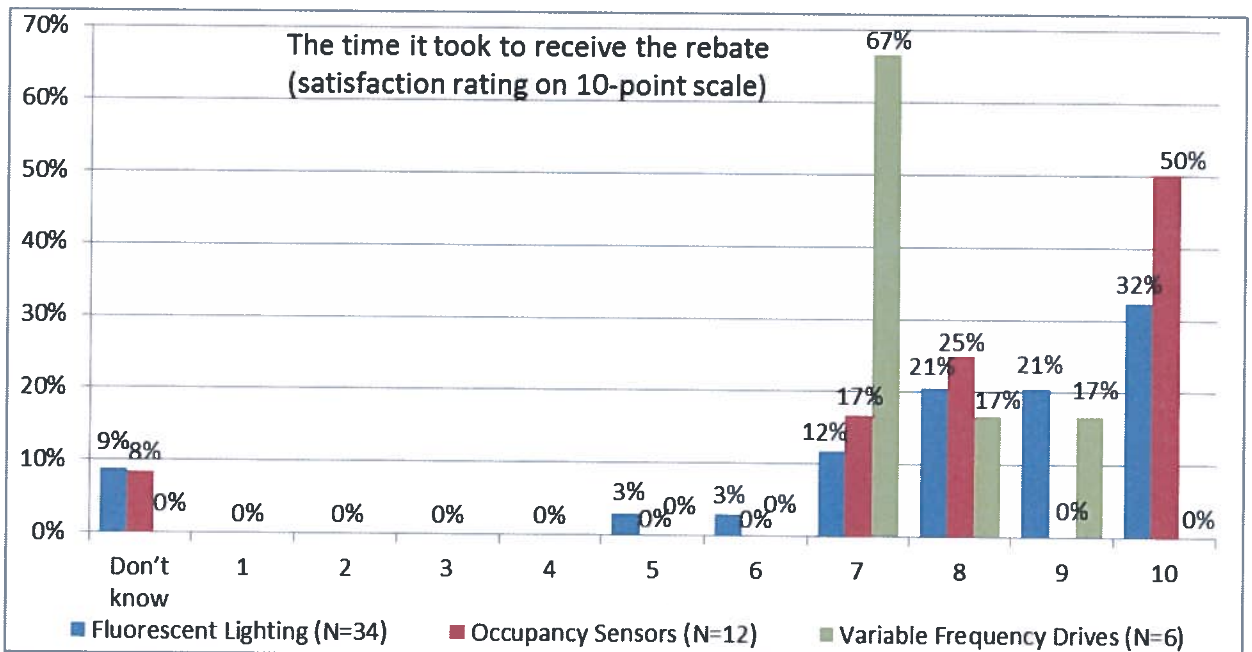

Figure 9. Satisfaction with the Time it Took to Receive the Rebate

Twelve respondents (23.1% of 52) rated their satisfaction with the time it took to receive their rebate at "7" or less on a 10 point scale. They were asked what could be done to improve this aspect of the program, and their answers are listed below.

- *"An optimum turnaround would be 4 weeks or less."*
- *"Duke could minimize its rebate turnaround."*
- *"Duke could reduce the application turnaround to 3 or 4 weeks."*

- *"Duke should consolidate the number of addresses the rebate processing needs to be shuffled between."*
- *"It could have come a little quicker."*
- *"Reduce the turnaround."*
- *"The rebate could come within four weeks so we could put it out of mind and not worry about it."*
- *"The rebate could have come a little more quickly."*
- *"The rebate could have come a little quicker."*
- *"The rebate could have come faster, but then again it only took a couple of weeks."*
- *"The rebate could have come sooner."*

- 1 respondent (1.9% of 52) had no specific suggestions about how to improve the speed of the rebate process.

Figure 10 shows that participants were generally more satisfied with the amount of the rebate provided than other aspects of the program (as seen in Figure 5 through Figure 9). Overall, 73.1% (38 out of 52) of participants in this survey rated their satisfaction with this aspect of the program an "8" or better on a 10-point scale. However, respondents who received rebates for Variable Frequency Drives were somewhat less satisfied: only 50.0% (3 of 6) gave ratings of "8" and none (0.0% or 0 of 6) gave "9" or "10" ratings (this is lower than the satisfaction ratings of Fluorescent Lighting rebate recipients at p<.10 using student's t-test; the sample sizes are too small for the difference with Occupancy Sensors to be statistically significant).

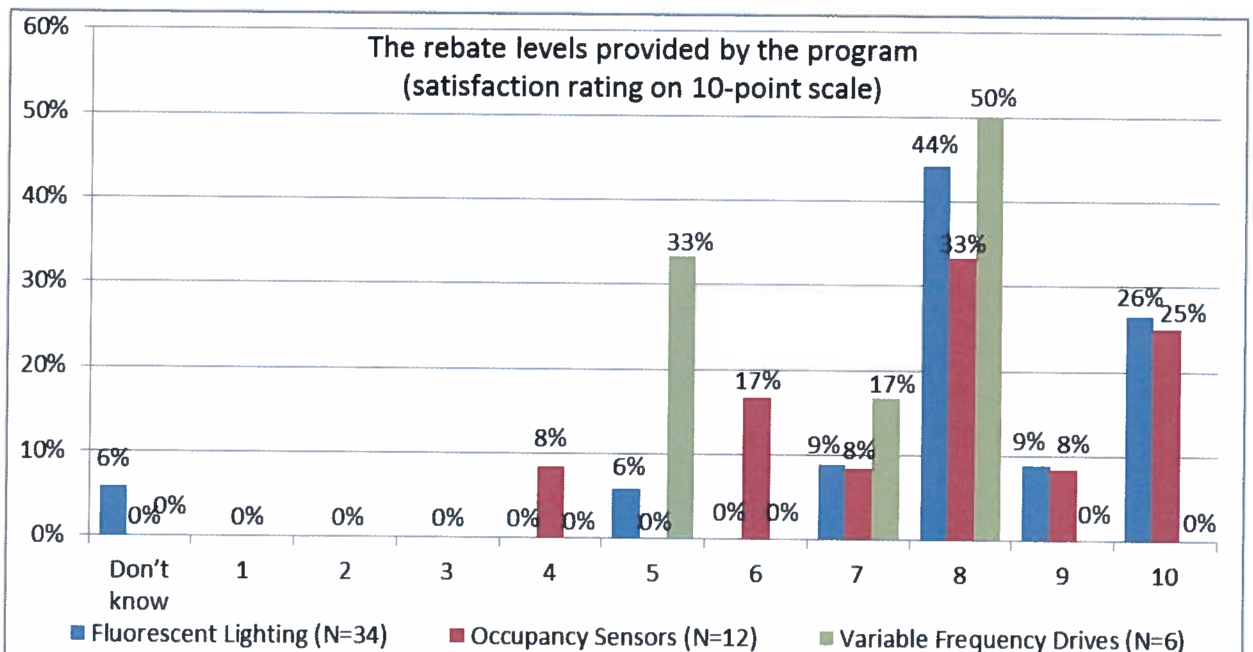

Figure 10. Satisfaction with the Rebate Levels Provided by the Program

Twelve respondents (23.1% of 52) rated their satisfaction with the rebate levels for Smart $aver a "7" or less on a 10 point scale. They were asked what could be done to improve this aspect of the program, and their answers are characterized below.

- Eleven respondents (21.2% of 52) suggested that the rebate amounts could be larger, in general.
- One respondent (1.9% of 52) suggested a specific condition where rebates could be larger, listed below:
    - *"Duke could offer additional incentives for LED lighting."*

What Participants Liked Most and Least about the Smart $aver Program

Table 26 categorizes the open-ended responses of participants when they were asked what they liked most about the non-residential Smart $aver prescriptive program. More than half (57.7% or 30 out of 52) mentioned the incentive payment, with saving money on bills in the long run (13.5% or 7 out of 52) and the simplicity of the program (13.5% or 7 out of 52) being the next most frequent responses. Variable Frequency Drive rebate recipients were significantly more likely to mention saving energy and helping the environment (33.3% or 2 out of 6) then the other types of rebate recipient (5.9% or 2 out of 34 for Fluorescent Lighting and 0.0% or 0 out of 12 for Occupancy Sensors; these differences are significant at $p<.05$ using student's t-test).

Table 26. What Do You Like Most About The Non-Residential Smart $aver Program?

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Like immediate rebate / incentive / recouping some upfront costs	55.9%	58.3%	66.7%	57.7%
Like saving money on bills / return on investment	14.7%	8.3%	16.7%	13.5%
Like how easy it was / simplicity	11.8%	25.0%	0.0%	13.5%
Like saving energy / helping the environment	5.9%	0.0%	33.3%	7.7%
Liked learning about efficiency / knowledge gained	8.8%	8.3%	0.0%	7.7%
Liked speed of rebate	8.8%	0.0%	0.0%	5.8%
Like upgraded equipment / better lighting	2.9%	8.3%	0.0%	3.8%
Like Duke Energy for doing this	2.9%	0.0%	16.7%	3.8%
Like that our organization is now more interested in efficiency / justifies further upgrades	5.9%	0.0%	0.0%	3.8%
Upgrades get done more quickly due to program	2.9%	0.0%	16.7%	3.8%
Like being able to sign up for the program online	2.9%	0.0%	0.0%	1.9%

Multiple responses were accepted for this question, so columns total to more than 100%.

Next, Table 27 categorizes respondents' least favorite things about participating in the non-residential Smart $aver prescriptive program. Although a plurality (40.4% or 21 out of 52) did not have any complaints about Smart $aver, overall about one in four (26.9% or 14 out of 52) said their least favorite part of the program had to do with the application process and filing paperwork. This was the most frequently mentioned complaint by all three types of rebate recipients, but was mentioned by a significantly higher percentage of Occupancy Sensor rebate recipients (41.7% or 5 of 12) and Variable Frequency Drive rebate recipients (50.0% or 3 of 6) than Fluorescent Lighting rebate recipients (17.6% or 6 of 34; these differences are significant at p<.05 using student's t-test). Overall, another 13.5% (7 out of 52) of participants complained about the size or speed or proportionality of the incentive rebate, but the percentage making this complaint was significantly higher for Variable Frequency Drive rebate recipients (33.3% or 2 of 6) than for the other types of rebate (significant at p<.10 using student's t-test).

Table 27. What Do You Like Least About The Non-Residential Smart $aver Program?

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Difficulties with filing application / amount of paperwork	17.6%	41.7%	50.0%	26.9%
Size / proportion / speed of rebate payment	11.8%	8.3%	33.3%	13.5%
Limitations / lack of customization / what is covered	5.9%	8.3%	16.7%	7.7%
Difficulty understanding information / application / jargon	8.8%	0.0%	0.0%	5.8%
Duke Energy did not do enough to help / promote	5.9%	0.0%	0.0%	3.8%
Energy bills did not decrease after installation	2.9%	0.0%	0.0%	1.9%
Rebate checks do not include enough info (hard to match rebates to projects internally)	2.9%	0.0%	0.0%	1.9%
Don't know/Nothing	47.1%	41.7%	0.0%	40.4%

Multiple responses were accepted for this question, so columns total to more than 100%.

Overall Satisfaction with Duke Energy

As seen in Figure 11, 71.2% (37 of 52) of participants in this survey rate their overall satisfaction with Duke Energy at "8" or higher on a 10-point scale, and only one respondent (1.9% of 52) rated their satisfaction with Duke Energy a "5" or less. Every respondent in the study was able to give a rating for their satisfaction with Duke Energy (0.0% or 0 out of 52 said "don't know").

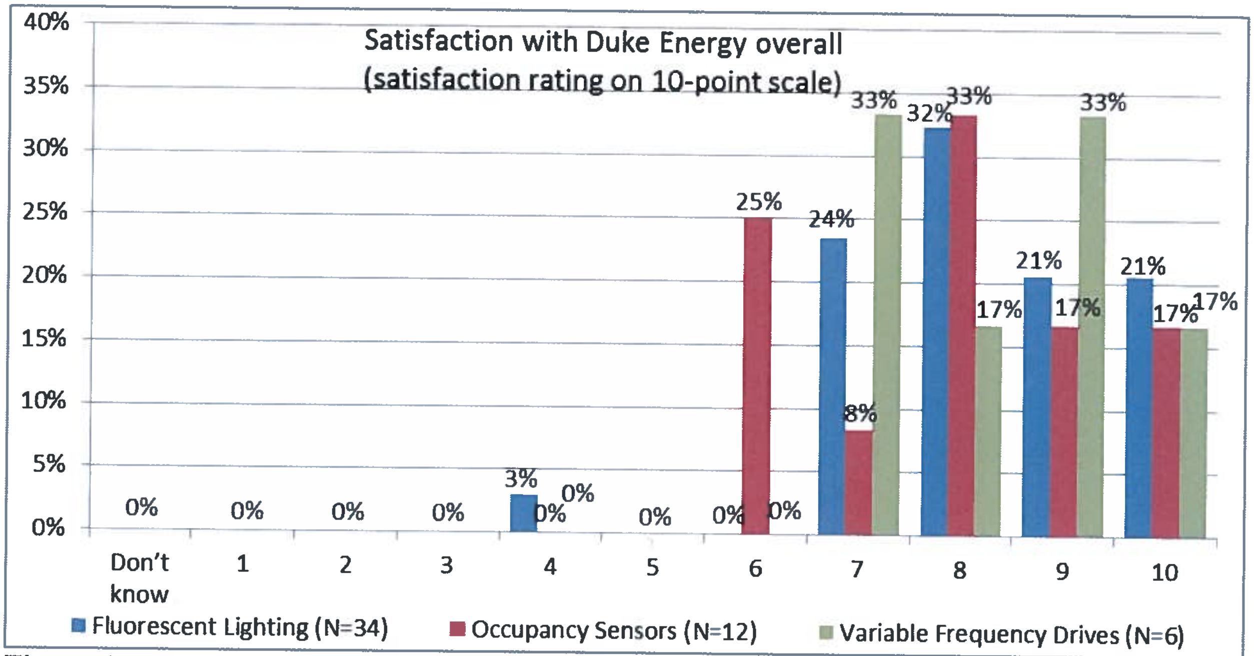

Figure 11. Satisfaction with Duke Energy Overall

Fifteen respondents (28.8% of 52) rated their overall satisfaction with Duke Energy a "7" or lower on a 10 point scale. They were asked what could be done to improve their satisfaction with Duke Energy.

- 5 respondents (9.6% of 52) mentioned rates and fees. Their comments are listed below.
  - *"Duke could allow more energy pricing competition and have a REC Buyback Program."*
  - *"Duke could change how it calculates various charges, including generation riders."*
  - *"Duke could lower its rates."*
  - *"Duke's rate structure needs improvement."*
  - *"I would like to see fewer costs passed along via surcharges and other charges."*

- 4 respondents (7.7% of 52) mentioned customer service. Their comments are listed below.
  - *"Duke could be more forthcoming when providing customers with information."*
  - *"Duke could provide better customer service and make it easier to reach staff for help."*
  - *"Duke could provide more personal service and feel more like a Cincinnati entity."*
  - *"We currently have a great working relationship with our Duke Energy representative, but our past history with Duke has occasionally been confrontational. We've had problems receiving bill credits that we were owed."*

- 2 respondents (3.8% of 52) mentioned interruptions in service. Their comments are listed below.
    - "*Duke could respond more quickly to power outages.*" (two mentions)
- 4 respondents (7.7% of 52) had no suggestions.

Improving the Non-Residential Smart $aver Program

Respondents were asked what additional services they'd like to see provided by the Smart $aver program. Although a little over half (53.8% or 28 out of 52) had no suggestions, 15.4% (8 out of 52) wanted to see more types of technology covered by the program (their verbatim suggestions are listed after Table 28). No other suggestions were mentioned by more than 5.8% (3 out of 52) of participants surveyed.

Table 28. What Additional Services Would You Like the Smart $aver Program to Provide?

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Incentives for more types of equipment (listed below)	14.7%	8.3%	33.3%	15.4%
Make experts more available on-site, through workshops or over the phone	2.9%	16.7%	0.0%	5.8%
Include natural gas-powered equipment	5.9%	0.0%	16.7%	5.8%
More pro-active recommendations from Duke Energy	8.8%	0.0%	0.0%	5.8%
Include smaller / less expensive equipment in program	5.9%	0.0%	0.0%	3.8%
More info / updates / literature / education about programs	5.9%	0.0%	0.0%	3.8%
Higher incentives / bigger rebates	2.9%	0.0%	0.0%	1.9%
Help review organizations' energy decisions	2.9%	0.0%	0.0%	1.9%
Help disposing of / recycling old equipment that is being replaced	2.9%	0.0%	0.0%	1.9%
Better metering / monitoring of energy savings	2.9%	0.0%	0.0%	1.9%
Include 440V electric equipment	2.9%	0.0%	0.0%	1.9%
Do follow-up surveys online instead of by phone	2.9%	0.0%	0.0%	1.9%
Don't know/Nothing	47.1%	75.0%	50.0%	53.8%

Multiple responses were accepted for this question, so columns total to more than 100%.

Eight respondents (15.4% of 52) suggested that more types of equipment should be covered by Non-Residential Smart $aver. Their verbatim comments are listed below. The most commonly mentioned technologies are solar power (mentioned by 3 respondents or 5.8% of 52) and LED lighting (mentioned by 2 respondents or 3.8% of 52).

- *"Duke could offer incentives for solar measures."* (two mentions)
- *"Duke could offer incentives for solar upgrades. We had a $300,000 solar upgrade put on indefinite hold when the state grants were rescinded."*
- *"Duke should offer additional incentives for LED lighting."*
- *"I would like to see some incentives for replacing or upgrading the light fixtures in the coolers at my business. More types of LED lighting should qualify for Prescriptive incentives."*
- *"The program could cover smaller-sized VFD units."*
- *"I'd like to see more rebates for motors."*

As a follow-up question, respondents were asked if there were any other things they would like to change about the Smart $aver program. Only 14 respondents (26.9% of 52) had further suggestions; their verbatim comments are listed below.

- *"Higher incentives."*
- *"Duke should offer additional customized incentives for LED lighting."*
- *"Duke should offer higher incentives for HVAC upgrades."*
- *"Duke should [provide] incentives for HVAC equipment."*
- *"The program could cover more items."*
- *"I'd like to see better communication from Duke about what it could do."*
- *"Duke could do more promotion and communication."*
- *"Duke should do more to educate small businesses. Duke representatives could conduct on-site visits."*
- *"Duke should have a more knowledgeable support staff regarding Custom Rebates on file."*
- *"The process for documentation should be streamlined and better explained. If Duke just had a person in place to answer questions about Smart $aver, it would save us the time and effort of re-doing paperwork."*
- *"Duke should make its Non-Prescriptive rebate submissions easier."*
- *"I hope that the program continues."* (two mentions)
- *"I would like to see it continue."*

- 38 respondents (73.1% of 52) had no further suggestions for things they would like to see changed about Non-Residential Smart $aver Prescriptive.

Increasing Participation in Non-Residential Smart $aver

Respondents were asked what they thought could be done to increase interest in participating in Smart $aver; their suggestions are shown in Table 29. The most frequent suggestion was that Duke Energy should make more effort to advertise, promote, educate and spread awareness of Smart $aver, mentioned by a plurality of participants (42.3% or 22 out of 52). Other common suggestions include direct mail (21.2% or 11 out of 52), personal contact from Duke Energy Representatives by phone or in-person (19.2% or 10 out of 52), more partnerships with trade allies (17.3% or 9 out of 52), and using email and the web more (15.4% or 8 out of 52). Only 5.8% (3 out of 52) of respondents had no suggestions at all.

Table 29. What Can Be Done to Increase Interest in Participating in Smart $aver?

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
More info / education / awareness / advertising / etc.	38.2%	50.0%	50.0%	42.3%
Direct mail / inserts with bills	14.7%	41.7%	16.7%	21.2%
Personal contact from Duke Energy representatives (phone or on site)	20.6%	16.7%	16.7%	19.2%
More trade ally participation & partnerships	17.6%	25.0%	0.0%	17.3%
Email customers / use Duke Energy website more	14.7%	8.3%	33.3%	15.4%
Examples / testimonials / notify customers of their own savings	5.9%	16.7%	0.0%	7.7%
Target specific industries or job titles	5.9%	8.3%	0.0%	5.8%
More / larger / quicker rebates	5.9%	0.0%	16.7%	5.8%
Don't know/Nothing	5.9%	0.0%	16.7%	5.8%

Multiple responses were accepted for this question, so columns total to more than 100%.

Ranking the Reasons Why an Organization Tries to Save Energy

Respondents in this survey were asked to rank five statements in terms of how well they describe their company's view on saving energy. The five statements are listed below.

A. Our energy efficiency efforts contribute to increased customer satisfaction.
B. We want to project a "green" (sustainable) image to the community.
C. Our organization is concerned about the environment.
D. Saving energy is not important to our organization.
E. Saving energy is important because it reduces costs, but not for any other reason.

None of the respondents in this study (0.0% or 0 out of 52) chose statement D "saving energy is not important to our organization", though there were differences in the rankings of the other four statements by type of rebate received.

Figure 12 shows how respondents from companies that received Smart $aver rebates for Fluorescent Lighting ranked the five statements. The most common first choice (by 47.1% or 16 out of 34), and overall most mentioned statement (by 67.6% or 23 out of 34) for this group, was E, "Saving energy is important because it reduces costs, but not for any other reason." The next most common first choice (by 32.4% or 11 out of 34) and next most mentioned statement (by 35.3% or 12 out of 34) for Fluorescent Lighting rebate recipients was statement B, "we want to project a 'green' (sustainable) image to the community." Very few (11.8% or 4 out of 34) mentioned statement A, "our energy efficiency efforts contribute to increased customer satisfaction."

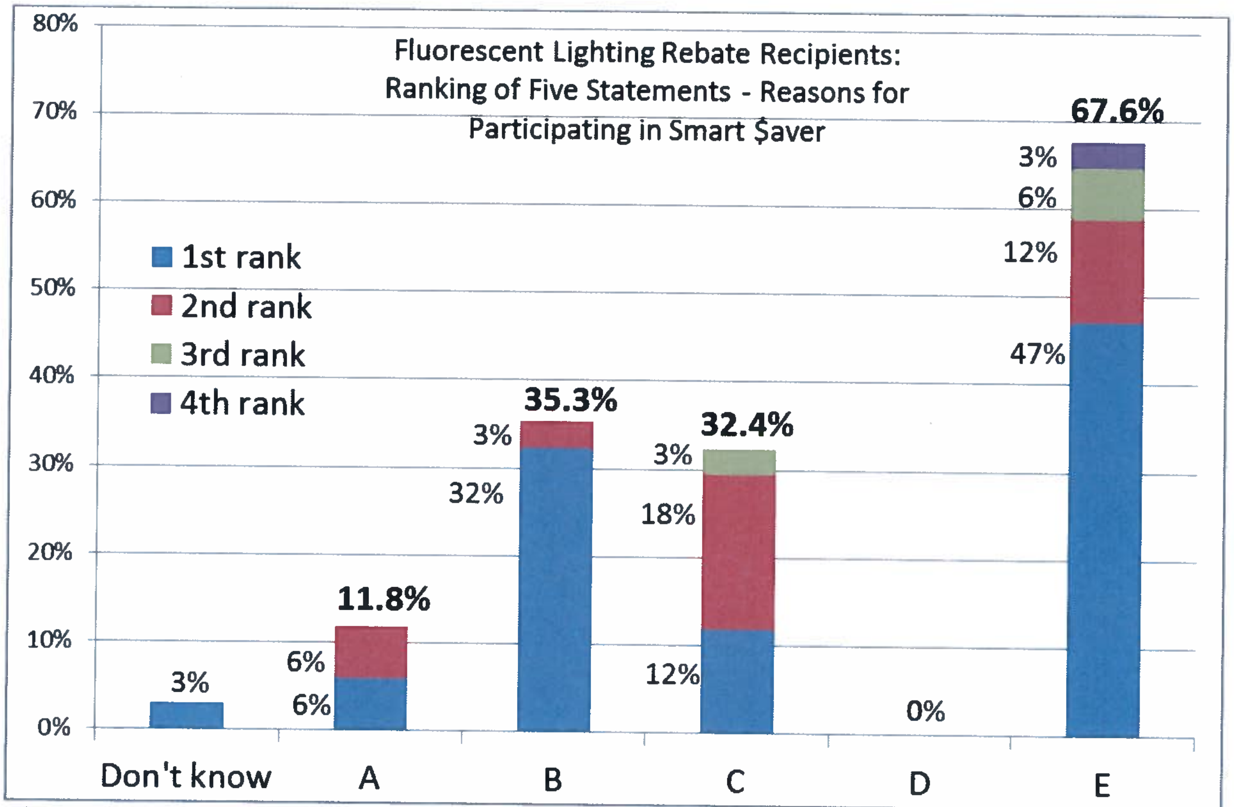

Figure 12. Fluorescent Lighting Rebate Recipients' Ranking of Reasons for Becoming More Energy Efficient (N=34 Fluorescent Lighting rebate recipients)

Opinion was more evenly divided among respondents who received a rebate for installing Occupancy Sensors, as seen in Figure 13. Statement C "our organization is concerned about the environment", statement B "we want to project a 'green' (sustainable) image to the community" and statement E "saving energy is important because it reduces costs, but not for any other reason" were all ranked as the #1 most important reason why their organization tries to save energy by 25.0% (3 out of 12 for each). But by a narrow margin, statement C "our organization is concerned about the environment" was the most mentioned overall (by 41.7% or 5 out of 12). For this group of rebate recipients, statement A "our energy efficiency efforts contribute to increased customer satisfaction" (ranked as most important by 16.7% or 2 out of 12, and with 25.0% or 3 out of 12 total mentions) was not far behind the top three statements.

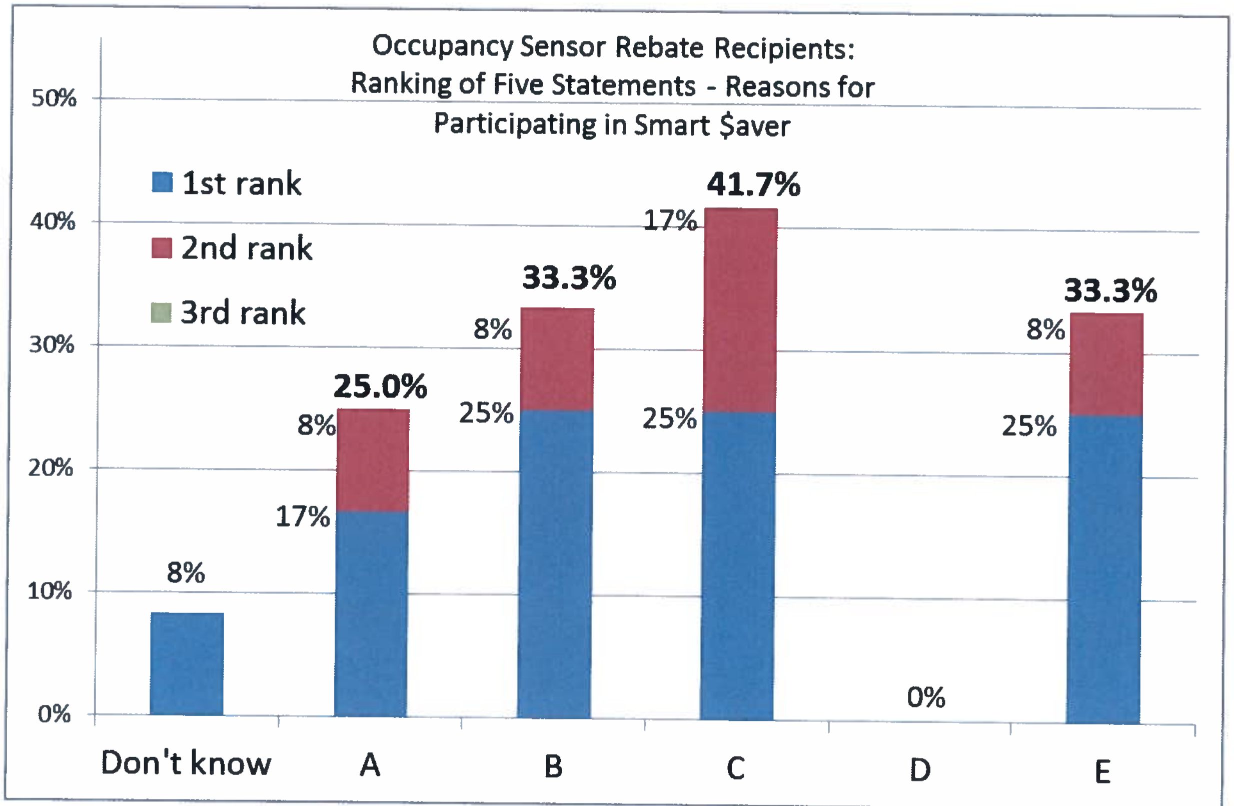

Figure 13. Occupancy Sensor Rebate Recipients' Ranking of Reasons for Becoming More Energy Efficient (N=12 Occupancy Sensor rebate recipients)

Among Variable Frequency Drive rebate recipients, the statement most frequently ranked #1 was again E "saving energy is important because it reduces costs, but not for any other reason" (by 50.0% or 3 out of 6), though nobody ranked this statement as a 2nd or 3rd choice and thus it was not the most mentioned statement overall (total mentions also only 50.0% or 3 out of 6). Although they were only the first ranked statements for one participant apiece (16.7% or 1 out of 6), the most mentioned statements overall for this group were C "our organization is concerned about the environment" (by 83.3% or 5 out of 6) and B "we want to project a 'green' (sustainable) image to the community" (by 66.7% or 4 out of 6). As Figure 14 also indicates, statement A "our energy efficiency efforts contribute to increased customer satisfaction" received very few mentions from this group (ranked first and total mentions both 16.7% or 1 out of 6).

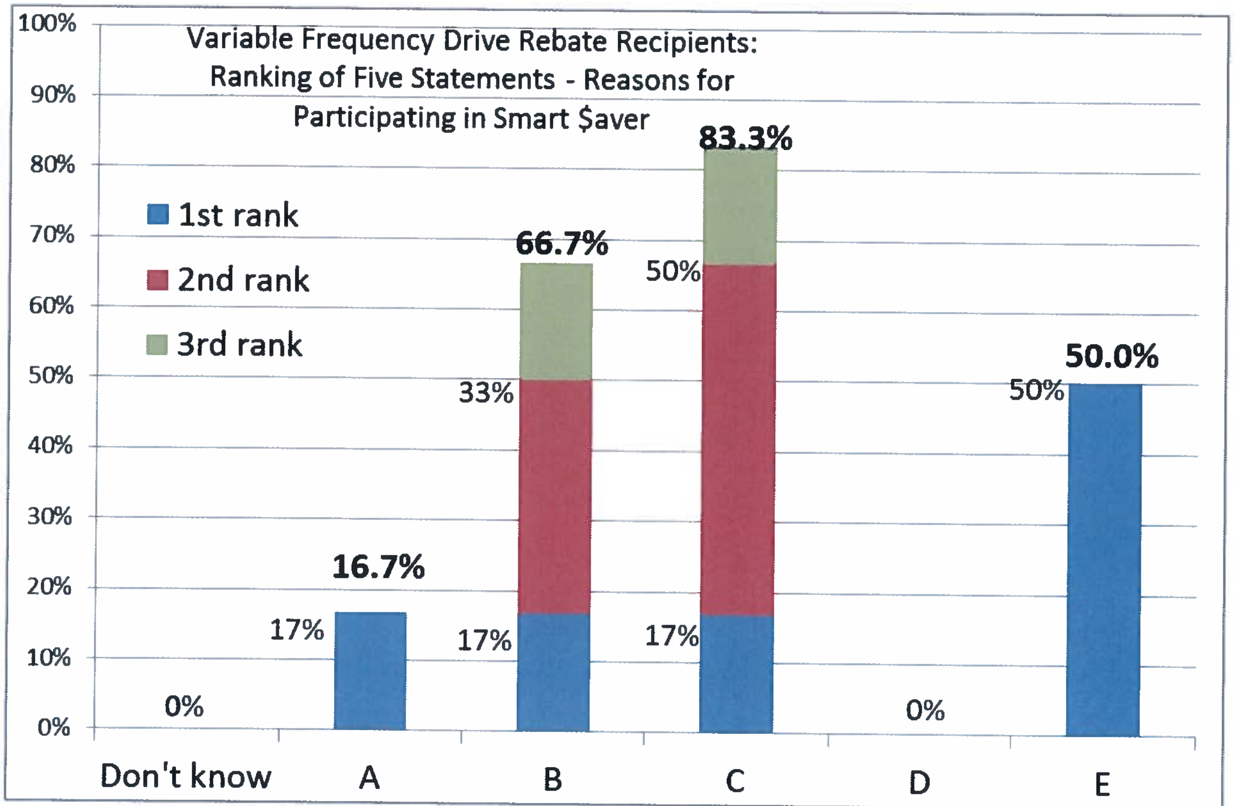

Figure 14. Variable Frequency Drive Rebate Recipients' Ranking of Reasons for Becoming More Energy Efficient (N=6 Variable Frequency Drive rebate recipients)

Characteristics of Respondent Organizations

Overall, one quarter (25.0% or 13 out of 52) of the respondents in this survey installed their Smart $aver-rebated equipment at a non-profit, community or public sector organization. Another quarter (25.0% or 13 out of 52) are industrial organizations, and the remaining 50.0% (26 out of 52) are other commercial entities. However, organizations that received rebates for Fluorescent Lighting were most likely to be categorized as "commercial" (58.8% or 20 out of 34), while Occupancy Sensor rebate recipients were mostly "industrial" (58.3% or 7 out of 12) and Variable Frequency Drive rebate recipients were mostly "non-profit" (66.7% or 4 out of 6).

Smart $aver-rebated Occupancy Sensor installations were more likely to be done at warehouses (25.0% or 3 out of 12) and industrial petroleum, plastic, rubber or chemical concerns (25.0% or 3 out of 12; both of these are significantly more likely to be mentioned than for other types of rebates at p<.10 using student's t-test). Organizations that received rebates for installing Variable Frequency Drives were more likely to be schools (66.7% or 4 out of 6; this is significantly more likely than for other types of rebate at p<.05 using student's t-test).

Table 30. Survey Respondent's Organization

	Linear Fluorescent Lighting	Occupancy Sensors N=12	Variable Frequency Drives	Total N=52

	N=34		N=6	
Total non-profit and public sector	**23.5%**	**8.3%**	**66.7%**	**25.0%**
Community Service / Church / Temple / Municipality	11.8%	0.0%	0.0%	7.7%
School	11.8%	8.3%	66.7%	17.3%
Total industrial	**17.6%**	**58.3%**	**0.0%**	**25.0%**
Electronics and machinery	8.8%	8.3%	0.0%	7.7%
Petroleum, plastic, rubber, chemicals	0.0%	25.0%	0.0%	5.8%
Mining, metals, stone, glass, concrete	0.0%	8.3%	0.0%	1.9%
Other industrial	8.8%	16.7%	0.0%	9.6%
Total commercial	**58.8%**	**33.3%**	**33.3%**	**50.0%**
Warehouse	2.9%	25.0%	0.0%	7.7%
Office	8.8%	0.0%	0.0%	5.8%
Retail (non-food)	2.9%	0.0%	16.7%	3.8%
Transport / Automotive	5.9%	0.0%	0.0%	3.8%
Convenience store	5.9%	0.0%	0.0%	3.8%
Property management / condo association	2.9%	0.0%	0.0%	1.9%
Healthcare / Hospital	2.9%	0.0%	0.0%	1.9%
Restaurant	2.9%	0.0%	0.0%	1.9%
Miscellaneous other commercial (listed below)	23.5%	8.3%	16.7%	19.2%
Refused	0.0%	0.0%	0.0%	0.0%

Ten respondents' organizations (19.2% of 52) were categorized as "miscellaneous other commercial". Their verbatim descriptions of these organizations are listed below:

- Data Center
- Environmental Services
- Food Manufacturing
- Golf Course
- Gymnastics Instruction Studio
- Manufacturing Wholesale
- Printing
- Racquet and Fitness Club
- Self-storage facilities
- Shipping

Table 31 shows that most organizations surveyed (69.2% or 36 out of 52) own the buildings where the installation of Smart $aver-rebated equipment took place

Table 31. Ownership of Property Where Installation Took Place

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Own space where installation took place	67.6%	75.0%	66.7%	69.2%
Lease space where installation took place	17.6%	16.7%	16.7%	17.3%
Own part and lease part of space where installation took place	5.9%	0.0%	16.7%	5.8%
Don't know	8.8%	8.3%	0.0%	7.7%

Companies that installed Occupancy Sensors and Variable Frequency Drives tend to have more square footage at the locations where they installed their new equipment, as seen in Table 32; 50.0% of respondents whose organizations installed Occupancy Sensors (6 out of 12) and Variable Frequency Drives (3 out of 6) had more than 100,000 square feet, compared to only 11.8% (4 out of 34) of Fluorescent Lighting installations having that much square footage. Conversely, 35.3% (12 out of 34) of Fluorescent Lighting installations were at facilities under 15,000 square feet, while only 8.3% (1 out of 12) of the Occupancy Sensor installations and 0.0% (0 out of 6) of the Variable Frequency Drive installations reported having that little square footage.

Table 32. Size of Facility Where Installation Took Place

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Under 15,000 sq ft	35.3%	8.3%	0.0%	25.0%
15,001 – 30,000 sq ft	20.6%	16.7%	16.7%	19.2%
30,001 – 99,999 sq ft	23.5%	16.7%	16.7%	21.2%
100,000 or more sq ft	11.8%	50.0%	50.0%	25.0%
Don't know	8.8%	8.3%	16.7%	9.6%

Table 33 shows the number of employees working at the location where the Smart $aver-rebated installation took place. Fluorescent Lighting installations tend to have the fewest employees, with 70.6% (24 out of 34) having 25 or fewer employees, versus only 41.7% (5 out of 12) of Occupancy Sensor and 16.7% (1 out of 6) of Variable Frequency Drive rebate recipients having 25 or fewer employees (this difference is significant at $p<.05$ using student's t-test).

Table 33. Number of Employees at Facility Where Installation Took Place

	Linear	Occupancy	Variable	Total

	Fluorescent Lighting N=34	Sensors N=12	Frequency Drives N=6	N=52
Less than 10	32.4%	16.7%	0.0%	25.0%
11 to 25	38.2%	25.0%	16.7%	32.7%
26 to 40	2.9%	16.7%	0.0%	5.8%
41 to 75	2.9%	8.3%	16.7%	5.8%
76 to 100	5.9%	8.3%	16.7%	7.7%
More than 100	14.7%	16.7%	33.3%	17.3%
Don't know	2.9%	8.3%	16.7%	5.8%

Respondents in this survey were asked their job title at the organization where the Smart $aver-rebated equipment was installed, which is reported in Table 34. The most common categories were "facilities manager or director" (19.2% or 10 out of 52), "other manager, director or supervisor" (17.3% or 9 out of 52), with "president / CEO / COO / VP / GM" and "proprietor / owner" each mentioned by 15.4% (8 out of 52).

Table 34. Survey Respondent's Job Title at Organization

	Linear Fluorescent Lighting N=34	Occupancy Sensors N=12	Variable Frequency Drives N=6	Total N=52
Facilities Manager / Director	14.7%	16.7%	50.0%	19.2%
Other facilities management / maintenance position	8.8%	0.0%	0.0%	5.8%
Operations Manager / Director	8.8%	16.7%	16.7%	11.5%
Proprietor / Owner	14.7%	25.0%	0.0%	15.4%
President / CEO / COO / VP / GM	17.6%	16.7%	0.0%	15.4%
Other Manager / Director / Supervisor	23.5%	8.3%	0.0%	17.3%
CFO	0.0%	8.3%	0.0%	1.9%
Other financial / administrative position	8.8%	0.0%	0.0%	5.8%
Energy Manager / Coordinator	0.0%	0.0%	16.7%	1.9%
Engineer / electrician / inspector / researcher	0.0%	8.3%	0.0%	1.9%
"Real Estate" or "Property" title	0.0%	0.0%	16.7%	1.9%
Government position	2.9%	0.0%	0.0%	1.9%

Net to Gross Methodology

Freeridership

TecMarket Works utilized two sets of questions from the participant survey to estimate freeridership.

For the first set of calculations, the primary "gateway" question asks when they might have replaced their units without the Smart $aver program, and the second question asks those who say they would have delayed their purchase to estimate how long they would have delayed the purchase.

The gateway question asked survey respondents what their behavior would have been if the Smart $aver rebate program had not been available. The four categories of responses were:

a.) bought the same unit at the same time
b.) bought the same unit at a later time
c.) bought a used unit at the same time
d.) continued to use the currently installed unit and not purchase a new or used unit

Participants who indicated that they would have bought the same unit at the same time were assigned 100% freeridership. Participants answering that they would have continued using the currently installed unit were assigned 0% freeridership.

Freeridership for participants who indicated that they would have bought their units at a later time was determined by when they said they would have purchased the units in the absence of the program.

The equivalent freerider rate (the number of units that count toward freeridership) in the case of customers who indicated they would have purchased the unit at a later time, is the product of the freerider percentage multiplied by the number of respondents/units (each respondent was surveyed about one recently installed unit).

The second set of calculations is based on questions which ask what participants would have done without the Smart $aver incentive, and without the Smart $aver program information and technical assistance.

The three categories of responses to these questions were:

a.) bought unit with at least the same efficiency level
b.) bought a unit with a different efficiency level
c.) not sure what organization would have done

The results of the Freerider analysis will be presented in the energy impact report to be submitted under separate cover.

Appendix A: Management Interview Instrument

Name: ____

Title: ____

Position description and general responsibilities:

____

____

____

We are conducting this interview to obtain your opinions about and experiences with the Smart $aver® program. We'll talk about the Smart $aver® Program and its objectives, your thoughts on improving the program, and the technologies the program covers. The purpose of this study is to capture the program's current operations as well as help identify areas where the program might be improved. Your responses will feed into a report that will be shared with Duke Energy and the state regulatory agency. I want to assure you that the information you share with me will be kept confidential; we will not identify you by name. However, you may provide some information or opinions that could be attributed to you by virtue of your position and role in this program. If there is sensitive information you wish to share, please warn me and we can discuss how best to include that information in the report.

The interview will take about an hour to complete. Do you have any questions for me before we begin?

Program Background and Objectives (15 min)

1. Please describe your role and scope of responsibility in detail.
2. How long have you been involved with the Smart $aver program?
3. (PM only) Describe the evolution of the Smart $aver® Program. Why was the program created, and has the program changed since it was it first started?
4. Have there been any recent changes been made to your duties since you started?
    a. If YES, please tell us what changes were made and why they were made. What are the results of the change?
5. In your own words, please describe the Smart $aver® Program's objectives. (e.g. enrollment, energy savings, non-energy benefits)

6. (PM only) Can you please walk me through the program's implementation, starting with how the program is marketed and how you target your customers, through how the customer participates and finishing with how savings are verified?

    a. Marketing/Targeting: How & Who

    b. Enrollment/Participation

    c. Rebate processing

    d. Savings verification: How & Who

7. Of the program objectives you mentioned earlier, do you feel any of them will be particularly easy to meet, and why?

8. Which program objectives, if any, do you feel will be relatively difficult to meet, and why?

9. Are there any objectives you feel should be revised prior to the end of this program cycle? If yes, why?

Vendors (10 min)

10. (PM only) Do you use any vendors or contractors to help implement the program?

    a. What responsibilities do they have?

    b. Are there any areas in which think they can improve their services?

11. *(If not captured earlier)* Please explain how activities of the program's vendors, customers and Duke Energy are coordinated.

    a. Do you think methods for coordination should be changed in any way? If so, how and why?

Rebates (15 min)

12. (PM only) How do you determine which pieces of equipment are included in the program? For example, how do you determine what level of efficiency the rebated equipment should have?

    a. Do you use any outside vendors or experts to help with this process?

    b. What should be changed about this selection process?

13. Describe your quality control and process for tracking participants, rebates, and other program data.

14. Do you believe that the program currently offers rebates on enough energy efficient products to meet your customers' needs?
    a. If not, what products would you like to add? Are these currently being considered?
15. Is the program offering enough of a rebate to motivate your customers to participate?
    a. If not, which rebates do you think should be changed, and why?

Contractor Training (5 min)

16. Describe Smart $aver's contractor program orientation training and development approach.
    a. (PM and WECC only) How do you ensure that contractors are getting adequate program training and updated program information?
    b. Can we obtain training materials that are being used?
    c. Are there any new areas where you think contractors could be trained?
17. Do you have any suggestions for improving contractor effectiveness?

Improvements (10 min)

18. Are you currently considering any changes to the program's design or implementation?
    a. What are the changes?
    b. What is the process for deciding whether or not to make these changes?
19. Do you have suggestions for improvements to the program that would increase participation rates, or is Duke Energy happy with the current level of participation?
20. Do you have suggestions for increasing energy impacts *per participant*, given the same participation rates, or is Duke Energy happy with the current per participant impact?
21. Overall, what would you say about the Smart $aver® program is working really well?
    a. Is there anything in this program you could highlight as a best practice that other utilities might like to adopt?
22. What area needs the most improvement, if any?
    a. (If not mentioned before) What would you suggest can be done to improve this?
23. Are there any other issues or topics we haven't discussed that you feel should be included in this report?

24. Do you have any further questions for me about this study or anything else?

25. Thank you!

Appendix B: Trade Ally Interview Instrument

Name: ____

Title: ____

Position description and general responsibilities:

____

____

____

We are conducting this interview to obtain your opinions about and experiences with Duke Energy's Non-Residential Smart $aver program. We'll talk about your understanding of the Smart $aver Program and its objectives, your thoughts on improving the program, and the technologies the program covers. The interview will take about 45 minutes to complete. May we begin?

Understanding the Program

We would like to ask you about your understanding of the Smart $aver program. We would like to start by first asking you to…

1. Please review for me how you are involved in the program and the steps you take in the participation process. Walk me though the typical steps you take to help a customer become eligible for this program and what you do to receive or help the customer receive the program incentive.

2. What kinds of problems or issues have come up in the Smart $aver program?

3. Have you heard of any customer complaints that are in any way associated with this program? Have callbacks increased due to the program technologies?

Program Design and Design Assistance

4. Do you feel that the proper technologies and equipment are being covered through the program?

5. Are the incentive levels appropriate? How do they impact the choice by the customers of the higher efficient equipment?

6. Are there other technologies or energy efficient systems that you think should be included in the program?

7. Are there components that are now included that you feel should not be included? What are they and why should they not be included?

Reasons for Participation in the Program

We would like to better understand why contractors become partners in the Smart $aver Program.

9. How long have you been a partner in the Smart $aver Program?

10. What are your primary reasons for participating in the program? Why do you continue to be a partner?.... *If prompts are needed…* Is this a wise business move for you, is it something you believe in professionally, does it provide a service to your customers, do you want to build a relationship with Duke Energy, or other reasons?

11. Has this program made a difference in your business? How?

12. How do you think Duke Energy can get more contractors to participate in this program?

Program Participation Experiences

The next few questions ask about the process for submitting participation forms and obtaining the incentive payments.

13. Do you think the process could be streamlined in any way? How?

14. How long does it take between the time that you apply for your incentive, to the time that you and your customer receive the payments? Is this a reasonable amount of time? What should it be? Why?

15. Do you have the right amount of materials such as forms, information sheets, brochures or marketing materials that you need to effectively show and sell your Smart $aver® heat pumps and air conditioners? What else do you need?

16. Overall, what about the Smart $aver Program do you think works well and why?

17. What changes would you suggest to improve the program?

18. Do you feel that communications between you and Duke Energy's Smart $aver program staff is adequate? How might this be improved?

19. What benefits do you receive as a result of participating in Duke Energy's Smart $aver Program or from selling Smart $aver items?

20. What do you think are the primary benefits to the people who buy a Smart $aver appliance? Are there other benefits that are important to a potential customer?

Market Impacts and Effects

21. How do you make customers aware of the Program?

22. Are customers more satisfied with this equipment? Why or why not?

23. Do you have fewer calls or more calls to correct problems with the Smart $aver appliances?

24. Do you market or sell the Smart $aver equipment differently than your other equipment? How?

25. What percent of Smart $aver buyers do you think are replacing older equipment that is still functioning, but less efficient? What percent of Smart $aver buyers do you think are replacing failed units?

26. Has the program influenced you to carry other energy efficient equipment that is not rebated through the program?

    a. *If yes*, what do you now carry?

    b. *If yes,* About how many of these units did you install/sell in the last year?

We would like to know what your practices were before you became a partner in the program, and what you would offer your customers without the program.

27. There are no plans to terminate the program, but we would like to know how the program affects contractors. If the program were to be discontinued, would you still offer the same energy efficient equipment options?

28. If the program were not offered, how would you structure pricing differently to make up for the program loss?

29. In your opinion is the Smart $aver program still needed? Why?

Recommended Changes from the Participating Contractors

30. Are there any other changes that you would recommend to Duke Energy for their Program not already discussed?

Appendix C: Participant Survey Instrument

Surveyor Name*

____

Survey ID*

____

Survey Identification*
Customer Name: __________________________

State*
( ) North Carolina
( ) South Carolina
( ) Ohio
( ) Kentucky
( ) Indiana

for answering machine 1st through penultimate attempts:
Hello, my name is [name] and I am calling on behalf of Duke Energy to conduct a customer survey about the Smart $aver Incentive Program. I'm sorry I missed you. I'll try again another time.

for answering machine - Final Attempt:
Hello, my name is [name] and I am calling on behalf of Duke Energy to conduct a customer survey about the Smart $aver Incentive Program. This is my last attempt at reaching you, my apologies for any inconvenience.

if person answers

Hello, my name is ______. I am calling on behalf of Duke Energy to conduct a customer survey about the Smart $aver Incentive Program. May I speak with _____________ please?

If person talking, proceed. If person is called to the phone reintroduce. If not home, ask when would be a good time to call and schedule the call-back:

We are conducting this survey to obtain your opinions about the Smart $aver Incentive Program in which you participated. We are not selling anything. The survey will take about 10-15 minutes and your answers will be confidential, and will help us to make improvements to the program to better serve others. May we begin the survey?

Note: If this is not a good time, ask if there is a better time to schedule a callback.

1) Do you recall participating in the Smart $aver Program?*

( ) Yes

( ) No

( ) DK/NS

If No or DK/NS to question 1, ask:

This program was provided through Duke Energy. In this program, your company purchased a new energy efficient motor, pump, HVAC system or component, or lighting system. Duke Energy provided an incentive of [$xxx] for purchasing the qualifying item.

1a. **Do you remember participating in this program?**

( ) Yes
( ) No
( ) DK/NS

If No or DK/NS terminate interview and go to next participant.

2) Our records indicate that you purchased a [measure] Is this correct? If not, what was the rebated technology that you purchased?*

( ) Correct

( ) Pump

( ) Motor

( ) HVAC

( ) Lighting

( ) Refrigeration

( ) Other: _________________*

3) **Please think back to the time when you were deciding to buy the energy saving , perhaps recalling things that occurred in your company shortly before and after your purchase. What kinds of factors motivated you to purchase energy saving [measure]?***

(Do not read list, place a "1" next to the response that matches best)

(Then ask: 3a. **Were there any other reasons?** *(Number responses above in the order they are provided - Repeat until 'no' response.)*

Old equipment didn't work: ___________________________

Old equipment working poorly: ___________________________

The program incentive: ___________________________

The program technical assistance: ___________________________

Recommendation of someone else (*ask:* **Who?**): ___________________________

Wanted to reduce energy costs: ___________________________

The information provided by the Program: ___________________________

Past experience with this program: ___________________________

Because of past experience with "Smart Energy Now" (or "Envision Charlotte"):
____

Because of past experience with "Non-Residential Energy Assessment":
____

Because of past experience with another Duke Energy program (*ask:* **What program?**):
____

Recommendation from "Smart Energy Now" (or "Envision Charlotte"):
____

Recommendation from "Non-Residential Energy Assessment": ___________________________

Recommendation from other utility program (*ask:* **What program?**):
____

Recommendation of dealer/contractor: ___________________________

Advertisement in newspaper (*ask:* **For what program?**): ___________________________

Radio advertisement (*ask:* **For what program?**): ___________________________

Other *(Please specify:)*: ___________________________

DK/NS: ___________________________

4) **How did you hear about the program?***

(Do not read list, place a "1" next to the response that matches best)

The program technical assistance: ___________________________

Recommendation of someone else (*ask:* **Who?**): ___________________________

Wanted to reduce energy costs: ___________________________

The information provided by the Program: ___________________________

Past experience with this program: ___________________________

Because of past experience with "Smart Energy Now" (or "Envision Charlotte"):
____

Because of past experience with "Non-Residential Energy Assessment": ____________________

Because of past experience with another Duke Energy program (*ask:* **What program?**): ____________________

Recommendation from "Smart Energy Now" (or "Envision Charlotte"): ____________________

Recommendation from "Non-Residential Energy Assessment": ____________________

Recommendation from other utility program (*ask:* **What program?**): ____________________

Recommendation of dealer/contractor: ____________________

Advertisement in newspaper (*ask:* **For what program?**): ____________________

Radio advertisement (*ask:* **For what program?**): ____________________

Other *(Please specify:)*: ____________________

DK/NS: ____________________

5) Did you get this [measure] to replace an existing [measure]?*

( ) Yes *(skip to question 5c)*

( ) No

( ) DK/NS *(skip to question 6)*

5a. Is this [measure] the first you have ever purchased for your company?

( ) Yes *(skip to question 6)*

( ) No

( ) DK/NS *(skip to question 6)*

5b. Did you get this [measure] because you wanted to add another/more [measure] to your facility?

( ) Yes

( ) No

( ) DK/NS *(skip to question 6)*

5c. About how old was the [measure] you replaced?

( ) Less than 5 years old

( ) 5 to less than 10 years old

( ) 10 to less than 20 years old

( ) 20 years to less than 30 years old

( ) 30 or more years old

( ) DK/NS

5d. Was the old [measure] working or not working?

( ) Yes, working

( ) No, not working *(skip to question 6)*

( ) DK/NS

5e. Was the old [measure] in good, fair, or poor working condition?

( ) Good

( ) Fair

( ) Poor

( ) DK/NS

6) Where did you get your rebate application?*

[Use list as prompt as necessary. Record one response.]

( ) Contractor or Equipment Vendor

( ) Website/on-line

( ) Utility

( ) Program staff

( ) Consulting Engineer, Architect or Energy Consultant

( ) Other *Please specify*: ________________ *

( ) Refused

( ) DK/NS

7) Who filled out the program rebate application for your company?*

( ) I did (customer)

( ) Someone from my company did

( ) The contractor

( ) The salesperson

( ) Someone from Duke Energy

( ) Other: ________________

If they filled it out

7a.Was the rebate application easy to understand?

( ) Yes

( ) No

( ) Some of it

( ) DK/NS

If no or some of it,

7b. **Do you remember what it was that was not clear or which part of it was difficult?**

8) Who submitted the application to Duke Energy?*

( ) I did (customer)

( ) Someone from my company did

( ) The contractor

( ) The salesperson

( ) Someone from Duke Energy

( ) Other: ________________

9) Did you have any problems receiving the incentives?*

( ) Yes

( ) No

( ) DK/NS

If yes,

9a. **Please explain the problem and how it was resolved. Was it resolved to your satisfaction?**

---

10) Please indicate from the following choices what action you would have taken if the [program] had not been available:*

( ) I would have continued using old [measure]

( ) I would have bought a used [measure] at the same time or later time

( ) I would have bought new [measure] at the same time

( ) I would have bought new [measure] at a later time

10a. At what later date would you have bought a new [measure]?

____

11) Was the Duke Energy incentive payment a factor in your choice to install the more energy efficient equipment?*

( ) Yes, the incentive had an influence on the decision

( ) No, the incentive had no influence on the decision

11a. Please indicate how much of an influence the program incentive had on your energy efficient equipment choice. On a scale of 1 to 10, where a 1 means that the program had a minor influence and a 10 means that the program had a major influence please rate the level of influence the program incentive had on your choice to go with the higher efficiency choice?

minor influence

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

major influence

12) Did Duke Energy's program information explaining the benefits of making energy efficient equipment choices have any influence on your decision to purchase the more efficient equipment?*

( ) Yes, the information had an influence on the decision

( ) No, the information had no influence on the decision

Please indicate how much of an influence the program information had on your energy efficient equipment choice. On a scale of 1 to 10, where a 1 means that the program had a minor influence and a 10 means that the program had a major influence please rate the level of influence the program information had on your choice to go with the higher efficiency choice?
minor influence

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

major influence

13) Do you think that you would have selected the same level of energy efficiency if the program information and/or technical assistance would not have been available to you?*

( ) No. We would make a somewhat different equipment selection or not do the same project

( ) Not sure what we would do

( ) Yes. We would make exactly the same equipment choice

( ) other: _________________

14) Do you think that you would have selected the same level of energy efficiency if the program's financial incentive would not have been available to you?*
( ) No. We would make a somewhat different equipment selection or not do the same project

( ) Not sure what we would do

( ) Yes. We would make exactly the same equipment choice

( ) other: ____________________

If State=OHIO and if a "bonus program" participant:

15) Were you aware that you received a bonus incentive (an increased incentive)?

( ) Yes

( ) No

( ) DK/NS

( ) NA

16) Since you participated in the Smart $aver Program, have you purchased and installed any other type of high efficiency equipment or made energy efficiency improvements at your company or at any other locations?*

( ) Yes, only at this company

( ) Yes, only at other locations

( ) Yes, at both company and other locations

( ) No

( ) Don't Know

a. What type and quantity of high efficiency equipment did your company install on its own?

(Probe to get exact type and quantity and location)

	Type	Quantity	Location
1	___	___	___
2	___	___	___
3	___	___	___
4	___	___	___

For each type listed above,

b. How do you know that this equipment is high efficiency? For example, was it Energy Star rated?

1: ______________________________

2: ______________________________

3: ____________________________

4: ____________________________

I'm going to read a statement about this equipment that you purchased on your own. On a scale from 1-10, with 1 indicating that you strongly disagree, and 10 indicating that you strongly agree, please rate the following statement.

17) My experience with the Smart $aver Program in [2010, 2011] influenced my decision to install different types of high efficiency equipment on my own.*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

( ) NA

18) What other actions, if any, have you taken in your company to save energy and reduce utility bills as a result of what you learned in this program?

Response 1: ____________________________

Response 2: ____________________________

Response 3: ____________________________

Response 4: ____________________________

Now I am going to ask you some general satisfaction statements. On a scale from 1-10, with 1 indicating that you were very dissatisfied , and 10 indicating that you very satisfied, please rate the following statements.

19) The rebate form being easy to understand and complete.*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

20) The interactions and communications with Duke Energy staff.*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

21) The rebate levels provided by the program*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

22) The time it took to receive the rebate*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

23) The number and kind of technologies covered in the program*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

24) The information you were provided explaining the program*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

25) The program overall.*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

26) Duke Energy overall.*

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) 6

( ) 7

( ) 8

( ) 9

( ) 10

( ) DK/NS

If 7 or less,

How could this be improved?

____

27) What additional services would you like the program to provide that it does not now provide?*

28) Are there any other things that you would like to see changed about the program?*

29) What do you think can be done to increase people's interest in participating in the Smart $aver Program?*

Response 1: _________________________

Response 2: _________________________

Response 3: _________________________

Response 4: _________________________

For Ohio ONLY

30) Please rate your overall satisfaction with Duke Energy's Smart $aver program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, or Very Dissatisfied?

( ) Very Satisfied

( ) Somewhat Satisfied

( ) Neither Satisfied nor Dissatisfied

( ) Somewhat Dissatisfied

( ) Very Dissatisfied

( ) Refused

( ) DK/NS

31) What do you like most about this program?*

32) What do you like least about this program?*

33) Which category best describes your organization?*
[Single Choice]

( ) Office

( ) Retail (non-food)

( ) College/university

( ) School

( ) Grocery store

( ) Convenience store

( ) Restaurant

( ) Health care/hospital

( ) Hotel or motel

( ) Warehouse

( ) Personal Service

( ) Community Service/ Church/ Temple/Municipality

( ) Industrial Electronic & Machinery

( ) Industrial Mining, Metals, Stone, Glass, Concrete

( ) Industrial Petroleum, Plastic, Rubber and Chemicals

( ) Other Industrial

( ) Agricultural

( ) Condo Assoc/Apartment Mgmt

( ) Miscellaneous *[record verbatim]*: _________________ *

( ) Refused

( ) DK/NS

34) What is your job title or role?*
( ) Facilities Manager

( ) Building Manager

( ) Energy Manager

( ) Other facilities management/maintenance position

( ) Chief Financial Officer

( ) Other financial/administrative position

( ) Proprietor/Owner

( ) President/CEO

( ) Other *(Specify)*: ________________*

( ) Refused

( ) DK/NS

35) Does your organization own or lease the space at [SITE_ADDRESS]?*

( ) Own

( ) Lease

( ) Own part and lease part

( ) DK/NS

36) What is the total square footage of the portion of the facility that you occupy at this location? Your best estimate will be fine.*

( ) Square feet: ________________*

( ) Refused

( ) DK/NS

37) About how many full time equivalent employees work at the facility at [SITE_ADDRESS]?*

( ) Less than 10

( ) 11 to 25

( ) 26 to 40

( ) 41 to 75

( ) 76 to 100

( ) More than 100

( ) Refused

( ) DK/NS

38) Many organizations try to save energy to reduce costs, but there may be other reasons as well. Please listen to the following 5 statements and tell me which statement best describes your organization's view on saving energy?*
(Choose one)

( ) a. **Our energy efficiency efforts contribute to increased customer satisfaction**

( ) **b. We want to project a "green" (sustainable) image to the community**

( ) **c. Our organization is concerned about the environment**

( ) **d. Saving energy is not important to our organization**

( ) **e. Saving energy is important because it reduces costs, but not for any other reason**

( ) Multiple reasons (ranked) (ie b 1, a 2): _________________*

We have reached the end of the survey. Do you have any comments that you would like for me to pass on to Duke Energy?

That's all the questions I have for you today. Thank you for your time!

Do you have any comments that you would like to pass on to your supervisor about this survey?

Final Report

Impact Evaluation and Review of the 2012 Power Manager® Program in Ohio and Kentucky

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

June 17, 2013

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Table of Contents

Executive Summary

Summary of Findings

The approach used by Duke Energy for estimating the effect of the Power Manager® program is very reasonable and defensible. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches (i.e., approaches that compare average usages from a pre-event period, for example, rather than conducting a multivariate regression model, as Duke Energy is doing).

In 2011, the behavior of some Cannon switches to deviate substantially from the shed times expected for the Target Cycle method was an issue since it increases the uncertainty of the program impacts. Duke Energy and Cooper determined that the root cause was a firmware flaw in the Target Cycle algorithm. Duke Energy and Cooper worked together to develop a solution that utilized radio signal communications (via the paging network) that changed the affected switches from the flawed Target Cycle algorithm to the True Cycle algorithm. This conversion of the affected switches was completed prior to the start of the 2012 event season. Therefore, inverse shed is no longer an issue.

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and should result in accurate estimates of event impacts and the summer load reduction capacity under peak normal weather conditions, as summarized in Table 7 on page 13.

Introduction and Purpose of Study

This document presents the evaluation report for Duke Energy's Power Manager Program as it was administered in Ohio and Kentucky.

The evaluation was conducted by Duke Energy and the TecMarket Works evaluation team. Duke Energy conducted the impact analysis, and Integral Analytics (a TecMarket Works subcontractor) conducted the review of the methodology and results.

Summary Overview

This document presents a review of the impact evaluation for the Power Manager (PM) program conducted by Duke Energy as it was administered in Ohio and Kentucky.

Summary of the Evaluation

Power Manager is a voluntary residential program, available to homeowners with central air conditioning (AC). On days where energy demand and/or energy costs are expected to be high, Power Manager participants have agreed to allow Duke Energy to cycle their air conditioning off for a period of time.

The impact evaluation conducted by Duke Energy developed an air conditioner (AC) duty cycle model based on information from a sample of PM participants. This duty cycle was then used to simulate the expected natural duty cycle during the PM event days and under peak normal weather conditions for different PM program options and load control technologies to produce estimates of the potential load reduction. These estimates were then de-rated by the results of operability studies to give estimates of the realized load reductions.

Evaluation Objectives

The purpose of this evaluation was two-fold. The first objective is to summarize the actual kW and expected peak normal kW impacts determined by Duke Energy for 2012. The second objective is to determine if the approach used by Duke Energy in estimating these impacts is consistent with commonly accepted evaluation principles.

Summary of Review

The approach used by Duke Energy for estimating the effect of the Power Manager® program is very reasonable and defensible. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches (i.e., approaches that compare average usages from a pre-event period, for example, rather than conducting a multivariate regression model, as Duke Energy is doing).

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and should result in accurate estimates of event impacts and the summer load reduction capacity under peak normal weather conditions, as summarized in Table 7 on page 13.

Description of Program

Power Manager is a voluntary residential program, available to homeowners with central air conditioning (AC). On days where energy demand and/or energy costs are expected to be high, Duke Energy has permission from Power Manager participants to cycle their air conditioning off for a period of time.

When customers enroll, Duke Energy installs a switch that allows the AC unit to be cycled off and on in response to signals sent over Duke Energy's paging system.

Within Duke Energy's portfolio, Power Manager is currently the only residential demand response program[1]. The Power Manager program plays a key role in capacity planning; every year, Power Manager provides an estimate as to how much capacity it can provide during the summer season, and this information is taken into account by the capacity planners.

Program Participation

Program	Participation Count for 2012
Power Manager Ohio	EOM Sept. 2012 = 42,597
Power Manager Kentucky	EOM Sept. 2012 = 9,086

[1] Not including pilot programs.

Methodology

Overview of the Evaluation Approach

The impact evaluation for the Power Manager (PM) program was conducted by Duke Energy staff. The results presented in this report include a review by Integral Analytics of the impact evaluation methodology and results.

The impact evaluation developed an air conditioner (AC) duty cycle model based on information from a sample of PM participants. This duty cycle model was then used to simulate the expected natural duty cycle during the PM event days for estimates of event load reduction impacts and under peak normal weather conditions for different PM program options and load control technologies to produce estimates of the potential load reduction on a peak normal day. These estimates were then de-rated by the results of operability studies to give estimates of the realized load reductions.

The approach used by Duke Energy staff is nearly identical to the approach used in the prior evaluations reviewed by the TMW team.

This general approach is well established in the industry and the actual analysis was very thorough and well thought out. The resulting impact estimates are reasonable and accurate.

Data collection methods, sample sizes, and sampling methodology

The 2012 Power Manager M&V sample in the Midwest consists of 283 households with 307 air-conditioner (AC) units. This includes 117 households from Ohio and 26 households from Kentucky, closely reflecting the relative numbers of PM participants in each state. The 2012 Ohio and Kentucky M&V sample is representative of the PM population within the two states and includes 95 new households randomly selected from the PM population in February, 2012, and 48 holdovers from the 2011 M&V sample that were randomly selected in either 2010 or 2011. The samples are designed to target at 10% relative precision at 90% confidence level with additional households to compensate loss of the sample due to data issue or removal of the switch through the summer.

At households selected for the M&V sample, any older load control device was replaced by a Cannon load control device. The purpose of this study is to determine the load reduction achieved when the load control device functions as expected, so this device replacement does not introduce bias into the results. Completely separate operability studies are conducted to determine deviation from expected performance (the de-rating factor) for each load control technology. The M&V samples were used for both fixed and target cycling.

PM M&V samples are stratified into high, medium and low groups according to premise monthly kWh usage from the previous summer. The Dalenius-Hodges technique for selecting strata boundaries and the Neyman method for optimum sample allocation were employed to achieve reduced sample variance of load reduction estimates. Stratification analysis was performed together for Ohio and Kentucky. The resulting stratification of PM M&V samples is shown in Table 1.

Table 1. M&V Sample Stratification

	Sample allocation			Population weight		
	High	Medium	Low	High	Medium	Low
OH & KY	46	49	48	14.4%	46.8%	38.8%

Hourly run-time of AC units in the M&V samples was collected during 2012 summer months (May through September). This was accomplished with Cannon load control devices, which record hourly run-time (in minutes) of the AC unit to which they are attached. Data collection from M&V Cannon devices were conducted in June and the end of September. In addition to hourly run-time, the Cannon device scan data includes hourly shed minutes and the contents of many device registers. Information about the AC unit is also recorded, including rated amps for the compressor and fan.

Households in the M&V samples are equipped with load research interval meters, and 15-minute or 30-minute premise interval usage (kWh) was collected for 2012 summer months.

Number of completes and sample disposition for each data collection effort

See "Table 1. M&V Sample Stratification" above.

Expected and achieved precision

The 2012 M&V sample is representative of the PM population and is designed to target at 10% relative precision at 90% confidence level.

The final sample sizes for OH & KY were adequate to produce estimates at 20% relative precision at 90% confidence level.

Description of baseline assumptions, methods and data sources

The baseline is developed from the duty-cycle of the sampled AC units based upon the observed AC usage during non-holiday, non-weekend, and non-control days.

Description of measures and selection of methods by measure(s) or market(s)

The PM program is an AC cycling program, so the only measure in question is the AC units.

Use of TRM values and explanation if TRM values not used

The analysis provides estimate of the savings that were achieved by participating households, thus there was no need to use TRM values.

Threats to validity, sources of bias and how those were addressed

The approach used in the evaluation relied upon actual measurement of AC usage, and is therefore not subject to any reporting or self-selection bias.

Evaluation Findings

Validation of AC Duty Cycle Data

Hourly air conditioner (AC) run-time collected from Cannon M&V devices is compared to corresponding premise interval kWh to verify that it accurately reflects operation of the attached AC unit. The validation process is accomplished through a sequence of computer programs that: 1) convert the hourly A/C run-time data into hourly duty cycle; 2) display time series plots of premise kWh and duty cycle with control over time resolution enabling visual comparison of plot detail; 3) calculate cross-correlation between hourly kWh and hourly duty cycle and display cross-plots of kWh vs. duty cycle. Each run-time data file collected for an AC in the 2012 M&V sample is reviewed in this fashion, and the AC duty cycle is added to the model database if it passes the validation process.

In the Ohio and Kentucky sample, Duke Energy could not obtain the 2012 data needed to apply validation procedures for 8 ACs due to the inability to retrieve scan data (6), disconnection (1), or no access to the switch (1). In the validation process, run-time data was rejected for 2 ACs in the Ohio and Kentucky sample. These cases appear to be due to equipment sensitivity issues, where the AC is reported to have no run-time or to be always running. The final sample sizes include 135 households with 143 devices for OH & KY. This is still adequate to produce estimates at 20% relative precision at 90% confidence level, which is required by PJM for OH and KY.

Table 2 summarizes the 2012 M&V sample.

Table 2. M&V Sample

	Midwest	
	Ohio	Kentucky
Households	117	26
Total AC Units	153	
Missing data	8	
Invalid Data	2	
Final AC Sample	143	
Final Households	135	

AC Duty Cycle Models

Impact estimates during PM load control periods are based upon models developed for the natural duty cycle of M&V AC units. These models are developed from 2012 duty cycle data described above, and similar duty cycle data from the two prior summers (2010, 2011) for AC units that are holdovers from previous M&V samples. Weekends and holidays are not used in the models, and hours during load control and for the remainder of the day are not used. As addressed above, Duke Energy staff was able to develop duty cycle models for AC units at 135 households in the Ohio and Kentucky M&V sample.

Natural duty cycle models are specified and estimated individually for M&V AC units to better capture the unique dependence of duty cycle on the temperature and humidity characteristics of each AC unit. A limited dependent variable model specification is adopted for hourly duty cycle, the dependent variable in the models. Candidate specifications for independent variables in the models include temperature averaged over the prior 2-hour, 4-hour, and 6-hour intervals, and a weighted temperature average with declining weights over the previous six hours. Candidate specifications also include similar sets of averages based on temperature-humidity index (THI) and heat index (16-element polynomial). Models are estimated with the SAS procedure QLIM[2]. The dependent variable specification selected for an AC unit is based on fit diagnostics from hourly model fits over the typical load control hours, 2:00–6:00 PM. For the selected model, distinct parameters are estimated in each hour of interest, resulting in a set of hourly natural duty cycle fits for each M&V AC.

PM Load Control Strategies

The PM program employs two generic types of load control devices which require somewhat different treatment for load impact evaluation. The newer switch types (Cannon LCR 4700) in OH and KY operate with an adaptive control strategy called Target Cycle (TC). For each hour of load control, the Target Cycle switch calculates a unique shed time (or percentage) based on characteristics of the attached AC unit. The older switch type (CSE) in KY uses traditional fixed cycling control, where all devices on the same program shed the same amount of time during the control period. In Ohio and Kentucky, the principal PM program options are 1.5 kW and 1.0 kW, and Target Cycle switches are configured with these load reduction targets constrained by the maximum shed time of 24 minutes per 30-minute control period. Fixed Cycling (FC) devices limit the AC run-time to 7.5 minutes (1.5 kW) or 15 minutes (1.0 kW) of each 30-minute control period. Equivalently, PM CSE devices are operated with fixed cycling percentages of 75% (FC 75%) for 1.5 kW, or 50% (FC 50%) for 1.0 kW. The third program option is 0.5 kW. Due to the limited number of participants on this option, we scale the impact estimate for it based on the results for 1.0 kW. Table 3 summarizes PM load control technology and strategy used in different states.

Table 3. PM Load Control Devices and Strategies

		Strategy			
Device	Period	OH		KY	
	(min)	1.5 kW	1.0 kW	1.5 kW	1.0 kW
Cannon	30	TC 1.5	TC 1.0	TC 1.5	TC 1.0
CSE	30			FC 75%	FC 50%

The Target Cycle control strategy puts more functionality in the switch itself. Rated amps of the attached AC unit is entered into the switch at installation, and used to determine connected load for the unit. The switch also records hourly duty cycle of attached AC unit and builds a profile (historical profile) of the expected hourly duty cycle under weather conditions typical for load control. The historical profile can be scaled (globally) by adjusters included in the commands sent to switches for load control. The connected load and adjusted historical profile are used to

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calculate hourly cycling percentages for the attached AC unit expected to achieve the appropriate load reduction target. The shed percentage is calculated in the switch for each load control hour as shown below for Target Cycle:

> AmpKW = 0.85*DeviceAmp*230/1000
> Shedpct = Min(1-scaled_profile/100+Target kW/AmpKW, MaxAllowed_Shed)

Impact analysis for PM in 2011 revealed that shed times for some of the Cannon switches deviated substantially from the expected shed times for the target cycle method. Instead these switches appeared to shed more like an "inverted" pattern, relative to the pattern expected. Further investigation by Cooper Power Systems (Cannon) discovered that the cause of this issue was due to a firmware flaw in these defective switches. An alternate adaptive cycling approach, True Cycle, was developed to solve the inverted shed issue. For the True Cycle approach, a cycling percentage called a gear is estimated using the duty cycle model and is sent to switches for load control. This gear and the scaled historical profile are then used to calculate hourly shed percentages for the attached AC unit expected to achieve the appropriate load reduction target (1.5 kW or 1.0 kW). The main difference between target cycle and true cycle is that the latter does not use rated amps to calculate connected load for the attached unit. The shed percentage is calculated in the switch for each load control hour as below for True Cycle:

> Shedpct = Min(1-scaled_profile/100+gear, MaxAllowed_Shed)

Factors that determine Target Cycle and True Cycle shed percentages for M&V AC units during control periods are known, except for contents of hourly historical profile registers on those days. Values in these registers change frequently during the summer as they are updated with the AC hourly run-time on "saved" days, which are selected with weather conditions sufficiently close to a typical load control day. Hourly run-time profiles on 2012 control days for M&V AC units are determined from the contents at the end of the 2012 control season (when available), and the unit run-time on 2012 saved days. The impact for both of the cycling strategies are estimated and the proportions of True Cycle switches are used to determine the overall shed per switch attributable to Cannon switches.

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Connected load is the average power demand (kW) of a running AC unit over a full cycle. It determines the load reduction (kWh) achieved when AC run-time is reduced. Connected load is specified for M&V AC units through the basic engineering formulas:

$$\text{Apparent Power (kVA)} = (\text{Compressor Amps} + \text{Fan Amps}) * 230 \text{ Volts} / 1000$$

$$\text{Connected Load (kW)} = \text{Power Factor} * \text{Apparent Power}$$

Rated amps for the compressor (FLA) and fan (RLA) are typically listed on the AC faceplate.

Power factor in this formula is actually different for different AC units, and even varies somewhat for different cycles of the same unit, increasing at high temperature and humidity.

Duke Energy has analyzed synchronous AC run-time and premise interval kWh collected for the M&V samples to determine an appropriate overall power factor within each sample. Results are 0.83 for the Ohio and Kentucky M&V sample. These power factor values are used to calculate connected loads for impact evaluation.

Simulation Method for PM Impact Evaluation

Simulation with M&V natural duty cycle models is used to determine average load reduction per household within M&V strata during each hour of load control and for each PM cycling strategy. These strata results are combined with the population weights given in Table 1 to estimate average load reduction per household in the PM populations in OH and KY. The potential load impacts estimated in this manner represent the load reduction which would be achieved if all switches controlled as expected. Impact results for PM load control are obtained by simulation with the OH/KY M&V samples.

The simulation procedure is very similar for the basic PM control strategies: Target/True Cycle and Fixed Cycling. In a fixed cycling simulation, the same specified shed percentage is applied to all ACs to evaluate load impact. In a Target/True Cycle simulation for a particular program option, or load reduction target, and during a specified hour (and day) of load control, a customized shed percentage is calculated for each AC unit from information specific to that unit. The resulting unit-specific shed percentages remain fixed in all simulated realizations for that load reduction target and load control hour.

A single realization in the simulation is generated by a random draw of residuals for each of the M&V natural duty cycle model fits, which are evaluated at the temperature and humidity of the control hour (and day). This gives a set of simulated natural duty cycles appropriate for the control hour. Load reduction for each M&V AC is calculated as follows:

Duty cycle reduction = MAX[Duty cycle - (1 – Shed percentage), 0]

*Load reduction = Connected load * Duty cycle reduction*

For households with multiple ACs, realized load reduction is aggregated to the household level by summing load reduction from all household ACs. These realized load reductions are averaged within the strata to produce single realizations of average load reduction per household within high, medium, and low strata. These three sample averages constitute the result from one pass through the simulation corresponding to one draw of model residuals.

Two thousand passes through the simulation are performed to adequately capture the variation in average load reduction within strata that is consistent with our duty cycle models and M&V sample sizes. The results accumulate into distributions of sample averages for all three strata. The grand means of these distributions are the most significant output from a simulation run. They are the estimates of average load reduction per household in each stratum for the specified control hour and cycling strategy. The spread of these distributions (e.g., variance) characterizes the uncertainty in the load reduction estimates, and is inversely related to the M&V sample sizes.

Load Impact Results

Load impacts described in this section are computed with population estimates of load reduction per switch, rather than load reduction per household. Simulation results are converted to load reduction per switch using the factors 1.04 switches per household for Ohio and Kentucky results. Population estimates of load reduction per household are divided by these factors to get corresponding population estimates of load reduction per switch. The estimates of switches per household are determined from the M&V samples in Ohio and Kentucky.

Power Manager hourly results for OH and KY are given in Table 5. These results are adjusted for distribution and transmission line losses. Both Cannon and CSE load control devices are installed in KY. Only Cannon devices are installed in OH.

Table 4 shows de-rating factors used for the 2012 impact evaluation. The CSE factor in KY was determined by an operability study conducted in 2009. The factors for Cannon in OH and KY were determined by an operability study conducted in 2010. We will conduct operability studies for Cannon in OH and KY in 2013.

Table 4. De-rating Factors for Impact Evaluation

Switch Type	OH	KY
Cannon	0.931	0.931
CSE		0.541

Table 5. 2012 PM Impact Results for OH and KY

Event Date	Hour	PM Impact (MW)	
		OH	KY
6/20/2012	15	36.6	9.5
	16	26.8	9.7
	17	27	9.9
6/21/2012	15	37.2	9.5
	16	39.2	10.1
	17	39.8	10.3
6/28/2012	16	39.2	
	17	40.3	10.3
	18	40.4	10.4
	19		10.6
6/29/2012	16	43	10.7
	17	43.1	10.9
7/5/2012	16	35.3	8.7
	17	34.2	8.7
	18	35.5	9
7/6/2012	16	39.4	9.8
	17	39.6	10
	18	40.4	10.2
7/17/2012	16	47.8	11.5
	17	49.2	12
	18	48.5	11.9

PM load control was activated in OH and KY on 7 days during the summer of 2012, including both CSE and Cannon devices on all days. Table 5 gives hourly impact results in OH and KY for each control day. The highest hourly impact in Ohio was 49.2 MW, and in Kentucky, 12 MW, both in hour 17 (5:00 – 6:00 pm EDT) on July 17 adjusted for line losses.

Table 6 gives estimated load reduction per switch not adjusted for line losses under peak normal weather conditions and load control technologies. **Table 7 shows the summer monthly load reduction adjusted for line losses under peak normal weather conditions.** Table 8 shows the peak normal weather conditions used to calculate the results in Table 6. The system peak is assumed to occur in the hour 5:00 – 6:00 pm EDT (identified as hour 18 in this report).

Table 6. Shed kW/switch with Peak Normal Weather

Switch Type	Control Strategy	Potential Impact	De-rated Impact
		OH/KY	OH/KY
Cannon	TC 1.5	1.52	1.42
	TC 1.0	1.01	0.94
CSE	FC 75%	1.81	0.98
	FC 50%	1.07	0.58

Table 7. Monthly Peak Normal Weather Load Reduction De-rated Impact by State Adjusted for Line Losses for Cycling

State	Control Strategy	June	July	August	September	Summer Capability
Ohio	Cycling	44.6	44.7	45.3	45.5	44.9
Kentucky	Cycling	11	10.9	10.9	10.9	10.9

Table 8. Peak Normal Weather

Hour	OH / KY	
	Temp	Dewpt
11	85.3	71.8
12	87.6	71.9
13	89.9	71.9
14	92.0	71.5
15	93.1	70.7
16	93.9	70.5
17	92.5	70.0
18	92.4	69.5

The last column of Table 7 shows the weighted average capability of the Power Manager program across the summer months in 2012 for each state. These weighted average values are calculated using the summer monthly values and weighting them based on the probability of experiencing an annual peak load in that month in each state. However, for revenue recovery purposes, Duke Energy also calculates a value called a P&L value. The P&L value is calculated from monthly capability values in each state. The P&L value is the value proposed by Duke Energy to be used for revenue recovery since it is consistent with accounting guidelines. The P&L values for 2012 are 44.9 MW Ohio and 11.0 MWs Kentucky. A further explanation of the P&L value is provided below.

P&L Value (Revenue Recovery Value) – the process can be summarized as follows.

- Using the processes described above and the program participants for a particular month, calculate the monthly capability of those participants using summer peak normal weather. For Power Manager, these values, for the summer months, are the same values as provided above in Table 7.
- The monthly values receive accounting adjustments if applicable.
- The revised monthly values are averaged across the months during which the program is available for curtailment. For the Power Manager program, this would include the months of May – September in OH and KY.

Review Results

The approach used by Duke Energy for estimating the effect of the Power Manager® program is very reasonable and defensible. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches (i.e., approaches that compare average usages from a pre-event period, for example, rather than conducting a multivariate regression model, as Duke Energy is doing).

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and should result in accurate estimates of event impacts and the summer load reduction capacity under peak normal weather conditions, as summarized in Table 7 on page 13.

Final Report

Impact Evaluation and Review of the 2012 Power Manager® Program in Ohio and Kentucky

Prepared for
Duke Energy
139 East Fourth Street
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June 17, 2013

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Executive Summary

Summary of Findings

The approach used by Duke Energy for estimating the effect of the Power Manager® program is very reasonable and defensible. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches (i.e., approaches that compare average usages from a pre-event period, for example, rather than conducting a multivariate regression model, as Duke Energy is doing).

In 2011, the behavior of some Cannon switches to deviate substantially from the shed times expected for the Target Cycle method was an issue since it increases the uncertainty of the program impacts. Duke Energy and Cooper determined that the root cause was a firmware flaw in the Target Cycle algorithm. Duke Energy and Cooper worked together to develop a solution that utilized radio signal communications (via the paging network) that changed the affected switches from the flawed Target Cycle algorithm to the True Cycle algorithm. This conversion of the affected switches was completed prior to the start of the 2012 event season. Therefore, inverse shed is no longer an issue.

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and should result in accurate estimates of event impacts and the summer load reduction capacity under peak normal weather conditions, as summarized in Table 7 on page 13.

Introduction and Purpose of Study

This document presents the evaluation report for Duke Energy's Power Manager Program as it was administered in Ohio and Kentucky.

The evaluation was conducted by Duke Energy and the TecMarket Works evaluation team. Duke Energy conducted the impact analysis, and Integral Analytics (a TecMarket Works subcontractor) conducted the review of the methodology and results.

Summary Overview

This document presents a review of the impact evaluation for the Power Manager (PM) program conducted by Duke Energy as it was administered in Ohio and Kentucky.

Summary of the Evaluation

Power Manager is a voluntary residential program, available to homeowners with central air conditioning (AC). On days where energy demand and/or energy costs are expected to be high, Power Manager participants have agreed to allow Duke Energy to cycle their air conditioning off for a period of time.

The impact evaluation conducted by Duke Energy developed an air conditioner (AC) duty cycle model based on information from a sample of PM participants. This duty cycle was then used to simulate the expected natural duty cycle during the PM event days and under peak normal weather conditions for different PM program options and load control technologies to produce estimates of the potential load reduction. These estimates were then de-rated by the results of operability studies to give estimates of the realized load reductions.

Evaluation Objectives

The purpose of this evaluation was two-fold. The first objective is to summarize the actual kW and expected peak normal kW impacts determined by Duke Energy for 2012. The second objective is to determine if the approach used by Duke Energy in estimating these impacts is consistent with commonly accepted evaluation principles.

Summary of Review

The approach used by Duke Energy for estimating the effect of the Power Manager® program is very reasonable and defensible. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches (i.e., approaches that compare average usages from a pre-event period, for example, rather than conducting a multivariate regression model, as Duke Energy is doing).

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and should result in accurate estimates of event impacts and the summer load reduction capacity under peak normal weather conditions, as summarized in Table 7 on page 13.

Description of Program

Power Manager is a voluntary residential program, available to homeowners with central air conditioning (AC). On days where energy demand and/or energy costs are expected to be high, Duke Energy has permission from Power Manager participants to cycle their air conditioning off for a period of time.

When customers enroll, Duke Energy installs a switch that allows the AC unit to be cycled off and on in response to signals sent over Duke Energy's paging system.

Within Duke Energy's portfolio, Power Manager is currently the only residential demand response program[1]. The Power Manager program plays a key role in capacity planning; every year, Power Manager provides an estimate as to how much capacity it can provide during the summer season, and this information is taken into account by the capacity planners.

Program Participation

Program	Participation Count for 2012
Power Manager Ohio	EOM Sept. 2012 = 42,597
Power Manager Kentucky	EOM Sept. 2012 = 9,086

[1] Not including pilot programs.

Methodology

Overview of the Evaluation Approach

The impact evaluation for the Power Manager (PM) program was conducted by Duke Energy staff. The results presented in this report include a review by Integral Analytics of the impact evaluation methodology and results.

The impact evaluation developed an air conditioner (AC) duty cycle model based on information from a sample of PM participants. This duty cycle model was then used to simulate the expected natural duty cycle during the PM event days for estimates of event load reduction impacts and under peak normal weather conditions for different PM program options and load control technologies to produce estimates of the potential load reduction on a peak normal day. These estimates were then de-rated by the results of operability studies to give estimates of the realized load reductions.

The approach used by Duke Energy staff is nearly identical to the approach used in the prior evaluations reviewed by the TMW team.

This general approach is well established in the industry and the actual analysis was very thorough and well thought out. The resulting impact estimates are reasonable and accurate.

Data collection methods, sample sizes, and sampling methodology

The 2012 Power Manager M&V sample in the Midwest consists of 283 households with 307 air-conditioner (AC) units. This includes 117 households from Ohio and 26 households from Kentucky, closely reflecting the relative numbers of PM participants in each state. The 2012 Ohio and Kentucky M&V sample is representative of the PM population within the two states and includes 95 new households randomly selected from the PM population in February, 2012, and 48 holdovers from the 2011 M&V sample that were randomly selected in either 2010 or 2011. The samples are designed to target at 10% relative precision at 90% confidence level with additional households to compensate loss of the sample due to data issue or removal of the switch through the summer.

At households selected for the M&V sample, any older load control device was replaced by a Cannon load control device. The purpose of this study is to determine the load reduction achieved when the load control device functions as expected, so this device replacement does not introduce bias into the results. Completely separate operability studies are conducted to determine deviation from expected performance (the de-rating factor) for each load control technology. The M&V samples were used for both fixed and target cycling.

PM M&V samples are stratified into high, medium and low groups according to premise monthly kWh usage from the previous summer. The Dalenius-Hodges technique for selecting strata boundaries and the Neyman method for optimum sample allocation were employed to achieve reduced sample variance of load reduction estimates. Stratification analysis was performed together for Ohio and Kentucky. The resulting stratification of PM M&V samples is shown in Table 1.

Table 1. M&V Sample Stratification

	Sample allocation			Population weight		
	High	Medium	Low	High	Medium	Low
OH & KY	46	49	48	14.4%	46.8%	38.8%

Hourly run-time of AC units in the M&V samples was collected during 2012 summer months (May through September). This was accomplished with Cannon load control devices, which record hourly run-time (in minutes) of the AC unit to which they are attached. Data collection from M&V Cannon devices were conducted in June and the end of September. In addition to hourly run-time, the Cannon device scan data includes hourly shed minutes and the contents of many device registers. Information about the AC unit is also recorded, including rated amps for the compressor and fan.

Households in the M&V samples are equipped with load research interval meters, and 15-minute or 30-minute premise interval usage (kWh) was collected for 2012 summer months.

Number of completes and sample disposition for each data collection effort

See "Table 1. M&V Sample Stratification" above.

Expected and achieved precision

The 2012 M&V sample is representative of the PM population and is designed to target at 10% relative precision at 90% confidence level.

The final sample sizes for OH & KY were adequate to produce estimates at 20% relative precision at 90% confidence level.

Description of baseline assumptions, methods and data sources

The baseline is developed from the duty-cycle of the sampled AC units based upon the observed AC usage during non-holiday, non-weekend, and non-control days.

Description of measures and selection of methods by measure(s) or market(s)

The PM program is an AC cycling program, so the only measure in question is the AC units.

Use of TRM values and explanation if TRM values not used

The analysis provides estimate of the savings that were achieved by participating households, thus there was no need to use TRM values.

Threats to validity, sources of bias and how those were addressed

The approach used in the evaluation relied upon actual measurement of AC usage, and is therefore not subject to any reporting or self-selection bias.

Evaluation Findings

Validation of AC Duty Cycle Data

Hourly air conditioner (AC) run-time collected from Cannon M&V devices is compared to corresponding premise interval kWh to verify that it accurately reflects operation of the attached AC unit. The validation process is accomplished through a sequence of computer programs that: 1) convert the hourly A/C run-time data into hourly duty cycle; 2) display time series plots of premise kWh and duty cycle with control over time resolution enabling visual comparison of plot detail; 3) calculate cross-correlation between hourly kWh and hourly duty cycle and display cross-plots of kWh vs. duty cycle. Each run-time data file collected for an AC in the 2012 M&V sample is reviewed in this fashion, and the AC duty cycle is added to the model database if it passes the validation process.

In the Ohio and Kentucky sample, Duke Energy could not obtain the 2012 data needed to apply validation procedures for 8 ACs due to the inability to retrieve scan data (6), disconnection (1), or no access to the switch (1). In the validation process, run-time data was rejected for 2 ACs in the Ohio and Kentucky sample. These cases appear to be due to equipment sensitivity issues, where the AC is reported to have no run-time or to be always running. The final sample sizes include 135 households with 143 devices for OH & KY. This is still adequate to produce estimates at 20% relative precision at 90% confidence level, which is required by PJM for OH and KY.

Table 2 summarizes the 2012 M&V sample.

Table 2. M&V Sample

	Midwest	
	Ohio	Kentucky
Households	117	26
Total AC Units	153	
Missing data	8	
Invalid Data	2	
Final AC Sample	143	
Final Households	135	

AC Duty Cycle Models

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Duty cycle reduction = MAX[Duty cycle - (1 – Shed percentage), 0]

*Load reduction = Connected load * Duty cycle reduction*

For households with multiple ACs, realized load reduction is aggregated to the household level by summing load reduction from all household ACs. These realized load reductions are averaged within the strata to produce single realizations of average load reduction per household within high, medium, and low strata. These three sample averages constitute the result from one pass through the simulation corresponding to one draw of model residuals.

Two thousand passes through the simulation are performed to adequately capture the variation in average load reduction within strata that is consistent with our duty cycle models and M&V sample sizes. The results accumulate into distributions of sample averages for all three strata. The grand means of these distributions are the most significant output from a simulation run. They are the estimates of average load reduction per household in each stratum for the specified control hour and cycling strategy. The spread of these distributions (e.g., variance) characterizes the uncertainty in the load reduction estimates, and is inversely related to the M&V sample sizes.

Load Impact Results

Load impacts described in this section are computed with population estimates of load reduction per switch, rather than load reduction per household. Simulation results are converted to load reduction per switch using the factors 1.04 switches per household for Ohio and Kentucky results. Population estimates of load reduction per household are divided by these factors to get corresponding population estimates of load reduction per switch. The estimates of switches per household are determined from the M&V samples in Ohio and Kentucky.

Power Manager hourly results for OH and KY are given in Table 5. These results are adjusted for distribution and transmission line losses. Both Cannon and CSE load control devices are installed in KY. Only Cannon devices are installed in OH.

Table 4 shows de-rating factors used for the 2012 impact evaluation. The CSE factor in KY was determined by an operability study conducted in 2009. The factors for Cannon in OH and KY were determined by an operability study conducted in 2010. We will conduct operability studies for Cannon in OH and KY in 2013.

Table 4. De-rating Factors for Impact Evaluation

Switch Type	OH	KY
Cannon	0.931	0.931
CSE		0.541

Table 5. 2012 PM Impact Results for OH and KY

Event Date	Hour	PM Impact (MW)	
		OH	KY
6/20/2012	15	36.6	9.5
	16	26.8	9.7
	17	27	9.9
6/21/2012	15	37.2	9.5
	16	39.2	10.1
	17	39.8	10.3
6/28/2012	16	39.2	
	17	40.3	10.3
	18	40.4	10.4
	19		10.6
6/29/2012	16	43	10.7
	17	43.1	10.9
7/5/2012	16	35.3	8.7
	17	34.2	8.7
	18	35.5	9
7/6/2012	16	39.4	9.8
	17	39.6	10
	18	40.4	10.2
7/17/2012	16	47.8	11.5
	17	49.2	12
	18	48.5	11.9

PM load control was activated in OH and KY on 7 days during the summer of 2012, including both CSE and Cannon devices on all days. Table 5 gives hourly impact results in OH and KY for each control day. The highest hourly impact in Ohio was 49.2 MW, and in Kentucky, 12 MW, both in hour 17 (5:00 – 6:00 pm EDT) on July 17 adjusted for line losses.

Table 6 gives estimated load reduction per switch not adjusted for line losses under peak normal weather conditions and load control technologies. **Table 7 shows the summer monthly load reduction adjusted for line losses under peak normal weather conditions.** Table 8 shows the peak normal weather conditions used to calculate the results in Table 6. The system peak is assumed to occur in the hour 5:00 – 6:00 pm EDT (identified as hour 18 in this report).

Table 6. Shed kW/switch with Peak Normal Weather

Switch Type	Control Strategy	Potential Impact	De-rated Impact
		OH/KY	OH/KY
Cannon	TC 1.5	1.52	1.42
	TC 1.0	1.01	0.94
CSE	FC 75%	1.81	0.98
	FC 50%	1.07	0.58

Table 7. Monthly Peak Normal Weather Load Reduction De-rated Impact by State Adjusted for Line Losses for Cycling

State	Control Strategy	June	July	August	September	Summer Capability
Ohio	Cycling	44.6	44.7	45.3	45.5	44.9
Kentucky	Cycling	11	10.9	10.9	10.9	10.9

Table 8. Peak Normal Weather

Hour	OH / KY	
	Temp	Dewpt
11	85.3	71.8
12	87.6	71.9
13	89.9	71.9
14	92.0	71.5
15	93.1	70.7
16	93.9	70.5
17	92.5	70.0
18	92.4	69.5

The last column of Table 7 shows the weighted average capability of the Power Manager program across the summer months in 2012 for each state. These weighted average values are calculated using the summer monthly values and weighting them based on the probability of experiencing an annual peak load in that month in each state. However, for revenue recovery purposes, Duke Energy also calculates a value called a P&L value. The P&L value is calculated from monthly capability values in each state. The P&L value is the value proposed by Duke Energy to be used for revenue recovery since it is consistent with accounting guidelines. The P&L values for 2012 are 44.9 MW Ohio and 11.0 MWs Kentucky. A further explanation of the P&L value is provided below.

P&L Value (Revenue Recovery Value) – the process can be summarized as follows.

- Using the processes described above and the program participants for a particular month, calculate the monthly capability of those participants using summer peak normal weather. For Power Manager, these values, for the summer months, are the same values as provided above in Table 7.
- The monthly values receive accounting adjustments if applicable.
- The revised monthly values are averaged across the months during which the program is available for curtailment. For the Power Manager program, this would include the months of May – September in OH and KY.

Review Results

The approach used by Duke Energy for estimating the effect of the Power Manager® program is very reasonable and defensible. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches (i.e., approaches that compare average usages from a pre-event period, for example, rather than conducting a multivariate regression model, as Duke Energy is doing).

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and should result in accurate estimates of event impacts and the summer load reduction capacity under peak normal weather conditions, as summarized in Table 7 on page 13.

Measure Name	Product	Program	Type
HT ES UC DW w-Boost Htr (Elec) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES UC DW w-Boost Htr (Gas) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
Low-Temp ES Multi-Tank - CNV DW New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
Low-Temp ES sngl Tank - CNV DW New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
Low-Temp ES sngl Tank - Door DW New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
Low-Temp ES UC DW New -repl on Burnout	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
Walk-In Cooler Automatic Door-Closer Retrofit	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
Walk-In Freezer Automatic Door-Closer Retrofit	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES Multi-Tank - CNV DW w-Boost Htr (Elec) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES Multi-Tank - CNV DW w-Boost Htr (Gas) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES Sngl Tank - CNV DW w-Boost Htr (Elec) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES Sngl Tank - CNV DW w-Boost Htr (Gas) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES Sngl Tank - Door DW w-Boost Htr (Elec) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
HT ES Sngl Tank - Door DW w-Boost Htr (Gas) New -repl on BO	Food Service	Smart $aver® Prescriptive - New Measures	Non-Residential
0.5 Faucet Aerator (DI) - Commercial, public use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
0.5 gpm Faucet Aerator (DI) - COMM, pvt use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
0.5 gpm Faucet Aerator (DI) - School, public use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
1.0 Faucet Aerator (DI) - Commercial, public use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
1.0 gpm Faucet Aerator (DI) - COMM, pvt use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
1.0 gpm Faucet Aerator (DI) - School, public use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
1.5 gpm Low Flow Showerhead (DI) - COMM, pvt use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Water Reset- Air Cooled Chillers, Grocery	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Water Reset- Air Cooled Chillers, Other	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Water Reset- Air Cooled Chillers, Retail	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Wtr Reset- Air Cooled Chillers, SCH (K-12)	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Water Reset- Water Cooled Chillers, Other	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Wtr Reset- Wtr Cooled Chillers, Retail	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Wtr Reset- Wtr Cooled Chillers, SCH (K-12)	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Wtr Reset-Wtr Cooled Chillers, Grocery	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout College	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Health	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Hotel	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Large Office	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Medium Office	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Motel	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Other	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Retail	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout School	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
CoolRoof New Replace on Burnout Strip Mall	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential

Ductless Mini-Split AC, College vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split AC, Convenience vs PTAC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split AC, Lodging vs PTAC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split AC, Other vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split AC, Schools (K-12) vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split Heat Pump, College vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split HP, Convenience vs PTHP	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split HP, Convenience vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split Heat Pump, Lodging vs PTHP	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split Heat Pump, Lodging vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split Heat Pump, Other vs PTHP	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split Heat Pump, Other vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Ductless Mini-Split HP, Schools (K-12) vs room AC	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Water Heater Pipe Insulation	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
1.5 gpm Low Flow Showerhead (DI) - COMM, public use	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Wtr Reset- Air Cooled Chillers, College or Sm Ofc	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Chilled Wtr Reset- Wtr Cooled Chillers, College or Sm Ofc	HVAC	Smart $aver® Prescriptive - New Measures	Non-Residential
Controlled Plug Strip	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
Energy Star 2.0 Server	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
Energy Star 6.0 Desktop Computer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
Energy Star 6.0 Small Scale Server (Data Storage)	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
PC Power Management from Network	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 10HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 10HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 15HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 15HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 20HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 20HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 25HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 25HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 30HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 30HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 40HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 40HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 50HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 50HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 5HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 5HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 7.5HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on chilled water pumps 7.5HP w Economizer	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on CRAC CRAH AHU fans 10HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on CRAC CRAH AHU fans 15HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on CRAC CRAH AHU fans 20HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential

VFDs on CRAC CRAH AHU fans 2HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on CRAC CRAH AHU fans 3HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on CRAC CRAH AHU fans 5HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
VFDs on CRAC CRAH AHU fans 7.5HP	Information Technology	Smart $aver® Prescriptive - New Measures	Non-Residential
Exterior LED Lighting Motion-Sensor Control	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Canopy replacing 176-250W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Canopy replacing 251-400W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Canopy replacing up to 175W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED FLD rplcng or ILO GRT 100W HAL, INCD, or HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED FLD rplcng or ILO up to 100W HAL, INCD, or HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Highbay replacing 251-400W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Highbay replacing greater than 400W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Lowbay replacing 176W-250W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Lowbay replacing up to 175W HID	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Panel 1x4 replacing or in lieu of T8 FL	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Panel 2x2 replacing or in lieu of T8 FL	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Panel 2x4 replacing or in lieu of T8 FL	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
Remote-Mounted Daylight Sensor	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
Switch or Fixture-Mounted Daylight Sensor	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
T8 HB 4ft 2L rplcng 150-249W HID (retrofit only)	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Bollards (rplcng or ILO INCD, CFL, or HID bollards)	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Display Case (rplcng or ILO INCD or FL display case Ltng)	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Portable Task Lights (rplcng or ILO INCD, HAL, or CFL task Ltng)	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Shelf-mounted Task Lights (rplcng or ILO FL task Ltng)	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
LED Track Ltng (rplcng or ILO INCD, HAL, CFL, or HID track Ltng)	Lighting	Smart $aver® Prescriptive - New Measures	Non-Residential
Heat Pump Water Heater	Heat Pump Water Heaters	Smart $aver® Residential New Measures	Residential
Faucet Aerators MF Direct 0.5 GPM - bath	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators MF Direct 1.0 GPM - bath	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators MF Direct 1.0 GPM - kitchen	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators MF DIY 0.5 GPM - bath	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators MF DIY 1.0 GPM - bath	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators MF DIY 1.0 GPM - kitchen	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Pipe Wrap MF Direct	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Pipe Wrap MF DIY	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead MF Direct 0.5 GPM	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead MF Direct 1.0 GPM	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead MF Direct 1.5 GPM	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead MF DIY 0.5 GPM	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead MF DIY 1.0 GPM	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead MF DIY 1.5 GPM	Multi-Family Water Measures	Smart $aver® Residential New Measures	Residential
Pool Pump	Pool Energy Efficiency Program	Smart $aver® Residential New Measures	Residential
Faucet Aerators SF Direct 0.5 GPM - bath	Single Family Water Measures	Smart $aver® Residential New Measures	Residential

Faucet Aerators SF Direct 1.0 GPM - bath	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators SF Direct 1.0 GPM - kitchen	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators SF DIY 0.5 GPM - bath	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators SF DIY 1.0 GPM - bath	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
Faucet Aerators SF DIY 1.0 GPM - kitchen	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
Pipe Wrap SF Direct	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
Pipe Wrap SF DIY	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead SF Direct 0.5 GPM	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead SF Direct 1.0 GPM	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead SF Direct 1.5 GPM	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead SF DIY 0.5 GPM	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead SF DIY 1.0 GPM	Single Family Water Measures	Smart $aver® Residential New Measures	Residential
LF Showerhead SF DIY 1.5 GPM	Single Family Water Measures	Smart $aver® Residential New Measures	Residential