

**Appendix A
 Cost Effectiveness Test Results**

Program Name	2015 - 2016			
	UCT	TRC	RIM	PCT
Residential Programs				
Appliance Recycling Program	0.94	1.36	0.61	
Energy Efficiency Education Program for Schools	1.66	1.96	0.96	
Low Income Neighborhood	0.82	1.68	0.61	
Low Income Services	0.58	0.89	0.47	
My Home Energy Report	2.44	2.44	1.20	
Residential Energy Assessments	3.53	3.73	1.55	
Residential Smart \$aver®	3.19	2.51	1.22	2.81
Power Manager®	4.28	5.64	4.28	
Non-Residential Programs				
Smart \$aver® Custom	4.53	1.22	1.36	1.28
Smart \$aver® Prescriptive - Energy Star Food Service Products	5.32	1.50	1.53	1.65
Smart \$aver® Prescriptive - HVAC	2.33	1.51	1.39	1.18
Smart \$aver® Prescriptive - Lighting	4.38	1.74	1.44	1.69
Smart \$aver® Prescriptive - Motors/Pumps/VFD	5.84	3.94	1.47	4.61
Smart \$aver® Prescriptive - Process Equipment	6.56	5.69	1.83	6.02
Smart \$aver® Prescriptive - IT	0.01	0.01	0.01	1.98
Small Business Energy Saver	4.16	2.72	1.56	2.61
PowerShare®	3.58	15.57	3.58	

Kentucky DSM Rider

Comparison of Revenue Requirement to Rider Recovery

Residential Programs	(1)	(2)	(3)	(4)	(5)		(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)
	Projected Program Costs 7/2015 to 6/2016 (A)	Projected Lost Revenues 7/2015 to 6/2016 (A)	Projected Shared Savings 7/2015 to 6/2016 (A)	Program Expenditures 7/2015 to 6/2016 (B)	Program Expenditures (C) Gas	Program Expenditures (C) Electric	Lost Revenues 7/2015 to 6/2016 (B)	Shared Savings 7/2015 to 6/2016 (B)	2015 Reconciliation Gas (D)	2015 Reconciliation Electric (E)	Rider Collection (F) Gas	Rider Collection (F) Electric	(Over)/Under Gas (G)	(Over)/Under Electric (H)	
Appliance Recycling Program	\$ 109,613	\$ 177,379	\$ (204)	\$ 81,596	\$ -	\$ 81,596	\$ 73,948	\$ (525)							
Energy Efficiency Education Program for Schools	\$ 198,861	\$ 40,057	\$ 6,450	\$ 209,468	\$ 51,560	\$ 157,888	\$ 53,588	\$ 10,903							
Low Income Neighborhood	\$ 276,950	\$ 101,264	\$ 14,484	\$ 257,188	\$ -	\$ 257,188	\$ 69,193	\$ (4,520)							
Low Income Services	\$ 700,410	\$ 54,819	\$ (8,455)	\$ 560,710	\$ 267,344	\$ 293,366	\$ 45,038	\$ (8,488)							
My Home Energy Report	\$ 625,158	\$ 542,633	\$ 84,254	\$ 845,136	\$ -	\$ 845,136	\$ 611,160	\$ 93,083							
Residential Energy Assessments	\$ 231,284	\$ 61,485	\$ 48,815	\$ 191,052	\$ 43,549	\$ 147,503	\$ 59,408	\$ 48,370							
Residential Smart Saver®	\$ 896,852	\$ 1,568,308	\$ 105,011	\$ 1,300,197	\$ 1,084	\$ 1,299,103	\$ 1,850,469	\$ 263,871							
Power Manager®	\$ 437,798	\$ -	\$ 149,597	\$ 456,430	\$ -	\$ 456,430	\$ -	\$ 142,798							
Home Energy Assistance Pilot Program (I)	\$ 252,236	\$ -	\$ -	\$ 290,145	\$ 121,952	\$ 168,194	\$ -	\$ -				\$ 107,491	\$ 148,249		
Revenues collected except for HEA												\$ 4,017,128	\$ 8,474,191		
Total	\$ 3,727,259	\$ 2,545,965	\$ 399,932	\$ 3,981,923	\$ 485,519	\$ 3,506,404	\$ 2,762,800	\$ 565,493	\$ 2,404,856	\$ 5,047,241	\$ 4,124,618	\$ 8,822,440	\$ (1,234,243)	\$ 3,259,488	

- (A) Amounts identified in report filed in Case No. 2015-00277.
- (B) Actual program expenditures, lost revenues (for this period and from prior period DSM measure installations), and shared savings for the period July 1, 2015 through June 30, 2016.
- (C) Allocation of program expenditures to gas and electric in accordance with the Commission's Order in Case No. 2014-00388.
- (D) Recovery allowed in accordance with the Commission's Order in Case No. 2012-00085.
- (E) Recovery allowed in accordance with the Commission's Order in Case No. 2012-00085.
- (F) Revenues collected through the DSM Rider between July 1, 2015 and June 30, 2016.
- (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)	(2)	(3)	(4)	(5)		(7)	(8)	(9)
	Projected Program Costs 7/2015 to 6/2016 (A)	Projected Lost Revenues 7/2015 to 6/2016 (A)	Projected Shared Savings 7/2015 to 6/2016 (A)	Program Expenditures 7/2015 to 6/2016 (B)	Lost Revenues 7/2015 to 6/2016 (B)	Shared Savings 7/2015 to 6/2016 (B)	2015 Reconciliation (C)	Rider Collection (D)	(Over)/Under Collection (E)
Smart Saver® Custom	\$ 512,180	\$ 97,430	\$ 91,979	\$ 250,533	\$ 148,556	\$ 77,897			
Smart Saver® Prescriptive - Energy Star Food Service Prox	\$ 57,432	\$ 24,915	\$ 42,139	\$ 22,503	\$ 23,522	\$ 9,618			
Smart Saver® Prescriptive - HVAC	\$ 328,497	\$ 30,015	\$ 105,390	\$ 138,596	\$ 28,238	\$ 18,452			
Smart Saver® Prescriptive - Lighting	\$ 1,053,191	\$ 301,487	\$ 478,195	\$ 923,255	\$ 283,070	\$ 312,090			
Smart Saver® Prescriptive - Motors/Pumps/VFD	\$ 56,722	\$ 23,435	\$ 20,324	\$ 26,516	\$ 19,714	\$ 12,726			
Smart Saver® Prescriptive - Process Equipment	\$ 2,101	\$ 2,202	\$ 1,468	\$ 12,068	\$ 2,879	\$ 6,591			
Smart Saver® Prescriptive - IT	\$ 42,538	\$ 7,070	\$ 28,094	\$ 6,757	\$ 2	\$ (645)			
Small Business Energy Saver	\$ 757,868	\$ 27,556	\$ 161,764	\$ 1,036,947	\$ 85,436	\$ 326,044			
Total	\$ 2,810,308	\$ 514,120	\$ 929,354	\$ 2,417,194	\$ 571,417	\$ 764,572	\$ 1,722,968	\$ 4,005,868	\$ 1,470,303
PowerShare®	\$ 924,747	\$ -	\$ 166,874	\$ 1,047,301	\$ -	\$ 270,224	\$ (1,482,429)	\$ 362,434	\$ (527,338)

- (A) Amounts identified in report filed in Case No. 2015-00277.
- (B) Actual program expenditures, lost revenues (for this period and from prior period DSM measure installations), and shared savings for the period July 1, 2015 through June 30, 2016.
- (C) Recovery allowed in accordance with the Commission's Order in Case No. 2012-00085.
- (D) Revenues collected through the DSM Rider between July 1, 2015 and June 30, 2016.
- (E) Column (4) + Column (5) + Column (6) + Column (7) - Column (8)

Kentucky DSM Rider

2017-2018 Projected Program Costs, Lost Revenues, and Shared Savings

Residential Program Summary (A)

	Costs	Lost Revenues	Shared Savings	Total	Allocation of Costs (B)		Budget (Costs, Lost Revenues, & Shared Savings)		
					Electric	Gas	Electric Costs	Electric	Gas Costs
Compliance Recycling Program	\$ -	\$ 15,695	\$ -	\$ 15,695	100.0%	0.0%	\$ -	\$ 15,695	\$ -
Energy Efficiency Education Program for Schools	\$ 275,930	\$ 67,148	\$ (495)	\$ 342,584	76.1%	23.9%	\$ 209,869	\$ 276,522	\$ 66,062
Low Income Neighborhood	\$ 306,206	\$ 37,486	\$ (15,051)	\$ 328,642	100.0%	0.0%	\$ 306,206	\$ 328,642	\$ -
Low Income Services	\$ 925,461	\$ 51,905	\$ (46,167)	\$ 931,199	57.3%	42.7%	\$ 529,855	\$ 535,593	\$ 395,606
My Home Energy Report	\$ 798,061	\$ 706,256	\$ 25,078	\$ 1,529,394	100.0%	0.0%	\$ 798,061	\$ 1,529,394	\$ -
Residential Energy Assessments	\$ 276,410	\$ 79,984	\$ 8,280	\$ 364,674	100.0%	0.0%	\$ 276,410	\$ 364,674	\$ -
Residential Smart Saver®	\$ 2,503,271	\$ 1,026,020	\$ 85,565	\$ 3,614,856	100.0%	0.0%	\$ 2,503,271	\$ 3,614,856	\$ -
Power Manager®	\$ 706,922	\$ -	\$ 840,876	\$ 1,547,798	100.0%	0.0%	\$ 706,922	\$ 1,547,798	\$ -
Power Manager® for Apartments	\$ 58,552	\$ -	\$ 5,795	\$ 64,347	100.0%	0.0%	\$ 58,552	\$ 64,347	\$ -
Total Costs, Net Lost Revenues, Shared Savings	\$ 5,850,813	\$ 1,984,494	\$ 903,882	\$ 8,739,188			\$ 5,389,146	\$ 8,277,521	\$ 461,667
Home Energy Assistance Pilot Program	\$ 255,722							\$ 148,230	\$ 107,492

NonResidential Program Summary (A)

	Costs	Lost Revenues	Shared Savings	Total	Allocation of Costs (B)		Budget (Costs, Lost Revenues, & Shared Savings)		
					Electric	Gas	Electric Costs	Electric	Gas
Small Business Energy Saver	\$ 1,077,726	\$ 232,139	\$ 127,508	\$ 1,437,373	100.0%	0.0%	\$ 1,077,726	\$ 1,437,373	NA
Smart Saver® Custom	\$ 435,565	\$ 109,614	\$ 64,889	\$ 610,068	100.0%	0.0%	\$ 435,565	\$ 610,068	NA
Smart Saver® Non-Residential Performance Incentive Program (C)	\$ 44,593	\$ 14,276	\$ 6,908	\$ 65,777	100.0%	0.0%	\$ 44,593	\$ 65,777	NA
Smart Saver® Prescriptive - Energy Star Food Service Products	\$ 40,177	\$ 14,711	\$ 7,236	\$ 62,124	100.0%	0.0%	\$ 40,177	\$ 62,124	NA
Smart Saver® Prescriptive - HVAC	\$ 224,262	\$ 27,306	\$ 20,926	\$ 272,495	100.0%	0.0%	\$ 224,262	\$ 272,495	NA
Smart Saver® Prescriptive - IT	\$ 15,537	\$ 5,272	\$ (1,553)	\$ 19,256	100.0%	0.0%	\$ 15,537	\$ 19,256	NA
Smart Saver® Prescriptive - Lighting	\$ 1,223,636	\$ 283,247	\$ 125,607	\$ 1,632,490	100.0%	0.0%	\$ 1,223,636	\$ 1,632,490	NA
Smart Saver® Prescriptive - Motors/Pumps/VFD	\$ 30,337	\$ 10,489	\$ 3,034	\$ 43,861	100.0%	0.0%	\$ 30,337	\$ 43,861	NA
Smart Saver® Prescriptive - Process Equipment	\$ 9,832	\$ 2,331	\$ (983)	\$ 11,181	100.0%	0.0%	\$ 9,832	\$ 11,181	NA
Power Manager® for Business	\$ 143,872	\$ 6,906	\$ (2,021)	\$ 148,758	100.0%	0.0%	\$ 143,872	\$ 148,758	NA
PowerShare®	\$ 924,919	\$ -	\$ 80,183	\$ 1,005,102	100.0%	0.0%	\$ 924,919	\$ 1,005,102	NA
Total Costs, Net Lost Revenues, Shared Savings	\$ 4,170,458	\$ 706,291	\$ 431,735	\$ 5,308,484			\$ 4,170,458	\$ 5,308,484	NA
Total Program	\$ 10,021,271	\$ 2,690,784	\$ 1,335,617	\$ 14,047,672					

Costs, Lost Revenues (for this period and from prior period DSM measure installations), and Shared Savings for Year 6 of portfolio.

Allocation of program expenditures to gas and electric in accordance with the Commission's Order in Case No. 2014-00388.

Originally filed as "Pay for Performance" in Case No. 2016-00289

Kentucky DSM Rider

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

July 2017 to June 2018

	Program Costs (A)
<u>Electric Rider DSM</u>	
Residential Rate RS	\$ 8,277,521
Distribution Level Rates Part A DS, DP, DT, GS-FL, EH & SP	\$ 4,303,382
Transmission Level Rates & Distribution Level Rates Part B	\$ 1,005,102
<u>Gas Rider DSM</u>	
Residential Rate RS	\$ 461,667

(A) See Appendix B, page 2 of 7.

Kentucky DSM Rider

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

Year 2017

Projected Annual Electric Sales kWh

Rate RS 1,450,131,074

Rates DS, DP, DT,
GS-FL, EH, & SP 2,415,938,199

Rates DS, DP, DT,
GS-FL, EH, SP, & TT 2,598,355,199

Projected Annual Gas Sales CCF

Rate RS 58,813,254

Kentucky DSM Rider

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

July 2016 to June 2017

Rate Schedule Riders	True-Up Amount (A)	Expected Program Costs (B)	Total DSM Revenue Requirements	Estimated Billing Determinants (C)	DSM Cost Recovery Rider (DSMR)
<u>Electric Rider DSM</u> Residential Rate RS	\$ 3,275,795	\$ 8,277,521	\$ 11,553,316	1,450,131,074 kWh	\$ 0.007967 \$/kWh
Distribution Level Rates Part A DS, DP, DT, GS-FL, EH & SP	\$ 1,477,655	\$ 4,303,382	\$ 5,781,036	2,415,938,199 kWh	\$ 0.002393 \$/kWh
Transmission Level Rates & Distribution Level Rates Part B TT	\$ (529,975)	\$ 1,005,102	\$ 475,127	2,598,355,199 kWh	\$ 0.000183 \$/kWh
Distribution Level Rates Total DS, DP, DT, GS-FL, EH & SP					\$ 0.002576 \$/kWh
<u>Gas Rider DSM</u> Residential Rate RS	\$ (1,240,415)	\$ 481,667	\$ (778,747)	58,813,254 CCF	\$ (0.013241) \$/CCF
Total Rider Recovery			\$ 17,030,733		
Customer Charge for HEA Program					
<u>Electric No. 4</u> Residential Rate RS			Annual Revenues \$ 148,230	Number of Customers 123,525	Monthly Customer Charge \$ 0.10
<u>Gas No. 5</u> Residential Rate RS			\$ 107,492	89,577	\$ 0.10
Total Customer Charge Revenues			\$ 255,722		
Total Recovery			\$ 17,286,455		

(A) (Over)/Under of Appendix B page 1 multiplied by the average three-month commercial paper rate for 2014 to include interest on over or under-recovery in accordance with the Commission's order in Case No. 95-312. Value is:
(B) Appendix B, page 2.
(C) Appendix B, page 4.

1.005000

Summary of Load Impacts July 2015 Through June 2016*

Allocation Factors based on July 2015-
June 2016

	<u>kWh</u>	<u>% of Total Res</u>	<u>ccf</u>	<u>% of Total Res</u>	<u>Elec % of Total</u>	<u>% of Gas</u>	<u>% of Total</u>	<u>% of</u>
		<u>Sales</u>		<u>Sales</u>	<u>Sales</u>	<u>Sales</u>	<u>Sales</u>	
Residential Programs								
Appliance Recycling Program	172,063	0.0124%	-	0.0000%	100%			0%
Energy Efficiency Education Program for Schools	361,870	0.0261%	4,397	0.0085%	75%			25%
Low Income Neighborhood	231,138	0.0167%	-	0.0000%	100%			0%
Low Income Services	244,993	0.0177%	8,303	0.0161%	52%			48%
My Home Energy Report	11,639,346	0.8403%	-	0.0000%	100%			0%
Residential Energy Assessments	429,956	0.0310%	4,721	0.0092%	77%			23%
Residential Smart Saver®	5,494,950	0.3967%	172	0.0003%	100%			0%
Power Manager®	-	0.0000%	-	0.0000%	100%			0%
Total Residential	18,574,317	1.3410%	17,593	0.0342%				
Total Residential (Rate RS) Sales	1,385,150,993	100%	51,514,012	100%				
for July 2015 Through June 2016								

Load Impacts Net of Free Riders at Meter

Summary of Load Impacts July 2017 Through June 2018 (1),(2)

Allocation Factors Projected - Revised

	kWh	% of Total Res		ccf	% of Total Res		Elec % of Total % of Gas % of Total % of	
		Sales			Sales		Sales	Sales
Residential Programs								
Appliance Recycling Program	-	0.0000%		-	0.0000%	100%		0%
Energy Efficiency Education Program for Schools	446,186	0.0308%		5,696	0.0097%	76%		24%
Low Income Neighborhood	219,037	0.0151%		-	0.0000%	100%		0%
Low Income Services	422,167	0.0291%		12,784	0.0217%	57%		43%
My Home Energy Report	13,532,694	0.9332%		-	0.0000%	100%		0%
Residential Energy Assessments	430,491	0.0297%		-	0.0000%	100%		0%
Residential Smart Saver®	6,633,025	0.4574%		-	0.0000%	100%		0%
Power Manager®	-	0.0000%		-	0.0000%	100%		0%
Power Manager® for Apartments	-	0.0000%		-	0.0000%	100%		0%
Total Residential	21,683,600	1.4953%		18,480	0.0314%			
Total Residential (Rate RS) Sales	1,450,131,074	100%		58,813,254	100%			
Projected								

(1) Load Impacts Net of Free Riders at Meter
 (2) Appliance Recycling Program will continue to collect lost revenues for prior period participation.

Duke Energy Kentucky
4580 Olympic Blvd.
Erlanger, KY 41018

KY.P.S.C. Electric No. 2
Nineteenth Revised Sheet No. 78
Cancels and Supersedes
Eighteenth Revised Sheet No. 78
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. 75 of this Tariff.

The DSMR to be applied to residential customer bills is \$0.007967 per kilowatt-hour. (I)

A Home Energy Assistance Program (HEA) charge of \$0.10 will be applied monthly to residential customer bills through December 2017.

The DSMR to be applied to non-residential distribution service customer bills is \$0.002576 per kilowatt-hour. (R)

The DSMR to be applied for transmission service customer bills is \$0.000183 per kilowatt-hour. (I)

Issued by authority of an Order by the Kentucky Public Service
Commission dated _____ in Case No. 2016-00382.

Issued: November 15, 2016
Effective: December 15, 2016
Issued by James P. Henning, President /s/ James P. Henning

Duke Energy Kentucky
4580 Olympic Blvd.
Erlanger, KY 41018

KY.P.S.C. Electric No. 2
~~Nineteenth~~ Revised Sheet No. 78
Cancels and Supersedes
~~Eighteenth~~ Revised Sheet No. 78
Page 1 of 1

Deleted: Eighteenth

Deleted: Seventeenth

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 \$0.007967 per kilowatt-hour.

(I) Deleted: 007128

A Home Energy Assistance Program (HEA) charge of \$0.10 will be applied monthly to residential customer bills through December 2017.

The DSMR to be applied to non-residential distribution service customer bills is \$0.002576 per kilowatt-hour.

(R) Deleted: I
Deleted: 002758

The DSMR to be applied for transmission service customer bills is \$0.000183 per kilowatt-hour.

(I) Deleted: 000049
Deleted: R

Issued by authority of an Order by the Kentucky Public Service
Commission dated _____ in Case No. 2016-00382.

Deleted: April 4, 2016

Issued: ~~November 15~~, 2016

Deleted: 5

Effective: ~~December 15~~, 2016

Deleted: 68

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

Deleted: April 8

Deleted: May 2

Duke Energy Kentucky
4580 Olympic Blvd.
Erlanger, Kentucky 41018

KY.P.S.C. Gas No. 2
Nineteenth Revised Sheet No. 62
Cancels and Supersedes
Eighteenth 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 \$(0.013241) per hundred cubic feet.

(R)

A Home Energy Assistance Program (HEA) charge of \$0.10 will be applied monthly to residential customer bills through December 2017.

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 dated _____ in Case No. 2016-00382.

Issued: November 15, 2016

Effective: December 15, 2016

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

Duke Energy Kentucky
4580 Olympic Blvd.
Erlanger, Kentucky 41018

KY.P.S.C. Gas No. 2
~~Nineteenth~~ Revised Sheet No. 62
Cancels and Supersedes
~~Eighteenth~~ Revised Sheet No. 62
Page 1 of 1

Deleted: Eighteenth

Deleted: Seventeenth

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 ~~\$(0.013241)~~ per hundred cubic feet.

(R) Deleted: 0.044741

A Home Energy Assistance Program (HEA) charge of \$0.10 will be applied monthly to residential customer bills through December 2017.

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 dated _____ in Case No. 2016-00382.

Deleted: April 4, 2016

Issued: ~~November 15~~, 2016
Effective: ~~December 15~~, 2016

Deleted: 5

Deleted: 68

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

Deleted: April 8

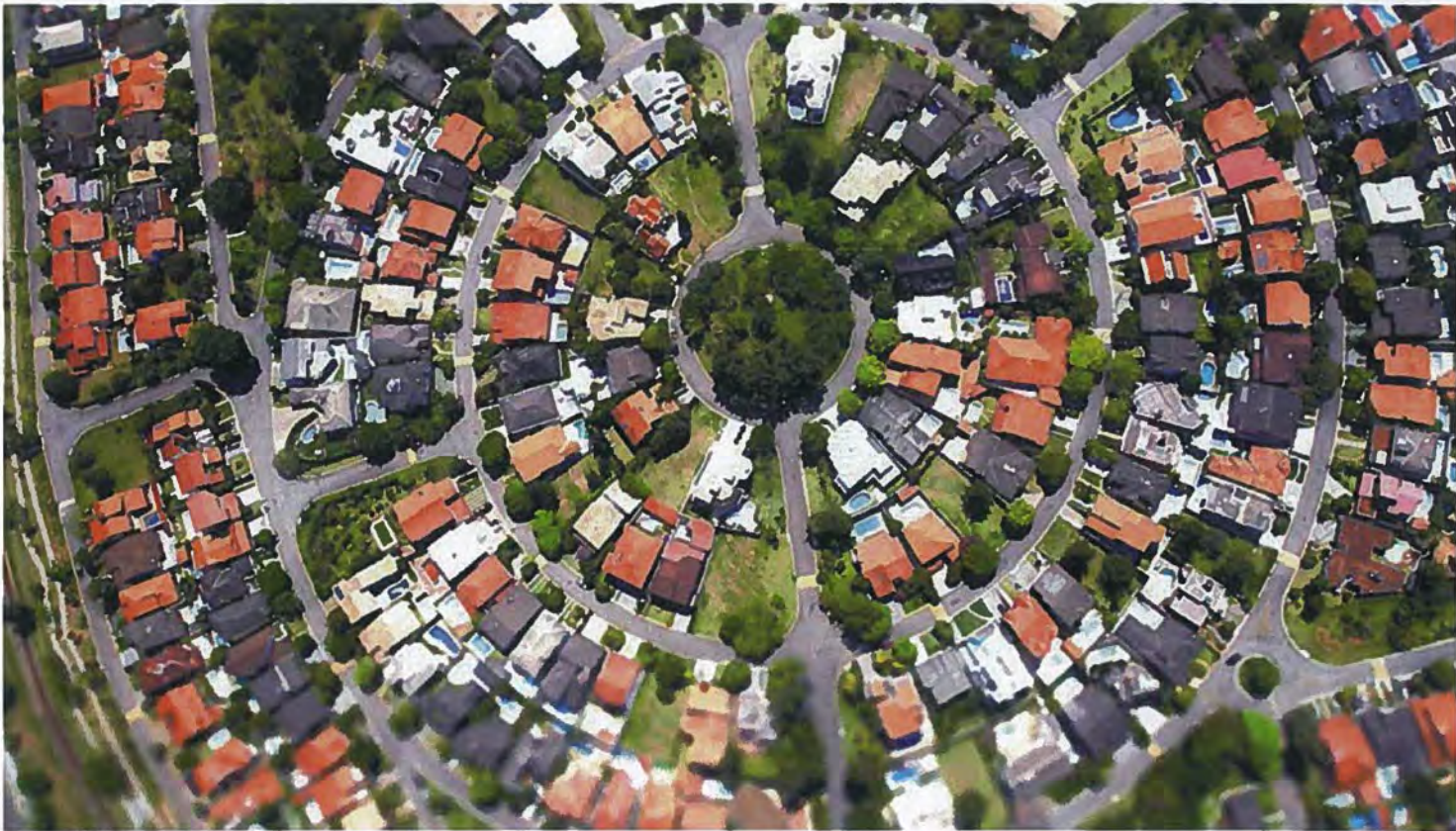
Deleted: May 2

REPORT

research > into > action™

 **Nexant**

Reimagine tomorrow.



Energy Education in Schools Program Year 2014-2015 Evaluation Report

Submitted to Duke Energy Kentucky
in partnership with Research into Action

November 1st, 2016

Principal authors:

Wyley Hodgson, Victoria DeCicco, and Patrick Burns, Nexant
Mersiha McClaren, Ryan Bliss, Jordan Folks, and Kathleen
Higgins, Research into Action

Contents

1	Executive Summary	5
1.1	Program Summary	5
1.2	Evaluation Objectives and Results	5
1.2.1	Impact Evaluation	5
1.2.2	Process Evaluation	6
1.3	Evaluation Conclusions and Recommendations.....	8
2	Introduction and Program Description	11
2.1	Program Description	11
2.1.1	Overview	11
2.1.2	Energy Efficiency Kit Measures	11
2.2	Program Implementation	12
2.2.1	Workshop Recruitment	12
2.2.2	Topics and Materials Covered in the Workshop	12
2.2.3	DEK Kit Form Promotion and Distribution.....	12
2.2.4	DEK Kit Eligibility	12
2.2.5	Participation	13
2.2.6	Program Goals.....	13
2.3	Key Research Objectives.....	13
2.3.1	Impact.....	14
2.3.2	Process.....	14
2.4	Evaluation Overview	15
2.4.1	Impact Evaluation	15
2.4.2	Process Evaluation	17
2.4.3	Summary of Activities	17
3	Impact Evaluation.....	19
3.1	Methodology	19
3.2	Database and Historical Evaluation Review	19
3.3	Sampling Plan and Achievement	21

3.4	Description of Analysis.....	21
3.4.1	Telephone and web-based surveys.....	21
3.4.2	In-Service Rate.....	22
3.4.3	Lighting.....	23
3.4.4	Water Heating.....	24
3.4.5	Air Infiltration.....	27
3.5	Targeted and Achieved Confidence and Precision.....	28
3.6	Results.....	28
4	Net-to-Gross Methodology and Results.....	31
4.1	Free Ridership.....	31
4.1.1	Free Ridership Change.....	32
4.1.2	Free Ridership Influence.....	32
4.1.3	End-Use-Specific Total Free Ridership.....	33
4.1.4	Program-Level Free Ridership.....	34
4.2	Spillover.....	34
4.3	Net-to-Gross.....	34
4.4	Comparisons with Other School Kit Programs.....	35
5	Process Evaluation.....	36
5.1	Summary of Data Collection Activities.....	36
5.1.1	Teacher Interviews.....	36
5.1.2	Survey of Student Families Who Received the DEK Kit.....	37
5.2	Process Evaluation Findings.....	37
5.2.1	Awareness of DEK Sponsorship of the Program.....	37
5.2.2	Teacher Satisfaction with the Program.....	38
5.2.3	Teachers' Familiarity and Engagement with the Energy Efficiency Kit Forms.....	39
5.2.4	Other Factors Limiting Kit Distribution.....	40
5.2.5	Student Family Experience with the Program.....	41
6	Conclusions and Recommendations.....	45

Appendix A	Summary Form	A-1
Appendix B	Measure Impact Results	B-1
Appendix C	Program Process Flow Chart.....	C-1
Appendix D	Program Performance Metrics	D-1
Appendix E	Instruments	E-1

List of Figures

Figure 1-1: 2014-2015 DEK NEED Gross Verified Energy Savings	6
Figure 1-2: DEK NEED Recipient Satisfaction with Measures They Had Installed	8
Figure 2-1: Impact Evaluation Process	16
Figure 3-1: DEK NEED Program Per Unit Energy Savings	28
Figure 5-1: Recipient Satisfaction with Measures They Had Installed*	42
Figure 6-1: Workshop Recruitment, Material Distribution, and Kit Distribution	C-1
Figure 6-2: Program Experience PPIs	D-1
Figure 6-3: Student Family Demographic Reach PPIs	D-2

List of Tables

Table 1-1: 2014 - 2015 Energy Savings per Kit.....	5
Table 1-2: 2014 - 2015 Program Level Energy Savings	5
Table 1-3: DEK NEED Program Year 2014-2015 Verified Impacts by Measure.....	6
Table 2-1: 2014-2015 Kit Measures	11
Table 2-2: DEK NEED Participation.....	13
Table 2-3: 2014 - 2015 DEK NEED Filed Targets.....	13
Table 2-4: DEK NEED Summary of Evaluation Activities	18
Table 3-1: DEK NEED 2008 Evaluation Reported Per Unit Energy Savings	20
Table 3-2: Comparison of Ex-Ante DEK NEED Energy Savings (kWh) to Peer Group Estimates	20
Table 3-3: DEK NEED Impact Sampling	21
Table 3-4: Data Collected and Used for Analysis	21
Table 3-5: DEK NEED In-Service Rates.....	22
Table 3-6: Inputs for Lighting Measures Savings Calculations.....	23
Table 3-7: DEK NEED Energy Savings, Lighting Measures	24
Table 3-8: DEK NEED Demand Savings, Lighting Measures	24
Table 3-9: Inputs for Water Heating Measures Savings Calculations	25

Table 3-10: DEK NEED Gross Energy Savings, Water Heating Measures	26
Table 3-11: DEK NEED Gross Demand Savings, Water Heating Measures	26
Table 3-12: Inputs for Water Heating Measures Savings Calculations	27
Table 3-13: DEK NEED Gross Energy Savings, Air Infiltration Measures	27
Table 3-14: DEK NEED Gross Demand Savings, Air Infiltration Measures	28
Table 3-15: Targeted and Achieved Confidence and Precision	28
Table 3-16: Measure-Level Reported and Verified Gross Energy Savings	29
Table 3-17: Measure-Level Reported and Verified Demand Gross Savings	29
Table 3-18: 2014 - 2015 Energy Savings per Kit.....	29
Table 3-19: 2014 - 2015 Program Level Energy Savings	30
Table 4-1: Free Ridership Change Values.....	32
Table 4-2: Free Ridership Influence Values.....	33
Table 4-3: End-Use-Level Free Ridership Scores.....	34
Table 4-4: Net-to-Gross Results	35
Table 4-5: NTG of Similar Programs	35
Table 5-1: Summary of Process Evaluation Data Collection Activities	36
Table 5-2: DEK Student Family Survey Response Rates	37
Table 5-3: New Behaviors Adopted by Child Since Involvement in NEED (Multiple Responses Allowed; n=28)	43
Table 5-4: New Behaviors Adopted by Parent Since Involvement in NEED (Multiple Responses Allowed; n=28)	43
Table 5-5: Additional Energy Saving Measures Purchased (Multiple Responses Allowed; n=28)	44
Table 6-1: Program Year 2014-2015 Per Unit Verified Impacts by Measure – Key Measure Parameters B-1	

Equations

Equation 3-1: Lighting Measures Energy Savings	23
Equation 3-2: Lighting Measures Demand Savings.....	23
Equation 3-3: Aerator and Showerhead Energy Savings	25
Equation 3-4: Water Heater Setback Energy Savings	25
Equation 3-5: Water Heating Measures Demand Savings.....	25
Equation 3-6: Air Infiltration Energy Savings	27
Equation 3-7: Air Infiltration Demand Savings.....	27

1 Executive Summary

1.1 Program Summary

The National Energy Education Development (NEED) Project is an energy efficiency program sponsored by Duke Energy Kentucky (DEK). The program provides K-12 educators in DEK service territory with free workshops on grade-appropriate classroom activities about the science of energy and energy conservation. The program materials and activities correlate with National Science Education Standards and Kentucky Core Content and Program of Studies in science and other disciplines.

1.2 Evaluation Objectives and Results

This report presents the results and findings of evaluation activities for the NEED program conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Research into Action, for the program and school year of August 2014 through May 2015.

1.2.1 Impact Evaluation

The evaluation team conducted the evaluation of the NEED program to estimate energy and demand savings attributable to the 2014 – 2015 NEED program. The evaluation was divided into two research areas to determine gross and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant’s home that are the direct result of the homeowner’s installation of a measure included in the Duke Energy home kit. Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and funds. Table 1-1 and Table 1-2 present the summarized findings of the impact evaluation.

Table 1-1: 2014 - 2015 Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	116.3	164.5%	191.3	1.09	209.2
Demand (kW)	0.011	672.6%	0.073		0.079

Table 1-2: 2014 - 2015 Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	6,396	164.5%	10,524	1.09	11,505
Demand (kW)	0.59	672.6%	3.99		4.36

Figure 1-1 provides the verified energy saving share by measure, and Table 1-3 provides energy and demand savings by measure, along with net to gross ratio details.

Figure 1-1: 2014-2015 DEK NEED Gross Verified Energy Savings

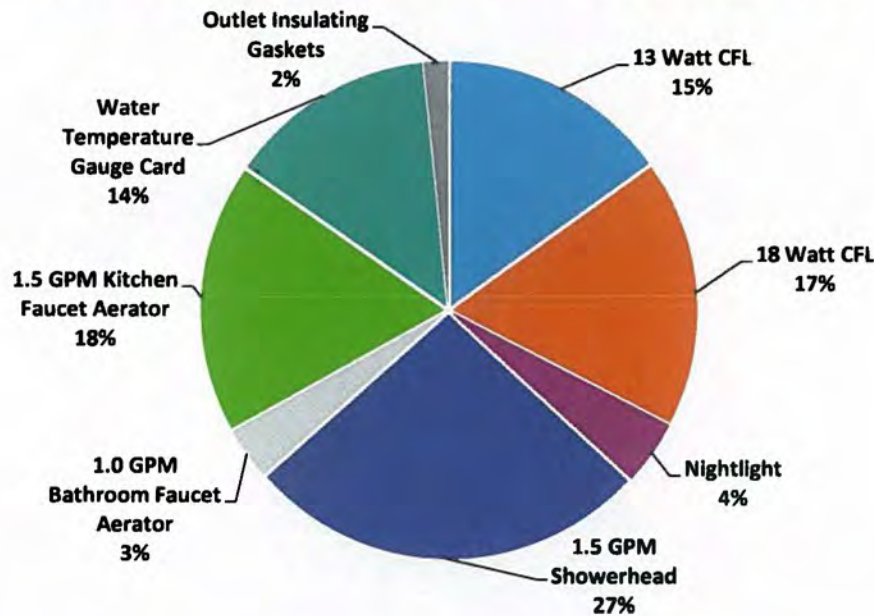


Table 1-3: DEK NEED Program Year 2014-2015 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio
13 Watt CFL	28.8	0.002	0.33	0.26	1.09
18 Watt CFL	33.6	0.003	0.33		
Nightlight	8.2	0.000	0.17		
1.5 GPM Showerhead	50.8	0.041	0.06		
1.0 GPM Bathroom Faucet Aerator	6.7	0.001	0.06		
1.5 GPM Kitchen Faucet Aerator	33.9	0.005	0.06		
Water Temperature Gauge Card	26.3	0.021	0.17		
Outlet Insulating Gaskets	3.1	0.000	0.17		

1.2.2 Process Evaluation

The process evaluation assessed opportunities for improving the design and delivery of the program in DEK service territory. It specifically documented teacher, student, and parent experiences by investigating: 1) teachers' assessments of the program materials, curriculum,

and kits in terms of ease of use, quality of content, and ability to engage and motivate students to save energy; and 2) student families' responses to the energy efficiency kits and the extent to which the kits effectively motivate families to save energy.

The evaluation team reviewed program documents and conducted telephone and web surveys with program participants (n=28). The team also conducted in-depth interviews with utility staff, the NEED trainer for Kentucky, and seven teachers who attended NEED workshops.

Program Successes

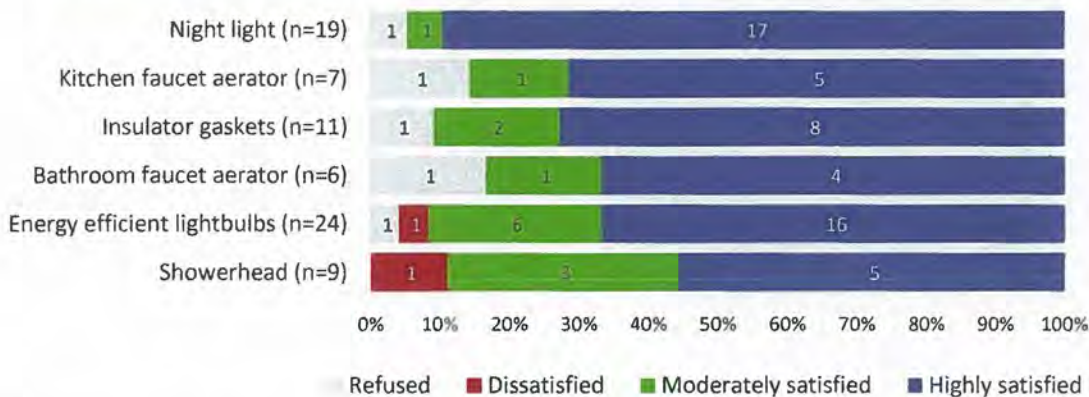
The 2014-2015 NEED program evaluation found successes in the following areas.

Teachers value the NEED workshops and incorporate NEED curriculum material into their classroom lessons. All interviewed teachers expressed that the NEED workshop met or exceeded their expectations, and all gave high scores on the clarity of the information presented. They also stated that there was nothing left out that should have been covered in the workshop and nothing covered unnecessarily. Both teachers and the NEED trainer indicated that workshop training had improved teachers' knowledge of the material and ability in teaching that material effectively.

The program influenced families to install kit measures and adopt new behaviors. Nearly all student families installed at least one measure from the energy efficiency kit and the vast majority of measures, once installed, remained installed. Student families were highly influenced by NEED to install kit measures, as demonstrated by low free ridership rates. Further, about half of respondents reported that they and/or their children adopted new energy saving behaviors since receiving their kit, and about one-third of respondents reported installing program-attributable spillover measures.

Satisfaction with the kit items varies. Respondents were most satisfied with the night light and kitchen faucet aerator and least satisfied with the compact fluorescent lamps CFLs and showerhead (Figure 1-2).

Figure 1-2: DEK NEED Recipient Satisfaction with Measures They Had Installed



NEED kits are reaching a good mix of consumer segments. Surveyed kit recipients had similar housing ownership rates and incomes to that of the service territory.

Program Challenges

Water measures had the lowest installation rates. Only 21% to 32% of student families initially installed any given water measure. When measure removal (uninstallation) is considered, the range is 18% to 32%.

Teachers’ perceived need to limit kit forms to one per family creates kit distribution barriers. All teachers reported needing to coordinate with other teachers to limit kit forms to one per family. Coordination involves asking other teachers whether another child in the same family received a kit and checking whether students received a kit in the past three years. This coordination barrier may be leading to lower than expected student family participation rates.

Several factors may limit distribution of kit forms by teachers. Interviews with the NEED trainer and workshop attendees revealed some factors that limit kit distribution:

- Teachers must distribute, collect, and submit the kit forms. This can be challenging as teachers are busy and they sometimes misplace the forms.
- Student families may receive only one kit every three years, but the NEED program’s long tenure and the fact that the National Theatre for Children (NTC) also routinely distributes kit forms at the schools that the NEED program serves creates a risk of distributing redundant kit forms, making teachers hesitant to distribute kit forms to students whose families may already have received them.

1.3 Evaluation Conclusions and Recommendations

Based on evaluation findings, the evaluation team concluded the following and provides several recommendations for program improvement.

Conclusion 1: Kit measures have varying levels of energy savings success. The lighting measures realized the highest installation rates and contributed over one third of the kit savings. Moreover, 74% of spillover savings were derived from participants purchasing additional Light Emitted Diode (LED) and CFL bulbs to complement the bulbs received in their kit. The low flow measures accounted for almost half of the kit savings (based primarily on installation of the shower head and kitchen aerator). While installation rates for these measures were among the lowest in the kit, participant responses indicated water savings benefits communicated through the program had influenced their behavior to conserve water and related water heating energy.

Recommendation: A review of the kit measure offerings should be made to assess and weight the benefits and costs of each measure including opportunity for energy savings, cost effectiveness, and education. Opportunities may exist to remove low performing measures and add new measure types or increase the quantity of existing measures that currently perform well such as lighting measures. However, careful review is needed before amending the kit measure mix to ensure it would not hinder the program's educational and behavioral impacts.

Conclusion 2: Water measures drive savings, but installations are low. One-quarter of surveyed kit recipients installed a kitchen faucet aerator or showerhead or adjusted water heater temperature based on the hot water temperature card in the kit. Fewer than one-fifth installed a bathroom faucet aerator. Despite these low installation rates, water measures account for almost two-thirds of gross program savings. Improving the installation rates could greatly increase the program savings.

Recommendation: Investigate opportunities to increase installation rates of water measures through focus group research (or comparable qualitative in-depth methods) to learn: 1) what types of aerators and showerheads customers use and like; and 2) whether emphasizing certain features of low-flow showerheads or aerators (for example, multiple spray settings) would entice customers to install low-flow products.

Conclusion 3: The NEED program is successfully influencing families to save energy in their homes. Several indicators support this conclusion. Nearly all student families installed at least one measure from the DEK kit and the vast majority of measures, once installed, stayed installed. Student families were highly influenced by the program to install these kit measures, as demonstrated by low free ridership rates. Families also reported installing program-attributable spillover measures and about half of respondents reported that they and/or their children adopted new energy saving behaviors (such as turning off equipment when not using it) since receiving the DEK kit.

Recommendation: Leverage the DEK kit to cross-promote other DEK rebate offerings to DEK customers who receive a kit. DEK customers requesting DEK kits are good targets for these promotions, as they:

- Demonstrated willingness to take energy saving actions in their home

- Are reading the energy saving information included in the kit
- Are predominantly single family home-owners

Conclusion 4: The kit distribution process is cumbersome for teachers. Because kits may be distributed in the same school by both the NEED and the alternative Energy Education in Schools program implementer, the National Theatre for Children (NTC), and sometimes in the same year, some confusion is caused among teachers which complicates the kit distribution process. Based on teacher feedback, it is not clear what impact this confusion has on overall (NEED or NTC) kit distribution as both implementers operating in the same school may bolster student interest in the kits but may also confuse some teachers on whose responsibility it is to ensure that students ask their parents to request the kits.

Recommendation: DEK may wish to consider one of two options: 1) ensure that the NEED and NTC programs operate in separate schools to make it possible to assess the effectiveness of the NEED kit distribution process (possibly having the added benefit of increasing the total number of schools affected); or 2) work with both NEED and NTC to develop an approach to coordinating their activities within schools so that teachers know the difference between the two programs and are completely clear on whose responsibility it is to carry out kit distribution in any given school.

Conclusion 5: Teachers use the classroom kit they receive in the NEED workshop, but replacement parts for that kit are difficult to find or expensive.

Recommendation: DEK might consider offering teachers a way to request and receive replacement parts for the classroom kit.

2 Introduction and Program Description

2.1 Program Description

2.1.1 Overview

The National Energy Education Development (NEED) Project is an energy efficiency program sponsored by Duke Energy Kentucky (DEK). The program provides K-12 educators in DEK service territory with free workshops on grade-appropriate classroom activities about the science of energy and energy conservation. The program materials and activities correlate with National Science Education Standards and Kentucky Core Content and Program of Studies in science and other disciplines.

In addition to classroom-based learning activities, NEED provides teachers with: 1) a take-home form that students and parents can complete to receive an energy efficiency starter kit (kit) from DEK; and 2) lesson plans associated with each measure in that kit. The NEED workshop trainers encourage teachers to distribute the kit form to their students.

The program can achieve energy savings in two ways:

1. Through the installation of specific energy efficiency measures provided in the kit.
2. By increasing students' and their families' awareness about energy conservation and engaging them to change behaviors to reduce energy consumption.

2.1.2 Energy Efficiency Kit Measures

Table 2-1 lists the kit's contents included in the evaluation scope (the kit includes additional educational items described in section 2.2.4 below).

Table 2-1: 2014-2015 Kit Measures

Measures	Details
13 Watt CFL	1 lamp
18 Watt CFL	1 lamp
Nightlight	1 LED plug-in nightlight
1.5 GPM Showerhead	1 low-flow showerhead
1.0 GPM Bathroom Faucet Aerator	1 low-flow faucet aerator
1.5 GPM Kitchen Faucet Aerator	1 low-flow kitchen aerator
Water Temperature Gauge Card	1 temperature card indicating water heat temperature
Outlet Insulating Gaskets	8 outlet and 4 light switch gaskets

2.2 Program Implementation

2.2.1 Workshop Recruitment

NEED staff contact schools and school district offices to recruit teachers to attend workshops. There is one NEED trainer designated for DEK service territory. When interviewed as part of this evaluation, she noted the program had no difficulty recruiting workshop attendees. She also noted that NEED had altered the contract with DEK to offer two rather than one workshop a year in Kentucky to meet high demand.

2.2.2 Topics and Materials Covered in the Workshop

In Kentucky, energy-related topics are tested in 4th, 7th, and 11th grade. In the workshops, the trainer reviews energy-related content for each grade and trains teachers on how to implement corresponding lesson plans in their classrooms. The trainer typically covers five topics in the workshops:

- Science of energy (forms of energy and energy transformation)
- Sources of energy (renewable and nonrenewable sources)
- Electricity and magnetism
- Energy of transportation
- Energy efficiency and conservation

The trainer also distributes a classroom kit to teachers. Teachers are eligible to receive this kit only if they attend a workshop. Please note that the classroom kit is different from the DEK kit (the kit distributed to student families); it includes materials teachers can use in the classroom to teach concepts on the science of energy.

2.2.3 DEK Kit Form Promotion and Distribution

In the workshop, the trainer explains to teachers that DEK sponsors the workshop and provides a kit with energy-saving measures that students and their families can install in their homes. The trainer also explains that NEED provides corresponding, measure-specific, "saving energy at home" lesson plans for teachers.

Teachers interested in distributing the kits hand out the DEK kit forms to their students. Students take the forms to their parents. Parents complete the forms, and the students bring back completed forms to the teachers. Teachers then send the forms to NEED and DEK for processing. The Process Flow Map in Appendix C outlines this process.

2.2.4 DEK Kit Eligibility

Student families can receive a DEK kit only once every 36 months. The kit contents will differ if a family is a DEK customer or not. DEK customers will receive a kit that includes: 1) a showerhead; 2) kitchen and bathroom faucet aerators; 3) water flow meter bag; 4) hot water temperature card; 5) two energy efficient bulbs; 6) a night light; 7) eight outlet and four socket gasket insulators; 8) Energy Savers booklet; 9) product information and instruction sheet; and

10) a glow ring toy. Families who are not DEK customers will receive a smaller kit that includes: 1) a water flow meter bag; 2) hot water temperature card; 3) one efficient light bulb; 4) eight outlet gasket insulators; 5) Energy Savers booklet; and 6) a glow ring toy.

2.2.5 Participation

For the defined evaluation period of August 2014 through May 2015, the program recorded a total of 58 kit recipients. However, during survey recruitment, a fraction of participants notified Nexant that their kits never arrived. Based on this feedback, we estimated five percent of participants did not receive their kits and subsequently reduced the total verified participation for the evaluation period from 58 to 55 participants as illustrated in Table 2-2 below.

Table 2-2: DEK NEED Participation

	2014 participation	2015 participation	Estimated kits not received	Total
Kits	20	38	3	55

2.2.6 Program Goals

The NEED program did not exceed targets for participation and energy savings (Table 2-3).

Table 2-3: 2014 - 2015 DEK NEED Filed Targets

Measurement	Filed Target	Achievement
Participation	113	55

2.3 Key Research Objectives

Over-arching project goals will follow the definition of impact evaluation established in the “Model Energy-Efficiency Program Impact Evaluation Guide – A Resource of the National Action Plan for Energy Efficiency,” November 2007:

“Evaluation is the process of determining and documenting the results, benefits, and lessons learned from an energy-efficiency program. Evaluation results can be used in planning future programs and determining the value and potential of a portfolio of energy-efficiency programs in an integrated resource planning process. It can also be used in retrospectively determining the performance (and resulting payments, incentives, or penalties) of contractors and administrators responsible for implementing efficiency programs.”

Evaluation has two key objectives:

- 1) To document and measure the effects of a program and determine whether it met its goals with respect to being a reliable energy resource.
- 2) To help understand why those effects occurred and identify ways to improve.

2.3.1 Impact

As part of evaluation planning, the evaluation team outlined the following activities to assess the impacts of the NEED program:

- Quantify accurate and supportable energy (kWh) and demand (kW) savings for energy efficient measures implemented in participants' homes¹;
- Assess the rate of free riders from the participants' perspective and determine spillover effects;
- Benchmark verified measure level energy impacts to applicable technical reference manual(s) and other Duke similar programs in other jurisdictions.

2.3.2 Process

The process evaluation assessed opportunities for improving the design and delivery of the program in DEK service territory. It specifically documented teacher, student, and parent experiences by investigating: 1) teachers' assessments of the program materials, curriculum, and kits in terms of ease of use, quality of content, and ability to engage and motivate students to save energy; and 2) student families' responses to the energy efficiency kits and the extent to which the kits effectively motivate families to save energy.

The evaluation team assessed several elements of the program delivery and customer experience, including:

- **Awareness:**
 - How aware are teachers and student families of the DEK sponsorship of the program?
 - Is there a need to increase this awareness?
- **Program experience and satisfaction:**
 - How satisfied are teachers with the overall program, program curriculum, and energy efficiency kits in terms of ease of use (if applicable) and ability to engage and motivate students to conserve energy at home?
 - How satisfied are student families with the measures in the kit?
- **Challenges and opportunities for improvement:**
 - Are there any inefficiencies or challenges associated with program delivery?
 - How engaged are teachers in implementing the curriculum and motivating student families to request program kits?
 - What are teachers' assessments of the training workshop, program information, and curriculum?

¹ Due to the very small program population, savings associated with behavioral impacts could not be estimated with a reasonable standard error and are therefore not included in the impact evaluation.

- **Student family characteristics:**
 - What are the demographic characteristics of kit recipients?
 - What are the demographic characteristics of those who installed measures from the kit?

2.4 Evaluation Overview

The evaluation team divided its approach into key tasks to meet the goals outlined:

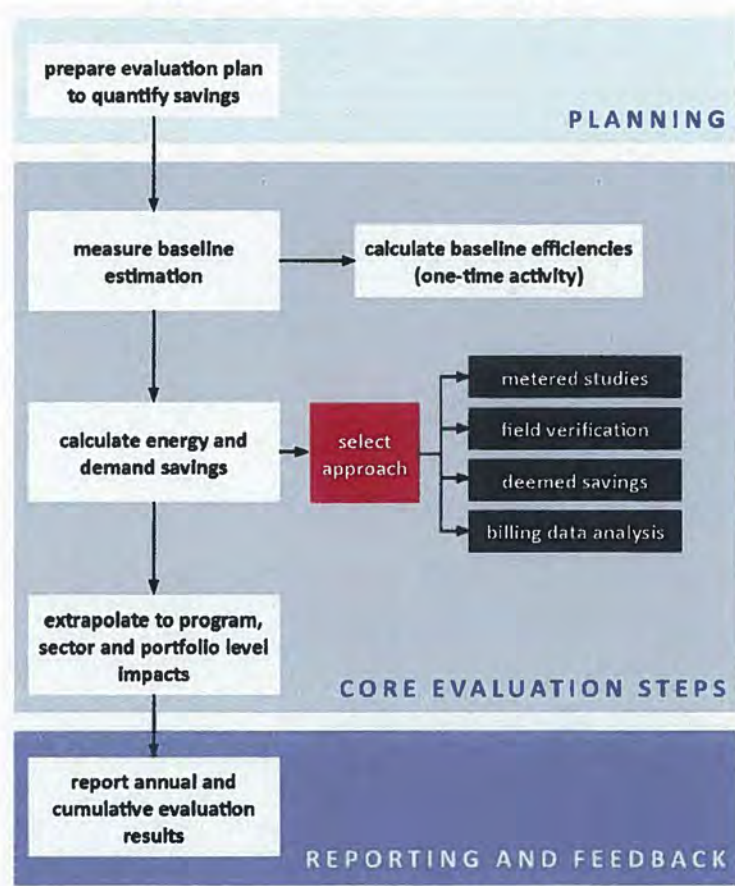
- **Task 1** – Develop and manage evaluation work plan to describe the processes that will be followed to complete the evaluation tasks outlined in this project;
- **Task 2** – Conduct a process review to determine how successfully the programs are being delivered to participants and identify opportunities for improvement;
- **Task 3** – Verify gross and net energy and peak demand savings resulting from the NEED program through verification activities of a sample of 2014-2015 program participants.

2.4.1 Impact Evaluation

The primary determinants of impact evaluation costs are the sample size and the level of rigor employed in collecting the data used in the impact analysis. The accuracy of the study findings is in turn dependent on these parameters. Techniques that we used to conduct our evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, included telephone and web-based surveys with program participants, best practice review, and interviews with implementation and program staff.

Figure 2-1 demonstrates the principal evaluation team steps organized through planning, core evaluation activities, and final reporting.

Figure 2-1: Impact Evaluation Process



The evaluation generally comprised the following steps, which are described in further detail throughout this report:

- **Participant Surveys:** The file review for all sampled and reviewed program participation concluded with a telephone and web-based survey with the participating families. Table 2-4, in Section 2.4.3 below summarizes the number of surveys and on-site inspections completed. The samples were drawn to meet a 90% confidence and 10% precision level based upon the expected and actual significance (or magnitude) of program participation, the level of certainty of savings, and the variety of measures.
- **Calculate Impacts and Analyze Load Shapes:** Data collected via surveys enabled the evaluation team to calculate gross verified energy and demand savings for each measure.
- **Estimate Net Savings:** Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and incentives. The evaluation team estimated free-ridership and spillover based on self-report methods through surveys with program participants. The ratio of net verified savings to gross verified savings is the net-to-gross ratio as an adjustment factor to the reported savings.

2.4.2 Process Evaluation

Process evaluation examines and documents:

- Program operations
- Stakeholder satisfaction
- Opportunities to improve the efficiency and effectiveness of program delivery

This feedback can inform program planning, design, and implementation. It provides insights pertaining to all aspects of a program, including operations, marketing and outreach, data tracking, quality assurance, customer and stakeholder feedback, and market conditions.

Evaluators may use some combination of the following activities:

- Database and document review
- Interviews with program staff and key stakeholders, such as trade allies
- Surveys with customers
- Benchmarking research
- Marketing review

2.4.3 Summary of Activities

To satisfy the evaluation, measurement, and verification (EM&V) objectives for this research effort, the evaluation team reviewed program documents and conducted telephone and web surveys with program participants. Because the participation over the evaluation period was very low (N=55), we expanded the sample frame to include a wider participation timeframe. By extending the participation timeframe from February 2014 through December 2015 (as opposed to the evaluation timeframe of August 2014 – May 2015), the sample frame of available participants to contact increased from 55 to 158. In order to increase the probability of completing a statistically significant number of participant surveys, we ultimately used this larger sample frame to collect our data.

The team also held in-depth interviews (IDI) with utility staff, the NEED trainer for Kentucky, and teachers. Table 2-4 provides a summary of the activities the evaluation team conducted as part of the DEK NEED program process and impact evaluation.

Table 2-4: DEK NEED Summary of Evaluation Activities

Target Group	2014-2015 Survey Population ¹	Sample	Confidence /Precision	Method
Impact Activities				
Participants	158	28	90/14.5	Telephone/Web Survey
Process Activities				
Participants – student families who received a kit and are DEK customers	158	28	90/14.5	Telephone/Web Survey
Teachers who attended a NEED workshop	73	7	n/a	In-Depth Interview (IDI)
DEK Program Staff	1	1	n/a	IDI
Implementer (NEED) Staff	1	1	n/a	IDI

¹Due to the small program year population (N=55), the evaluation team expanded the sample frame to include all participation from February 2014 through December 2015.

3 Impact Evaluation

3.1 Methodology

The evaluation team's impact analysis focused on the energy and demand savings attributable to the 2014 – 2015 NEED program. The evaluation was divided into two research areas to determine gross and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant's home that are the direct result of the homeowner's installation of a measure included in the program-provided energy saving kit. Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and funds. The evaluation team verified energy and demand savings attributable to the program by conducting the following impact evaluation activities:

- Review of DEK database
- Completion of telephone and web-based surveys to verify key inputs into savings calculations
- Estimation of gross verified savings using data collected in previous tasks
- Comparison of the gross-verified savings to 2008 program-evaluated results to determine kit and measure level realization rates
- Application of attribution survey data to estimate net-to-gross ratios and net-verified savings at the program level

3.2 Database and Historical Evaluation Review

DEK provided the evaluation team with a program database for the NEED program for all participation from August 1, 2014 through May 31, 2015. The program database provided participant contact information including account number, address, phone number, and email address, if available, and whether or not the participant was willing to be contacted. Because DEK was able to provide both phone numbers and email addresses, we were able to design a sampling approach that could take advantage of both phone and web-based surveying.

The NEED program's previous evaluation was conducted in 2008², which then became the basis for reported or ex-ante energy and demand savings. DEK's reported savings are representative of the kit as a whole as opposed to individual measures. Additionally, the reported kit value is the 2008 verified net lifetime levelized energy savings. Because neither DEK nor the 2008 evaluation report provided measure-level savings, the evaluation used the measure life and first year savings provided in the 2008 evaluation to estimate the reported per unit savings for each measure. These values are listed below in Table 3-1.

² Energy Impact Evaluation of the NEED Program in Kentucky. TecMarket Works, September 15, 2008.

Table 3-1: DEK NEED 2008 Evaluation Reported Per Unit Energy Savings

Measure	kWh	kW
13 Watt CFL	50.8	0.002
18 Watt CFL	N/A	N/A
Nightlight	N/A	N/A
1.5 GPM Showerhead	50.3	0.006
1.0 GPM Bathroom Faucet Aerator	2.9	< 0.001
1.5 GPM Kitchen Faucet Aerator	2.4	< 0.001
Water Temperature Gauge Card	N/A	N/A
Outlet Insulating Gaskets	9.9	0.003
Total	116.3	0.011

Having calculated the reported measure-level savings, the evaluation team could estimate measure-level realization rates. The kit provided to participants in 2008 only contained five of the eight currently offered measures (13W CFL, showerhead, bathroom aerator, kitchen aerator, and outlet gaskets). Therefore, the remaining three measures (18W CFL, nightlight, and water heater temperature card) have no reported savings, and as such have an assumed measure-level realization rate of 100%.

In addition to program savings, the evaluation team reviewed the uncertainty of deemed savings estimates to past evaluations, other impact evaluations, and multiple technical reference manuals. The details of the uncertainty analysis are referenced in Table 3-2.

Table 3-2: Comparison of Ex-Ante DEK NEED Energy Savings (kWh) to Peer Group Estimates

Measure	Kentucky NEED 2008	Ohio 2010 TRM	Indiana 2012 TRM	Illinois 2015 TRM	Pennsylvania 2016 TRM
13 Watt CFL	50.8	40.4	37.6	15.4	25.0
18 Watt CFL	N/A	56.0	52.1	17.9	29.1
Nightlight	N/A	N/A	13.6	N/A	29.5
1.5 GPM Showerhead	50.3	198.6	71.6	328.0	167.7
1.0 GPM Bathroom Faucet Aerator	2.9	20.2	22.4	21.7	10.4
1.5 GPM Kitchen Faucet Aerator	2.4	11.8	22.4	130.7	83.9
Water Temperature Gauge Card	N/A	N/A	N/A	N/A	N/A
Outlet Insulating Gaskets	9.9	N/A	N/A	N/A	N/A

3.3 Sampling Plan and Achievement

To provide representative results and meet program evaluation goals, a sampling plan was created to guide all evaluation activity. A random sample was created to target 90/10 confidence and precision at the program level, assuming a coefficient of variation (C_v) equal to 0.5. After reviewing the program database, the evaluation team identified a population of 58 participants within our defined evaluation period of which only 45 participants were willing to be contacted. Anticipating that such a small sample frame would make survey recruiting difficult, we chose to expand our sample frame for survey recruiting purposes to February 1, 2014 through December 31, 2015. This sample frame expansion resulted in 208 participants of which 158 total were available for recruitment.

Based on a sample frame of 158 participants, the evaluation team established sub-sample frames for phone and web-based survey administration. As illustrated in Table 3-3 below, we completed a total of 28 surveys. This sample size resulted in an achieved confidence and precision of 90/14.5.

Table 3-3: DEK NEED Impact Sampling

Survey Mode	Population	Sampled Participants	Achieved Confidence/ Precisions
Phone	85	21	90/14.5
Web-based	73	7	
Total	158	28	

3.4 Description of Analysis

3.4.1 Telephone and web-based surveys

The evaluation team performed telephone and web-based surveys to gain key pieces of information used in the savings calculations. Results of the 28 completed surveys were used to inform our program-wide assumptions as detailed in Table 3-4.

Table 3-4: Data Collected and Used for Analysis

Measure	Data Collected	Assumption
13 Watt CFL	Units Installed	In-Service Rate
18 Watt CFL	Units Later Removed	
Nightlight	Original Lamp Removed	Baseline Wattage
1.5 GPM Showerhead	Units Installed	In-Service Rate
1.0 GPM Bathroom Faucet Aerator	Units Later Removed	
1.5 GPM Kitchen Faucet Aerator	Hot Water Fuel Type	% Electric DHW

Measure	Data Collected	Assumption
Water Temperature Gauge Card	Gage Cards Used	In-Service Rate
	Thermostats Reverted	
	Hot Water Fuel Type	% Electric DHW
Outlet Insulating Gaskets	Units Installed	In-Service Rate
	Units Later Removed	

3.4.2 In-Service Rate

The in-service rate (ISR) represents the ratio of equipment installed and operable to the total pieces of equipment distributed and eligible for installation. For example, if 15 telephone surveys were completed for customers receiving 1 CFL each, and five customers reported to still have the CFL installed and operable, the ISR for this measure would be five out of 15 or 33%. In some instances equipment was installed but may have been removed later due to homeowner preferences. In these cases the equipment is no longer operable and therefore contributes negatively to the ISR. In-service rates for each measure from all 28 eligible survey respondents are detailed in Table 3-5.

Table 3-5: DEK NEED In-Service Rates

Measure	Distributed	Installed	Removed	ISR
13 Watt CFL	28	22.5	2	73%
18 Watt CFL	28	22.5	2	73%
Nightlight	28	19	1	64%
1.5 GPM Showerhead	28	9	2	25%
1.0 GPM Bathroom Faucet Aerator	28	6	1	18%
1.5 GPM Kitchen Faucet Aerator	28	7	0	25%
Water Temperature Gauge Card	28	7	0	25%
Outlet Insulating Gaskets ¹	336	74	0	22%

1. Note that 12 outlet insulating gaskets were included in each kit. Nexant calculated the ISR based on the total count of equipment distributed and installed.

For brevity and ease of use, the survey tool often asked customers about the two CFL measures in one question, which required the evaluation to make predictive assumptions when calculating the ISR. Specifically, the survey asked respondents how many energy efficient bulbs were installed.³

³ In the event that the respondent only installed one bulb, they were asked the wattage of the installed bulb as a follow-up question. Out of 28 survey respondents, 21 people installed both lamps. However, two respondents claimed to have only installed one bulb, and neither respondent could identify the wattage of the bulb in question. In calculating the ISR for these two customers, Nexant assigned a value of 0.5 to the quantity installed for both the 13W and 18W bulbs. One remaining respondent claimed they did not know if they had installed any of the energy efficient lamps. Nexant treated this similarly, assuming they would have installed one lamp, the wattage of which was unknown. In total, this equates to installation of one and a half 13W bulbs and one and a half 18W bulbs across these three customers, which was then added to the 21 customers who definitively installed both bulbs for a total of 22.5 installed lamps.

3.4.3 Lighting

The three lighting measures in the kit include a 13W CFL, an 18W CFL, and an LED nightlight. Equation 3-1 and Equation 3-2 outline the algorithms utilized to estimate savings accrued by the lighting measures, with key parameters defined in Table 3-6.

Equation 3-1: Lighting Measures Energy Savings

$$\Delta kWh = \frac{Watts_{BASE} - Watts_{EE}}{1000 \frac{W}{kW}} \times HOU \times (1 + IE_{kWh}) \times 365.25 \frac{days}{year} \times ISR$$

Equation 3-2: Lighting Measures Demand Savings

$$\Delta kW = \frac{Watts_{BASE} - Watts_{EE}}{1000 \frac{W}{kW}} \times CF \times (1 + IE_{kW}) \times ISR$$

Table 3-6: Inputs for Lighting Measures Savings Calculations

Input	Units	Value	Source
Watts _{BASE}	Watts	CFL: 43 or 53 Nightlight: 3.1	CFL: Federal minimum standards Nightlight: Survey responses
Watts _{EE}	Watts	CFL: 13 or 18 Nightlight: 0.03	Equipment specifications
HOU	Hours	CFL: 3.4 Nightlight: 12	2012 DEK ENERGY STAR Products evaluation ¹ ; Tennessee Valley Authority 2016 TRM; Survey responses; Equipment specifications
CF	Unitless	CFL: 0.11 Nightlight: 0.00	Indiana 2013 Statewide TRM
IE _{kWh}	Unitless	-6%	Indiana 2013 Statewide TRM
IE _{kW}	Unitless	+6%	Indiana 2013 Statewide TRM
ISR	Unitless	CFL: 73% Nightlight: 64%	Survey responses

¹Process and Impact Evaluation of the Energy Star Products (CFLs) Program in Kentucky. Prepared for Duke Energy. September 28, 2012

The evaluation team paid careful attention to the effects of the Energy Independence and Security Act (EISA), which mandated higher-efficiency technologies for incandescent bulbs. In the analysis of CFL bulbs, the evaluation team opted to replace the participant-reported baseline wattage with the EISA-compliant bulb that would produce the same lumen output. This resulted in the use of a 53W baseline for 18W CFLs and a 43W baseline for 13W CFLs. Nightlights, however, are not affected by EISA, and as such were evaluated using a baseline wattage dependent on what the participant specified as the removed lamp.

Hours of use (HOU) for CFL lighting was based on participant survey responses dictating the

location (room) of the new CFLs and primarily estimated HOU values by room based on the DEK 2012 ENERGY STAR® Products evaluation report. For a small portion of rooms that the evaluation report did not have data for, we used the assumed HOU values provided by the Tennessee Valley Authority's 2016 TRM.

Using the engineering algorithm and assumptions described above, we determined the gross energy and demand savings value for each lighting measure provided in the kit as summarized in Table 3-7 and

Table 3-8. The differences between reported and gross savings estimates primarily resulted from lower hours of use than those assumed in the reported savings value as well as different baselines as the reported savings value reflects a pre-EISA baseline.

Table 3-7: DEK NEED Energy Savings, Lighting Measures

Kit Measure	Reported per unit energy savings (kWh)	Realization rate	Gross per unit energy savings (kWh)
13W CFL	50.8	56.7%	28.8
18W CFL	N/A ¹	100.0%	33.6
Nightlight	N/A ¹	100.0%	8.2

¹ 18W CFL and nightlight measures were not offered in the previously evaluated program year and therefore no reported savings for these measures are available.

Table 3-8: DEK NEED Demand Savings, Lighting Measures

Kit Measure	Reported per unit demand savings (kW)	Realization rate	Gross per unit demand savings (kW)
13W CFL	0.002	98.1%	0.002
18W CFL	N/A	N/A	0.003
Nightlight	N/A	N/A	0.000

3.4.4 Water Heating

The four water heating measures in the kit include a low-flow kitchen faucet aerator, a low-flow bathroom faucet aerator, a low-flow showerhead, and a water temperature gauge card which encouraged participants to set back their hot water heater thermostats. Equation 3-3, Equation 3-4, and Equation 3-5 outline the algorithms utilized to estimate savings accrued by the domestic water heating measures with parameters defined in Table 3-9.

Equation 3-3: Aerator and Showerhead Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365 \frac{days}{year} \times DF \times \Delta T \times 8.3 \frac{BTU}{gal \cdot ^\circ F}}{\#faucets \times 3,412 \frac{BTU}{kWh} \times RE} \right]$$

Equation 3-4: Water Heater Setback Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{A_{tank} \times \Delta T \times 8760 \frac{hrs}{yr}}{R_{tank} \times RE \times 3,412 \frac{BTU}{kWh}} + \frac{V_{HW} \times \left(8.3 \frac{lb}{gal}\right) \times \left(365 \frac{days}{yr}\right) \times \left(1 \frac{BTU}{F \cdot lb}\right) \times \Delta T}{\left(3412 \frac{BTU}{kWh}\right) \times EF_{WH}} \right]$$

Equation 3-5: Water Heating Measures Demand Savings

$$\Delta kW = E T D F \times \Delta kWh$$

Table 3-9: Inputs for Water Heating Measures Savings Calculations

Input	Units	Value	Source
ISR	N/A	Bath: 18% Kitchen: 25% Shower: 25% Setback: 25%	Survey responses
ELEC	N/A	Bath: 60% Kitchen: 71% Shower: 57% Setback: 48%	Survey responses
ΔGPM	GPM	Bath: 1.2 Kitchen: 0.7 Shower: 1.0	Product specification sheet compared against federal code minimum
T _{person/day}	Minutes	Bath: 1.6 Kitchen: 4.5 Shower: 4.7	Pennsylvania 2016 TRM
N _{persons}	Persons	4	Survey responses
DF	N/A	Bath: 90% Kitchen: 75% Shower: 100%	Pennsylvania 2016 TRM
ΔT	°F	Bath: 22.2 Kitchen: 22.2 Shower: 43.2 Setback: 15.0	Indiana 2013 TRM and Ohio 2010 TRM compared against groundwater temperature map
#faucets	Units	Bath: 2.2 Kitchen: 1.0 Shower: 2.1	Bathroom: 2013 Kentucky RASS Data Kitchen: Pennsylvania 2016 TRM Showerhead: DeOreo, 2011
RE	N/A	98%	Pennsylvania 2016 TRM
A _{tank}	Ft ²	24.99	Pennsylvania 2016 TRM

SECTION 3

IMPACT EVALUATION

Input	Units	Value	Source
R_{tank}	°F·ft ² ·hr/BTU	8.3	Pennsylvania 2016 TRM
V_{HW}	GPD	7.3	Pennsylvania 2016 TRM
EF_{WH}	N/A	0.904	Pennsylvania 2016 TRM

Nexant determined that the 2016 Pennsylvania’s TRM provided the most applicable and rigorous algorithm by including factors such as standby losses and water volume savings, differentiating between kitchen and bathroom water use, and more comprehensive algorithms. Therefore, the evaluation team elected to use the Pennsylvania TRM as the secondary data source for estimating savings for these measures.

Using the applicable engineering algorithm and assumptions described above, the gross energy and demand savings value were estimated for each domestic hot water measure provided in the kit as summarized in Table 3-10 and Table 3-11. The differences between reported and verified gross energy savings estimates are primarily due to conservative estimates from the 2008 DEK NEED evaluation.

Table 3-10: DEK NEED Gross Energy Savings, Water Heating Measures

Kit Measure	Reported per unit energy savings (kWh)	Realization rate	Gross per unit energy savings (kWh)
1.5 GPM Showerhead	50.3	101.1%	50.8
1.0 GPM Bathroom Faucet Aerator	2.9	229.4%	6.7
1.5 GPM Kitchen Faucet Aerator	2.4	1391.1%	33.9
Water Temperature Gauge Card	N/A	100.0%	26.3

Table 3-11: DEK NEED Gross Demand Savings, Water Heating Measures

Kit Measure	Reported per unit energy savings (kW)	Realization rate	Gross per unit energy savings (kW)
1.5 GPM Showerhead	0.01	739.0%	0.041
1.0 GPM Bathroom Faucet Aerator	0.00	N/A	0.001
1.5 GPM Kitchen Faucet Aerator	0.00	N/A	0.005
Water Temperature Gauge Card	N/A	100.0%	0.021

After reviewing the 2008 evaluation final report, which served as the basis for the reported savings, the evaluation team was unable to fully identify the source of the large variance as specific assumptions, most importantly the daily hot water consumption, were not defined in the

prior evaluation report.

3.4.5 Air Infiltration

Equation 3-6 and Equation 3-7 outline the algorithms utilized to estimate savings accrued by the outlet insulating gaskets. The parameters are defined in Table 3-12.

Equation 3-6: Air Infiltration Energy Savings

$$\Delta kWh = ISR \times \frac{\Delta CFM}{home} \times \frac{kWh}{CFM}$$

Equation 3-7: Air Infiltration Demand Savings

$$\Delta kW = \frac{\Delta kWh}{8,760}$$

Table 3-12: Inputs for Water Heating Measures Savings Calculations

Input	Units	Value	Source
ISR	N/A	22%	Survey responses
$\Delta CFM/home$	CFM	0.69	2008 DEK NEED Evaluation Final Report
kWh/CFM	kWh/CFM	20.29	2013 Duke Energy RASS Data, 2008 DEK NEED Evaluation Final Report

In estimating the impacts of the outlet gaskets, the analysis relied on two key parameters detailed in the 2008 program evaluation. The analysis used the prior evaluation's estimated reduction in infiltration as a factor of cubic feet per minute (cfm) due to the installation of a gasket of 0.69 cfm. We also considered the prior evaluation's modeled energy savings for reduced infiltration and calibrated the savings value based on the saturation of heating and cooling equipment technologies reported in Duke Energy's 2013 Kentucky residential appliance saturation study to ensure the savings value represented the NEED program participants.

Using the engineering algorithm described above, we determined the gross energy and demand savings value for outlet insulating gaskets provided in the kit as summarized in Table 3-13 and Table 3-14. The differences between reported and gross savings estimates primarily resulted from the evaluation team's lower ISR finding as well as from the difference in calculation methodology described in Section 3.2 whereby the evaluation uses a first-year savings approach as opposed to a levelized net lifetime savings approach.

Table 3-13: DEK NEED Gross Energy Savings, Air Infiltration Measures

Kit Measure	Reported per unit energy savings (kWh)	Realization rate	Gross per unit energy savings (kWh)
Outlet Gaskets	9.9	31.3%	3.1

Table 3-14: DEK NEED Gross Demand Savings, Air Infiltration Measures

Kit Measure	Reported per unit energy savings (kW)	Realization rate	Gross per unit energy savings (kW)
Outlet Gaskets	0.003	12.3%	0.000

3.5 Targeted and Achieved Confidence and Precision

We developed the NEED evaluation plan with the goal of achieving a target of 10% relative precision at the 90% confidence interval for the program as a whole. However, as noted earlier in 3.3, the very small program participation limited our ability to achieve this level of sampling precision as due to survey recruitment limitations. As a result, the evaluation team's reported confidence and precision for the program is +/- 14.5% at the 90% confidence level (Table 3-15)

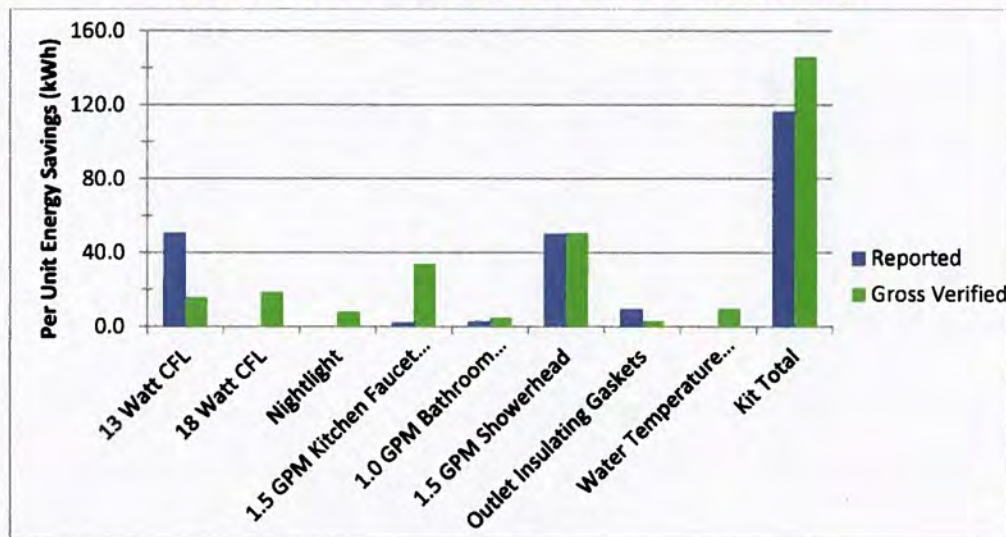
Table 3-15: Targeted and Achieved Confidence and Precision

Program	Targeted Confidence/Precision	Achieved Confidence/Precision
DEK NEED	90/10.0	90/14.5

3.6 Results

Measure level energy savings values are detailed in Figure 3-1 and Table 3-16.

Figure 3-1: DEK NEED Program Per Unit Energy Savings



SECTION 3

IMPACT EVALUATION

Table 3-16: Measure-Level Reported and Verified Gross Energy Savings

Measure	Reported Energy Savings, per unit (kWh)	Realization Rate	Verified Energy Savings, per unit (kWh)	Total Energy Savings (kWh)
CFL (13W)	50.8	57%	28.8	1,583.4
CFL (18W)	N/A	100%	33.6	1,847.3
Nightlight	N/A	100%	8.2	449.8
Low-flow Showerhead	50.3	101%	50.8	2,794.6
Low-flow Bath. Aerator	2.9	229%	6.7	368.3
Low-flow Kitch. Aerator	2.4	1,391%	33.9	1,866.8
Water Heater Setback	N/A	100%	26.3	1,443.8
Outlet Gaskets	9.9	31%	3.1	169.6
Total	116.3	165%	191.3	10,523.7

The increase in program level energy savings is connected to a high realization rate (165%), which is due in part to the fact that three additional measures were added to the kit since the reported values from the 2008 kit.

Table 3-17: Measure-Level Reported and Verified Demand Gross Savings

Measure	Reported Demand Savings, per unit (kW)	Realization Rate	Verified Demand Savings, per unit (kW)	Total Demand Savings (kW)
CFL (13W)	0.002	98%	0.002	0.1
CFL (18W)	N/A	100%	0.003	0.1
Nightlight	N/A	100%	< 0.01	0.0
Low-flow Showerhead	0.01	739%	0.041	2.2
Low-flow Bath. Aerator	< 0.01	N/A	0.001	< 0.1
Low-flow Kitchen. Aerator	< 0.01	N/A	0.005	0.2
Water Heater Setback	N/A	100%	0.021	1.2
Outlet Gaskets	< 0.01	12%	< 0.01	< 0.1
Total	0.01	673%	0.073	4.0

The impact evaluation for the 2014 - 2015 program resulted in a program energy realization rate of 165% and a demand realization rate of 673% as presented in Table 3-18.

Table 3-18: 2014 - 2015 Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	116.3	164.5%	191.3	1.09	209.2
Demand (kW)	0.011	672.6%	0.073		0.079

Table 3-19 presents the reported and verified energy and demand savings for the 2014 – 2015 program year.

Table 3-19: 2014 - 2015 Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	6,396	164.5%	10,524	1.09	11,505
Demand (kW)	0.59	672.6%	3.99		4.36

4 Net-to-Gross Methodology and Results

The evaluation team used student family survey data to calculate a net-to-gross (NTG) ratio for the NEED program. NTG reflects the effects of free ridership (FR) and spillover (SO) on gross savings. Free ridership refers to the portion of energy savings that participants would have achieved in the absence of the program through their own initiatives and expenditures ((U.S. DOE, 2014).⁴ Spillover refers to the program-induced adoption of additional energy-saving measures by participants who did not receive financial incentives or technical assistance for the additional measures installed (EPA, 2007). The evaluation team used the following formula to calculate the NTG ratio:

$$NTG = 1 - FR + SO$$

The evaluation team calculated mean FR separately for water end-use measures and light bulbs, and aggregated those values to the program level. The team calculated spillover at the program level only.

4.1 Free Ridership

Free ridership estimates how much the program influenced participants to install the energy-saving items included in the energy efficiency kit. Free ridership ranges from 0 to 1, 0 being no free ridership and 1 being total free ridership, with values in between representing varying degrees of partial free ridership.

The evaluation team used participant survey data to estimate free ridership. The survey used several questions to identify items that a given participant installed and did not later uninstall:

- For items that came one to a kit (showerhead, kitchen and bathroom faucet aerators, and night light), the survey asked whether the participant installed the item and, if so, whether the participant later uninstalled the item.
- For insulator gaskets, which came 12 to a kit, the survey asked how many the participant installed and if the participant later uninstalled them.
- For the CFLs (one 13W CFL and one 18W CFL), the survey first asked whether the participant installed one, both, or neither. If they installed only one CFL, the survey asked respondents to specify whether it was the 13W or 18W. The survey then asked whether the participant uninstalled the bulbs.

⁴The U.S. Department of Energy (DOE) (2014). *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 23: Estimating Net Savings: Common Practices*. Retrieved August 29, 2016 from http://energy.gov/sites/prod/files/2015/02/f19/UIMPChapter23-estimating-net-savings_0.pdf.

The evaluation team’s methodology for calculating free ridership consists of two components, free ridership change (FRC) and free ridership influence (FRI), both of which range from 0 to .5 in value.

$$FR = FRC + FRI$$

4.1.1 Free Ridership Change

FRC reflects what participants reported they would have done if the program had not provided the items in the kit. For each respondent, the survey assessed FRC for each measure that the respondent installed and did not later uninstall.

Specifically, the survey asked respondents which, if any, of the currently installed items they would have purchased and installed on their own within the next year if DEK had not provided them. For each measure, the evaluation team assigned one of the FRC values shown in the Table 4-1, based on the respondents’ responses.

Table 4-1: Free Ridership Change Values

What Respondent Would Have Done Absent the Program*	FRC Value
Would not have purchased and installed the item within the next year	0.00
Would have purchased and installed the item within the next year	0.50
Don't know	0.25

*Survey response to: If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

4.1.2 Free Ridership Influence

FRI assesses how much influence the program had on a participant’s decision to install (and keep installed) the items in the kit. The survey asked respondents to rate how much influence five program-related factors had on their respective decisions to install the measures, using a scale from 0 (“not at all influential”) to 10 (“extremely influential”). The program-related factors included:⁵

- The fact that the items were free
- The fact that the items were sent to their home
- Information in the kit about how the items would save energy
- Information that their child brought home from school
- Other information or advertisements from DEK, including its website

Asking respondents to separately rate the influence of each of the five above items had on the decision to install each measure would have been overly burdensome. Therefore, while the

⁵ To reduce response fatigue, we only asked respondents to rate program influence on their decision to install: a) efficient light bulbs (as a whole), and b) water saving measures (as a whole). Thus, we did not collect separate influence data for each CFL (13W and 18W) nor for each water saving measure (showerhead, bathroom aerator, and kitchen aerator).

survey assessed FRC for each measure, it assessed influence at the end-use level once for all water-saving measures and once for the light bulbs.

For each end-use (water-saving and light bulbs), the highest-rated item for each respondent represents the overall program influence. The evaluation team assigned the following FRI scores, based on that rating (Table 4-2). The evaluation team calculated up to two FRI scores for each respondent: one FRI score for water-saving measures and one FRI score for light bulbs.⁶

Table 4-2: Free Ridership Influence Values

Highest Influence Rating	FRI Value
0	0.50
1	0.45
2	0.40
3	0.35
4	0.30
5	0.25
6	0.20
7	0.15
8	0.10
9	0.05
10	0.00

4.1.3 End-Use-Specific Total Free Ridership

The evaluation team calculated total free ridership by end use, once for water saving measures and once for light bulbs, by:

- Calculating measure-specific FR scores for each respondent by summing each measure-specific FRC score with the corresponding end-use-specific FRI score.
- Calculating the mean FR score for each measure from the individual measure-specific FR scores.
- Calculating a savings-weighted mean of the measure-specific FR means for water-saving measures and a separate savings-weighted mean of the measure-specific FR means for light bulbs. These two savings-weighted means represent the FR estimates for the two end-uses.

Table 4-3 presents the end-use FR estimates.

⁶ Respondents were only asked to rate program influence on end-uses they installed and did not later uninstall. Thus, if a respondent installed both a showerhead and a light bulb, but later uninstalled the light bulb, the evaluation team only asked them to rate program influence on their decision to install the showerhead. Thus in this example, the evaluation team would only calculate a water end-use FRI score for this respondent.

Table 4-3: End-Use-Level Free Ridership Scores

End-use	End-Use Free Ridership
Light bulbs	0.33
Water saving measures	0.06

4.1.4 Program-Level Free Ridership

The evaluation team estimated program-level free ridership by calculating a savings-weighted mean of the end-use FR scores presented in Table 4-3. The program-level FR score is applied to the total gross savings for the program, resulting in a net savings estimate for the kit as a whole. Overall free ridership for the NEED kit is an estimated 17%.

4.2 Spillover

Spillover estimates energy savings from additional energy improvements made by participants who are influenced by the program, and is used to adjust gross savings. The evaluation team used participant survey data to estimate spillover. The survey asked respondents to indicate what energy-saving measures they had implemented since participating in the program. The evaluation team then asked participants to rate the influence the NEED program had on their decision to purchase these additional energy-saving measures on a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential."

The evaluation team converted the ratings to a percentage representing the program-attributable percentage of the measure savings, from 0% to 100%. The team then applied the program-attributable percentage to the savings associated with each reported spillover measure to calculate the participant measure spillover (PMSO) for that measure. We defined the per unit energy savings for the reported spillover measures based on ENERGY STAR® calculators as well as based on algorithms and parameter assumptions listed in the 2010 Ohio and 2013 Indiana TRMs. Participant measure spillover is calculated as follows:

$$PMSO = Deemed\ Measure\ Savings * Program\ Attributable\ Percentage$$

The evaluation team summed all PMSO values and divided them by the sample's gross program savings to calculate an estimated spillover percentage for the NEED program:

$$Program\ SO = \frac{\sum Program\ PMSO}{\sum Sample's\ Gross\ Program\ Savings} t$$

These calculations produced a spillover estimate of 26% for the program.

4.3 Net-to-Gross

Inserting the FR and SO estimates into the NTG formula ($NTG = 1 - FR + SO$) produces an NTG value for the program of 1.09 (Table 4-4). The evaluation team applied the NTG ratio of 1.09 to program-wide verified gross savings to calculate NEED kit net savings.

Table 4-4: Net-to-Gross Results

Free Ridership	Spillover	NTG
0.17	0.26	1.09

4.4 Comparisons with Other School Kit Programs

Table 4-5 compares NEED NTG metrics (including free ridership and spillover) with NTG metrics of Duke Energy's National Theatre for Children (NTC) programs. Free ridership and spillover varies across the programs in Table 4-5, with NEED demonstrating the highest spillover and the lowest CFL free ridership.

Table 4-5: NTG of Similar Programs

Jurisdiction	Program	Program Year	FR: CFLs	FR: Shower-head	FR: Faucet Aerators	FR: Outlet Insulators	FR: Program	Spillover	NTG
Duke Energy Kentucky	NEED	2014-2015	33%	6%	Not calculated	17%	26%	109%	
Other Duke Energy School Kit Programs									
Duke Energy Kentucky ^a	NTC	2014-2015	38%	3%	Not reported	16%	Not reported	5%	Not reported
Duke Energy Ohio ^b	NTC	2014-2015	51%	16%	Not reported	30%	Not reported	17%	Not reported

a Energy Efficiency in Schools Program: EM&V for Duke Energy Kentucky. Cadmus. July 30, 2015.

b Energy Efficiency in Schools Program: EM&V for Duke Energy Ohio. Cadmus. November 2, 2015.

5 Process Evaluation

5.1 Summary of Data Collection Activities

The process evaluation is based on telephone interviews and either telephone or web surveys with program and implementer staff, teachers, and student families who received a kit during the program evaluation year (Table 5-1).

Table 5-1: Summary of Process Evaluation Data Collection Activities

Target Group	Method	Sample Size	Population	Confidence / Precision
DEK program staff	Phone in-depth interview	1	n/a	n/a – purposive sample
Kentucky NEED staff who were workshop trainers	Phone in-depth interview	1	1 *	n/a – census
Kentucky teachers who attended NEED workshops	Phone in-depth interview	7 **	73	n/a – purposive sample
Student families who received DEK kit and are customers of DEK	Mixed mode (Web/Phone)	28	158	90% / 14%

* Only one NEED staff conducted NEED workshops in Kentucky during the program evaluation year.

** All interviewed contacts were elementary or middle school teachers, except for one. One contact was a college professor who trained teachers on middle school science teaching methods.

5.1.1 Teacher Interviews

The evaluation team interviewed several teachers who attended NEED workshops to better understand program success and delivery, gather an educator perspective on what could be improved, and elicit ideas for program improvement. As noted previously, the Kentucky NEED program offers two one-day professional development teacher workshops in the fall of each year for K-12 teachers. At the workshops, teachers are introduced to the NEED curriculum on energy topics and participate in activities that prepare them to teach the materials to their students.

In May of 2016, the evaluation team contacted 73 teachers who had attended one of two workshops in fall of 2015 and offered them a \$50 gift card to participate in an in-depth interview about the program. The evaluation team completed seven interviews with teachers who attended NEED workshops: three elementary school teachers, three middle school teachers, and one college professor who instructs a course on middle school science teaching methods at the graduate and undergraduate level.⁷ Interviewed teachers taught grade levels ranging from third to seventh grade. All six of the teachers taught science, three taught math, three taught language arts, and one taught religion.

⁷ The college professor was asked the same questions about workshop experience, with middle school as the reference point for the age-appropriateness questions, as she instructs on how to teach middle school science. Her responses were excluded from the kit form distribution section, as she did not have direct experience with the kit distribution.

5.1.2 Survey of Student Families Who Received the DEK Kit

In June of 2016, the evaluation team surveyed 28 families who received energy efficiency kits from DEK between February 2014 and December 2015⁸ (Table 5-2). During that period, DEK distributed a total of 208 kits to families who completed the kit request form that their child brought home from school. Of those, 50 asked to be put on a “do not contact” list. The evaluation team contacted all of the remaining 158 households, sending email survey invitations to all households for which program records provided an email address and calling the other households to complete a telephone version of the survey. Ultimately, the data collection effort achieved an 18% response rate, providing a sample with 90/14.5 confidence/precision for this population size. Comparisons with census data confirm that the sample is representative of housing characteristics and income for the region. However, respondents demonstrated greater educational attainment than that of the region.⁹

Table 5-2: DEK Student Family Survey Response Rates

Mode	Population Size	Completed Surveys	Response Rate	Confidence/Precision
Phone	73	21	29%	90/14.5
Web-based	85	7	8%	
Total	158	28	18%	

5.2 Process Evaluation Findings

5.2.1 Awareness of DEK Sponsorship of the Program

Overall, interviewed teachers and student families were aware of DEK’s sponsorship of the program. All interviewed teachers stated they were aware of DEK’s sponsorship of the program and reported learning of Duke’s sponsorship from a variety of sources:

- Energy program marketing pamphlets
- NEED workshop trainers
- Colleagues
- Conferences
- Past workshop attendees
- School administrative staff

All but two student family respondents said they knew the kit was sponsored by DEK, with most indicating they learned about Duke’s sponsorship via the information material included in the kit (18 of 26) and/or the classroom materials that their child brought home (11 of 26). About one-

⁸ Due to the small program year population (N=55), the evaluation team expanded the sample frame to include all participation from February 2014 through December 2015.

⁹ Region comparisons come from 2014 American Community Survey (Census) 5-year period estimates data for Boone, Campbell, and Kenton counties.

third (10 of 28) of the respondents said they knew about the energy-related classroom activities sponsored by DEK; most (7 of 10) said they found out about the Duke-sponsored classroom activities from their child, and the other three said they found out from a teacher.

5.2.2 Teacher Satisfaction with the Program

Overall, teacher experience with the program was positive. They reported being satisfied with the program, and all seven teachers stated that there was nothing left out that should have been covered in the workshop and nothing covered unnecessarily. All teachers reported their overall satisfaction with NEED curriculum or instructional materials as “completely satisfied.” This is consistent with teacher workshop evaluations, where teachers also indicated high overall satisfaction. The NEED trainer further confirmed teachers are satisfied with the workshops, quoting some attendees as having said, “I can use this [materials/kit] tomorrow” or “I’m going to take it [materials/kit] back to my classroom.”

The teachers indicated that the workshop topics and information and content align with the program’s goal of educating students about energy conservation. They also stated that the trainer presented information clearly in a way that teachers can communicate to their students.

When asked what they recalled about the topics covered, all seven teachers recalled that the workshop addressed sources of energy, and most recalled discussion of the forms or transmission of energy (6 of 7) and energy efficiency (5 of 7). None of the teachers volunteered that the workshop addressed magnetism or energy usage of transportation. All seven teachers noted that the concepts covered were age-appropriate and had the right level of detail. When asked to rate the clarity with which the information in the workshop was presented on a five-point scale¹⁰, all seven teachers gave ratings of ‘4’ or ‘5’, revealing that the information was presented very clearly. This aligns with the teacher workshop evaluations of the curriculum, where teachers on average found the curriculum to be applicable and grade-level appropriate for their classes.

Feedback from teachers aligns with the program’s emphasis on treating educators as professionals. Teachers found the workshops valuable and the NEED instructors engaging and informative. Several teachers noted that they do not find all workshops and professional development events they attend to be worthwhile, but that the NEED workshop stood out for its professionalism and respect for the teachers’ time.

One specifically explained: “I think the [NEED] workshop is really well done. I was surprised... sometimes it feels like you just went and listened and ate the food and went home. This one I actually learned a lot and other people did too.”

Another teacher noted that the workshop instructor had brought along a “panel of experts” composed of teachers who had participated in a previous workshop. She noted that hearing the

¹⁰ Where one is “not at all clear” and five is “perfectly clear.”

other teachers' feedback on how they had managed the activity in their classroom was valuable because those teachers had taught the same age groups as those attending the workshop.

Teachers rated their satisfaction with the NEED staff they had interacted with, how professional and courteous the NEED trainer was, and how knowledgeable the trainer was about the topics covered in the workshop on a five-point scale.¹¹ All seven teachers rated each of these items a five, or "completely satisfied." This is consistent with the teacher workshop evaluations of presenter knowledge, where teachers also found the presenter highly knowledgeable.

Expectations on what the workshop would provide varied among teachers, though most expressed that they were expecting to learn about energy, and most were expecting to come away with new materials or tools for teaching. One respondent said that, "This [science of energy unit] became my favorite unit to teach. I felt the most confident about it because I had so much training with the content." All seven stated that the program had met or exceeded expectations. This is consistent with results from the teacher evaluations of the workshop, where all teachers said that the program had either met all or most expectations.

5.2.3 Teachers' Familiarity and Engagement with the Energy Efficiency Kit Forms

All interviewed teachers were familiar with the energy efficiency kit that is available to students and their parents from DEK. All six of the school teachers were also familiar with the form for requesting the kit (i.e., the kit form). Only the college professor¹², who did not have the option to distribute the form, was not familiar with it.

When asked about their involvement in distribution of the kit forms, the six teachers described a range of experiences. The discussions with the teachers – and the interpretations of their responses – were complicated by the fact that four of the six teachers reported that, in addition to having participated in the NEED program, the schools also hosted Duke-sponsored performances by the National Theatre for Children (NTC). This is because energy-saving kits are also distributed through the Duke NTC program, but Duke Energy limits all families to receiving a kit to no more than once every three years – regardless of whether the kit comes from the NEED or NTC program.

The fact that the teachers themselves did not clearly differentiate the two programs further complicated the discussion. For example, one of the teachers referred to "this other NEED group" that came to the school, but that teacher's later comments made it clear the teacher was talking about the NTC program. Another teacher, when asked about the NEED kit forms, reported that she had not distributed the kit forms because, "Our [unified arts] teachers had a play this year and they received a Duke kit form to send out to every student that way."

¹¹ Where one is "not at all satisfied" and five is "completely satisfied."

¹² Note that all interviewed workshop attendees were elementary or middle school teachers, except for this contact. This particular contact was a college professor who trained teachers on middle school science teaching methods. She was able to answer most of the questions except for the questions relating to kit distribution process.

The conflation of the two programs means that it was not clear from some teachers' responses whether kit forms were distributed as a result of NEED or NTC efforts. In two cases, teacher responses made it fairly clear that the kits were not distributed as part of the NEED program as they already had been distributed through the NTC program.

In two other cases, responses were less clear. One teacher reported that all teachers who taught classes during the last period in the day distributed the forms to the students in those classes. In that way, the entire student body received forms. Another reported that a school coordinator was responsible for distribution of kit forms. Again, in those two cases it was not clear whether the form distribution was done through NEED or NTC.

Of the two teachers who did not report an NTC performance at their school, one reported not being engaged in kit form distribution at all because a single school official—a district energy manager—was responsible for distribution of kit forms. The other—a third- and fourth-grade teacher in a school that combined elementary and middle school grades—reported that both she and a middle-school teacher distributed kit forms: the middle school teacher distributed forms to all her students, and the interviewed teacher then distributed the form to all of her students that did not have siblings in the middle school teacher's class. That teacher confirmed that it was only the students that those two teachers taught who received the forms.

Because of the confusion between NEED and NTC, the teacher responses were not sufficient to establish what percentage of eligible students at a school received the kit forms. Moreover, the two teachers that reported involvement in kit distribution provided very different estimates of the percentage of students (of those who received forms) that took the forms home (25% and 90%) and the percentage of parents that completed the forms (5% and 75%).

5.2.4 Other Factors Limiting Kit Distribution

The NEED trainer noted that there is an overlap between NEED and National Theater for Children (NTC) programs. The NTC provides a live theatrical production delivered by professional actors to students in kindergarten through eighth grade on energy resources, use, and conservation. NTC conducts these performances in some of the schools that NEED serves, which makes it difficult for NEED to promote the kit forms.

To confirm that teachers attending NEED workshops are being exposed to the NTC program, the evaluation team asked teachers whether they have heard of or seen an NTC performance in their school. Four of seven interviewed teachers were familiar with the NTC program and recalled it had come to their school. The four teachers who had attended a NTC performance (or whose students attended the performance) stated that students enjoyed the performance.

Teacher Suggestions on How to Improve the NEED Program

Three teachers offered suggestions on improving the instructional materials in the kit.¹³ Two teachers suggested that the kit materials include items that are easily found in stores and

¹³ Teachers receive a kit in the workshop that includes tools for teachers to use in the classroom, such glow-sticks and bouncing spheres. This kit is separate from the energy efficiency kits that are sent to student families, when families request them.

affordable, as buying replacement or additional kit products could be expensive. One teacher suggested that the kit instructional materials could vary from year-to-year so that teachers who had done the workshop previously could learn something new.

Two teachers offered suggestions on other elements of the program. One suggested having the workshop on a weekend or outside of the school day because that would make her eligible for counting the workshop as professional development. Another noted that marketing of the workshop needed to be improved. Without the word-of-mouth from others at school, this teacher never would have attended the workshop, stating: "The email I got—no way was I going to take a day off from work. Awesome workshop, but marketing could be improved. If my friend hadn't told me about it, I wouldn't have done it."

5.2.5 Student Family Experience with the Program

Installation Rates

The majority (25 of 28) of kit recipients installed at least one measure, installing an average of three measures from the kit. Most kit recipients initially installed energy-efficient light bulbs (24 of 28) and the nightlight (19 of 28), with a smaller proportion reporting installing the other measures. The majority of those installing light bulbs (21 of 24) said they installed both bulbs provided in the kit. Student families installed each item at similar rates to that reported in the 2008 NEED evaluation and the 2015 DEK NTC evaluation.

Of the thirteen respondents that installed any of the water saving measures, none knew the gallon-per-minute flow of their previous aerator or showerhead. The kit also included a hot water temperature gauge card that helps families determine whether their hot water heater temperature is set too high. One-quarter of the respondents (7 of 28) said they adjusted their water heater's temperature based on the results of this card.

Of the respondents who installed something, about one-quarter (6 of 25) said they later uninstalled at least one of the measures, although no participant uninstalled everything she or he had installed. In total, 8% of all measures installed were later uninstalled. Showerheads and bathroom faucet aerators had the highest uninstallation rates. Respondents said they uninstalled these water saving measures because they did not like how they worked, later elaborating that the water pressure provided was insufficient to their preferences. Two respondents reported they uninstalled their energy-efficient light bulbs, not because of dissatisfaction with the bulbs but because the light bulbs had broken.

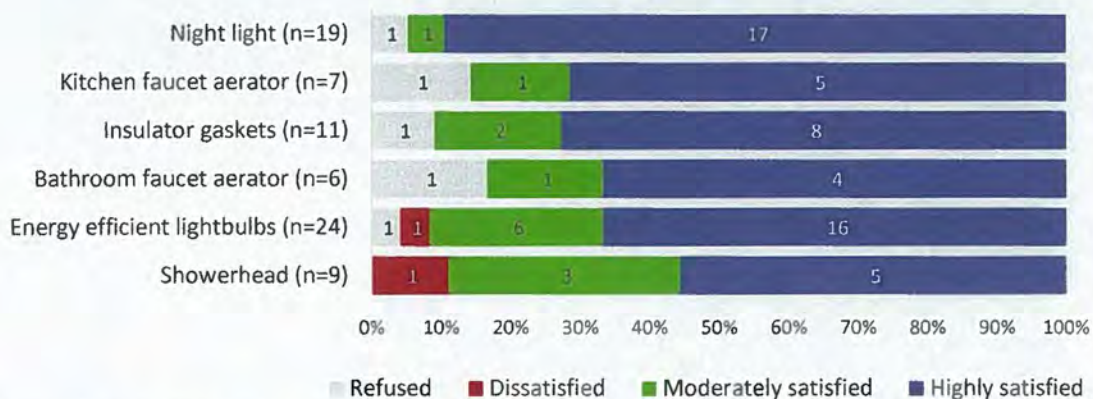
One respondent reported installing all kit items. Of the 27 respondents who did not install all items, most (17 of 27) said they do not plan to install any of the remaining items they had not yet installed. Respondents typically said they would not install the remaining items because they already had the item, they did not know how to install it, or they had not "gotten around to it."

Measure Satisfaction

Nearly all kit recipients reported moderate to high satisfaction with the items they installed from their kit. To best gauge the experience with the measures, we asked respondents to rate their

satisfaction with all measures they installed, including those they later uninstalled. Respondents were most satisfied with the night light, aerators, and gaskets. Smaller proportions of respondents were highly satisfied with the light bulbs and the showerhead, with respondents reporting that they did not like the low water pressure or the CFLs' light quality.

Figure 5-1: Recipient Satisfaction with Measures They Had Installed*



* Respondents rated their satisfaction with the measures on a 0 ("very dissatisfied") to 10 ("very satisfied") scale. Dissatisfied indicates 0-3 ratings, moderately satisfied indicates 4-6 ratings, and highly satisfied indicates 7-10 ratings.

Energy Saving Educational Materials in the Kit

In addition to energy-saving measures, the Energy Efficiency Kit includes a DEK-labeled Department of Energy (DOE) Energy Saver Booklet that includes educational information on saving energy at home. Nearly all (25 of 28) respondents said they read the booklet, most of whom (16 of 25) reported they found it highly helpful.¹⁴ Eight respondents who rated the booklet as not at all to moderately helpful generally indicated they already knew the information presented in the booklet.

Additional Energy Saving Actions

Almost half (13 of 28) of respondents reported their child had adopted new energy-saving behaviors since receiving their kit (Table 5-3). Parents most commonly said that their child now turns off lights when not using a room (9 of 13) or takes shorter showers (6 of 13).

¹⁴ We asked respondents to rate the helpfulness of the DEK-labeled DOE Energy Saver Booklet on a scale from 0 ("not at all helpful") to 10 ("very helpful"). Sixteen of the 25 respondents who reported reading the booklet gave a rating of 7 or higher. One of these 25 respondents did not offer a rating, reporting "don't know."

Table 5-3: New Behaviors Adopted by Child Since Involvement in NEED (Multiple Responses Allowed; n=28)

New Behaviors Child Has Adopted	Count Reporting	Percent Reporting
Child adopted new behaviors since receiving kit	13	46%
Turn off lights when not in a room	9	32%
Take shorter showers	6	21%
Turn off electronics when not using them	5	18%
Turns off water when brushing teeth	2	7%

Further, about half (15 of 28) of parent respondents said they had adopted new energy-saving behaviors themselves since receiving the kit, most of whom (13 of 15) said they now turn off lights when they are not using the room (Table 5-4). About half of those reporting new behaviors said they have changed their thermostat settings (8 of 15) or now turn off electronics when not using them (7 of 15). Two-thirds of parent respondents reporting new energy-saving behaviors (10 of 15) rated the DEK-sponsored kit and materials on saving energy as 'highly influential' on their reported behavior changes.¹⁵

Table 5-4: New Behaviors Adopted by Parent Since Involvement in NEED (Multiple Responses Allowed; n=28)

New Behaviors Parents Have Adopted	Count Reporting	Percent Reporting
Parent adopted new behaviors since receiving kit	15	54%
Turn off lights when not in a room	13	46%
Changed thermostat settings to use less energy	8	29%
Turn off electronics when we are not using them	7	25%
Take shorter showers	6	21%
Turn off air conditioning when not home	4	14%
Turned water heat thermostat down	3	11%
Turn off furnace when not home	2	7%

About one-third (10 of 28) of parent respondents reported purchasing and installing additional energy efficiency measures since receiving their kit (Table 5-5). Efficient light bulbs were the most commonly reported measure (mentioned by seven of the 10 respondents), with five respondents mentioning LEDs and two mentioning CFLs. Only one respondent reported getting a DEK rebate for their measure (for the 10 CFLs they purchased), and most (8 of 10) respondents said the DEK schools program at least partially influenced their decision to purchase and install additional energy-saving measures.

¹⁵ We asked respondents to rate the influence of DEK's kit and energy saving educational materials on their reported behavior changes, using a scale from 0 ("not at all influential") to 10 ("extremely influential"). Ten of the 15 respondents who reported behavior changes gave a rating of 7 or higher.

Table 5-5: Additional Energy Saving Measures Purchased (Multiple Responses Allowed; n=28)

	Count of Respondents Reporting Purchases After Receiving the Kit	Count That Received Duke Rebates for the Purchase/Measure	Count Reporting at Least Some DEK Program Influence on Purchase
At least one measure	10	1	8
LEDs	5	0	4
CFLs	2	1	2
Efficient appliances	2	0	2
Doors	1	0	1
Insulation	1	0	1
Smart thermostat	1	0	1
Efficient heating or cooling equipment	1	0	0

6 Conclusions and Recommendations

The evaluation findings, led to the following conclusions and recommendations for the program.

Conclusion 1: Kit measures have varying levels of energy savings success. The lighting measures realized the highest installation rates and contributed over one third of the kit savings. Moreover, 74% of spillover savings were derived from participants purchasing additional LED and CFL bulbs to complement the bulbs received in their kit. The low flow water measures accounted for almost half of the kit savings (based primarily on installation of the shower head and kitchen aerator). While installation rates for these measures were among the lowest in the kit, participant responses indicated water savings benefits communicated through the program had influenced their behavior to conserve water and related water heating energy.

Recommendation: A review of the kit measure offerings should be made to assess and weigh the benefits and costs of each measure including opportunity for energy savings, cost effectiveness, and education. Opportunities may exist to remove low performing measures and add new measure types or increase the quantity of existing measures that currently perform well such as lighting measures. However, careful review is needed before amending the kit measure mix to ensure it would not hinder the program's educational and behavioral impacts.

Conclusion 2: Water measures drive savings, but installations are low. One-quarter of surveyed kit recipients installed a kitchen faucet aerator or showerhead or adjusted water heater temperature based on the hot water temperature card in the kit. Fewer than one-fifth installed a bathroom faucet aerator. Despite these low installation rates, water measures account for almost two-thirds of gross program savings. Improving the installation rates could greatly increase the program savings.

Recommendation: Investigate opportunities to increase installation rates of water measures through focus group research (or comparable qualitative in-depth methods) to learn: 1) what types of aerators and showerheads customers use and like; and 2) whether emphasizing certain features of low-flow showerheads or aerators (for example, multiple spray settings) would entice customers to install low-flow products.

Conclusion 3: The NEED program is successfully influencing families to save energy in their homes. Several indicators support this conclusion. Nearly all student families installed at least one measure from the DEK kit and the vast majority of measures, once installed, stayed installed. Student families were highly influenced by the program to install these kit measures, as demonstrated by low free ridership rates. Families also reported installing program-attributable spillover measures and about half of respondents reported that they and/or their children adopted new energy saving behaviors (such as turning off equipment when not using it) since receiving the DEK kit.

Recommendation: Leverage the DEK kit to cross-promote other DEK rebate offerings to DEK customers who receive a kit. DEK customers requesting DEK kits are good targets for these promotions, as they:

- Demonstrated willingness to take energy saving actions in their home
- Are reading the energy saving information included in the kit
- Are predominantly single family home-owners
- **The kit distribution process is cumbersome for teachers.** Because kits may be distributed in the same school by both the NEED and the alternative Energy Education in Schools program implementer, the National Theatre for Children (NTC), and sometimes in the same year, some confusion is caused among teachers which complicates the kit distribution process. Based on teacher feedback, it is not clear what impact this confusion has on overall (NEED or NTC) kit distribution as both implementers operating in the same school may bolster student interest in the kits but may also confuse some teachers on whose responsibility it is to ensure that students ask their parents to request the kits.
- **Recommendation:** DEK may wish to consider one of two options: 1) ensure that the NEED and NTC programs operate in separate schools to make it possible to assess the effectiveness of the NEED kit distribution process (possibly having the added benefit of increasing the total number of schools affected); or 2) work with both NEED and NTC to develop an approach to coordinating their activities within schools so that teachers know the difference between the two programs and are completely clear on whose responsibility it is to carry out kit distribution in any given school.

Conclusion 5: Teachers use the classroom kit they receive in the NEED workshop, but replacement parts for that kit are difficult to find or expensive.

- **Recommendation:** DEK might consider offering teachers a way to request and receive replacement parts for the classroom kit.

Appendix A Summary Form

Home Energy Improvement Program Completed EMV Fact Sheet

Description of program

The National Energy Education Development (NEED) Project is an energy efficiency program that provides K-12 educators in Duke Energy Kentucky (DEK) service territory with free workshops on grade-appropriate classroom activities about the science of energy and energy conservation. NEED provides teachers with: 1) a take-home form that students and parents can complete to receive an energy efficiency starter kit from DEK and 2) lesson plans associated with each measure in that kit.

Date	March 1, 2015 - November 1, 2016
Region(s)	Kentucky
Evaluation Period	August 1, 2014 – May 31, 2015
Annual kWh Savings	11,505
Per Kit kWh Savings	209.2 / kit
Coincident kW Impact	4.4 kW
Net-to-Gross Ratio	109%
Process Evaluation	Yes
Previous Evaluation(s)	2008 – TecMarket Works

¹ Due to the small program year population (N=55), the evaluation team expanded the sample frame to include all participation from February 2014 through December 2015.

Evaluation Methodology

Impact Evaluation Activities

- 28 telephone/web surveys and analysis of 8 unique measures.

Impact Evaluation Findings

- Realization rate = 165% for energy impacts; 673% for demand impacts
- Net-to-gross ratio = 1.09

Process Evaluation Activities

- 28 telephone/web surveys and analysis of 8 unique measures.
- 1 in-depth interview with program staff
- 1 in-depth interview with NEED implementation staff
- 7 in-depth interviews with participating teachers

Process Evaluation Findings

- Water measures drive savings, but installations are low.
- The NEED program is successfully influencing families to save energy in their homes.
- The kit distribution process is cumbersome for teachers.

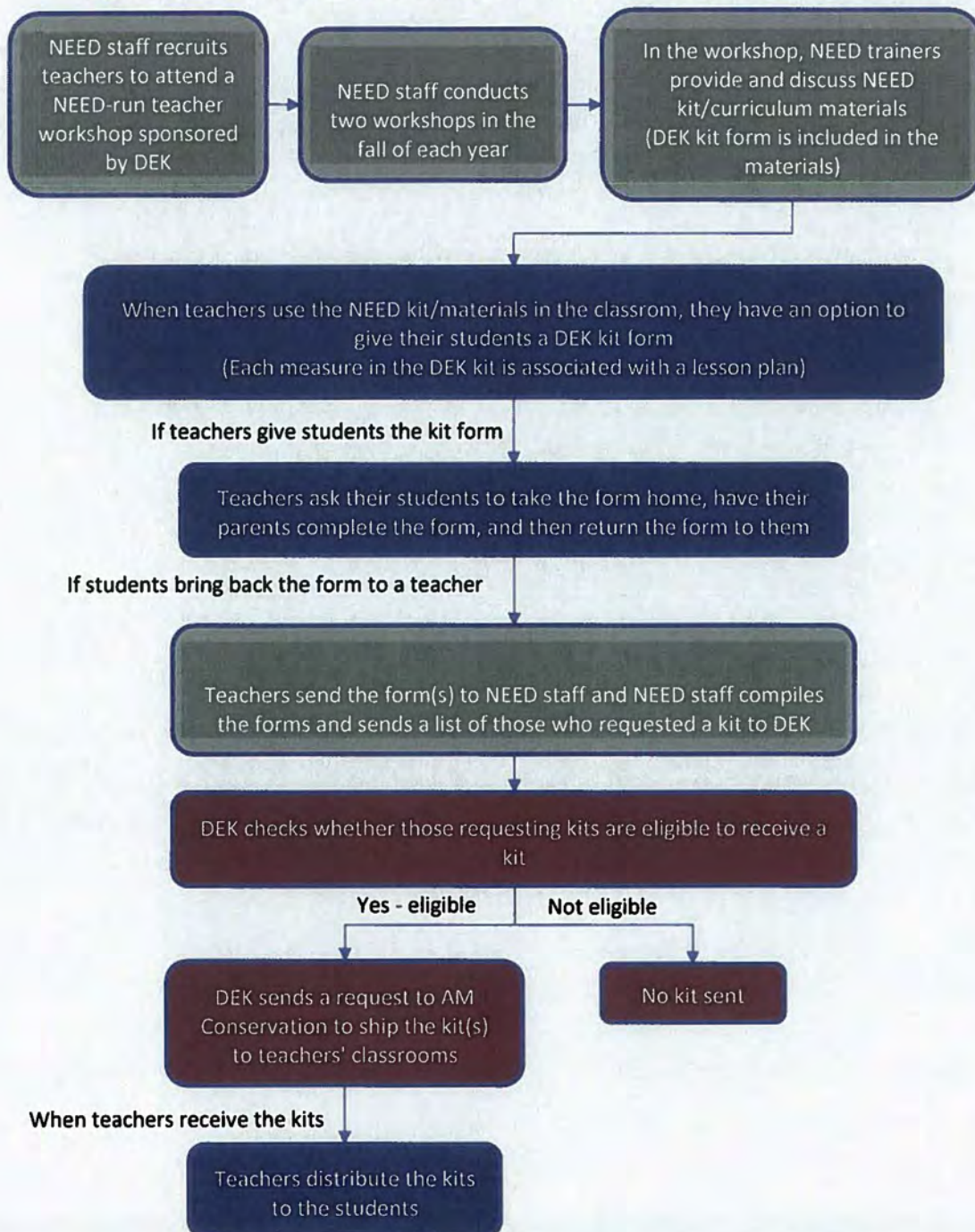
Appendix B Measure Impact Results

Table 6-1: Program Year 2014-2015 Per Unit Verified Impacts by Measure – Key Measure Parameters

Measure Category	Gross Energy Savings (kWh)	Gross Demand (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio	M&V Factor (Energy) (RR x NTG)	Measure Life
13 Watt CFL	28.8	0.0023	56.7%	0.33	0.26	1.09	61.8%	5
18 Watt CFL	33.6	0.0027	100.0%	0.33			109.0%	5
Nightlight	8.2	0.0000	100.0%	0.17			109.0%	8
1.5 GPM Showerhead	50.8	0.0407	101.1%	0.06			110.2%	10
1.0 GPM Bathroom Faucet Aerator	6.7	0.0009	229.4%	0.06			250.0%	9
1.5 GPM Kitchen Faucet Aerator	33.9	0.0045	1391.1%	0.06			1516.3%	9
Water Temperature Gauge Card	26.3	0.0210	100.0%	0.17			109.0%	4
Outlet Insulating Gaskets	3.1	0.0004	31.3%	0.17			34.1%	15

Appendix C Program Process Flow Chart

Figure 6-1: Workshop Recruitment, Material Distribution, and Kit Distribution



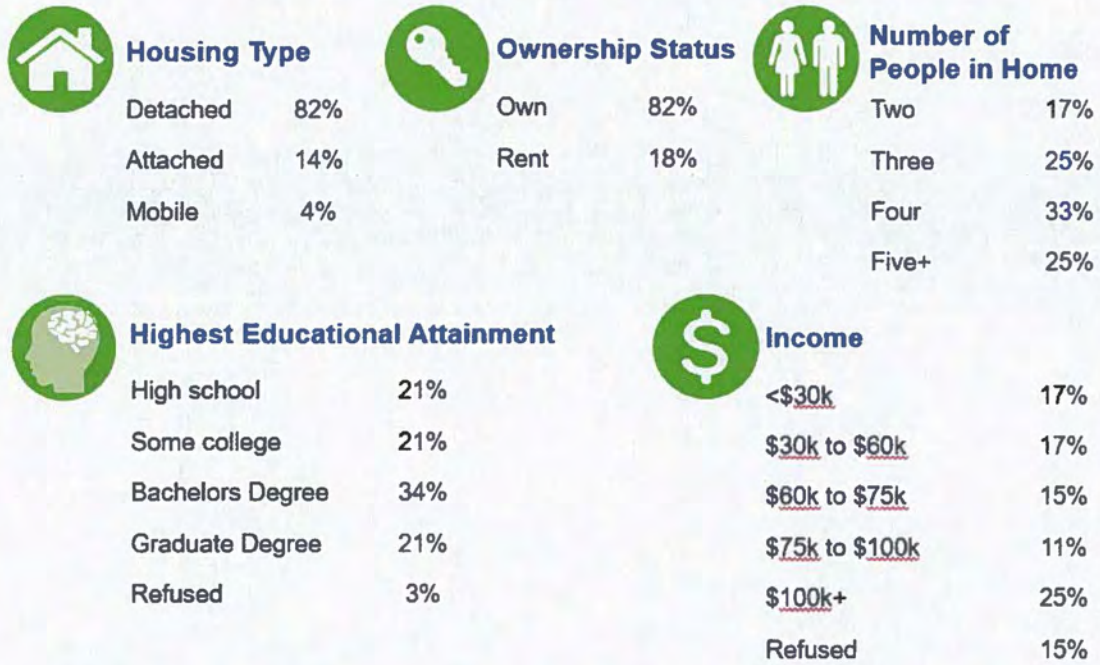
Appendix D Program Performance Metrics

This appendix provides key program performance metrics, or PPIs. See Chapter 5 for the underlying results and more detailed findings.

Figure 6-2: Program Experience PPIs

	Student Families		Teachers	
	%	n	%	n
Awareness PPIs				
Aware of DEK sponsorship of NEED	93%	28	100%	7
Learned of DEK sponsorship via program collateral*	100%	26	57%	7
Learned of DEK sponsorship via teachers	4%	26	29%	7
Read Energy Saver Booklet	89%	28	-	
Rated Energy Saver Booklet as highly informative	64%	25	-	
Satisfaction PPIs				
Workshop trainer	-		100%	7
Workshop experience	-		100%	7
Night light	94%	18	-	
Kitchen faucet aerator	83%	6	-	
Insulator gaskets	80%	10	-	
Bathroom faucet aerator	80%	5	-	
Light bulbs	70%	23	-	
Showerhead	56%	9	-	
Program Influence on behavior PPIs				
Installed at least one kit measure	89%	28	-	
Plan to install measure[s] (of those that did not install any measures)	67%	3	-	
Respondents reporting spillover	25%	28	-	
Adopted new energy saving behaviors: parents	54%	28	-	
Adopted new energy saving behaviors: children	46%	28	-	
Challenges and opportunities for improvement PPIs				
Offered suggestions on how to improve program delivery	-		43%	7
Distributed kit forms to classroom	-		50%	6
Mentioned challenges/concerns with instructional materials	-		67%	6
Suggested curriculum improvements	-		29%	7

Figure 6-3: Student Family Demographic Reach PPIs



Appendix E Instruments

E.1 Program Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the [If DEP, DEI say "Energy Efficiency Education Program"; if DEK say "NEED Project in Kentucky"]. We would like to learn about your experiences in administering this/these program(s) in 2015-2016.

Your comments are confidential. If I ask you about areas you don't know about, please feel free to tell me that and we will move on. Also, if you want to refer me to specific documents to answer any of my questions, that's great – I'm happy to look things up if I know where to get the information.

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

- Q1. Please describe your position at Duke Energy and your role in the [IF DEP, DEI SAY "Energy Efficiency Education Program"; IF DEK SAY "Duke sponsored NEED Project in Kentucky"]:
- Q2. How long have you been in this role?

Program Goals

- Q3. In 2015-2016 program year or to date, what were Duke Energy targets in terms of:
1. Number of schools recruited
 2. Number of teachers and students involved
 3. Activities performed
 4. Use of curricula by teachers
 5. Anything else?
- Q4. How were those targets set, and by whom?
- Q5. Compared to the previous program years, have these targets been the same or have they changed? [If changed:] Why have they changed?
- Q6. Are you on track to meet 2015-2016 targets? [If not on track, probe why not on track and how far behind are they in meeting their targets.]
1. Number of schools recruited
 2. Number of teachers and students involved
 3. Activities performed
 4. Use of curricula by teachers

5. Anything else?

- Q7. Does Duke Energy have any specific targets regarding the number of parents that request energy saving kits? If so, what are they?
- Q8. How about savings targets? Are you on track to meet the savings targets? If not, why not?
- Q9. Does the program have any process or non-impact goals? (*Probe: low-income or non-English speaking population targeting, increased student knowledge of how to save energy, parental /student interest in energy efficiency, etc.*)

[IF YES:]

1. How are these goals established?
2. How are they measured?

Program Delivery

Next, I'd like to learn more about how this program was delivered in 2015-2016 program year.

- Q10. As you know, Duke Energy has partnered with the [IF DEP, DEI SAY "National Theatre for Children or NTC"; IF DEK SAY "NEED Project"] to deliver the program. How is Duke or NTC/NEED recruiting schools to participate in this program?

[IF NEEDED:]

1. What types of marketing activities did Duke or NTC/NEED project staff conduct in the 2015-2016 program year?
 2. Of all the schools contacted, how many decided to participate? Did you receive any feedback from NTC/NEED why some schools decided not to participate?
 3. Have any participating schools dropped out of the program? If so, why?
 4. Did you adjust your marketing and outreach strategy in 2015-2016? If so, how?
- Q11. Please describe the program curricula and in-school activities.
- Q12. Are you involved in any of these activities? Or is it mainly NTC/NEED Project staff who manage these activities?
- Q13. Who developed the curricula? Were you involved in developing the curricula?
- Q14. [IF NTC-RUN PROGRAM:] Please describe the digital workbook of math and science concepts that are provided to teachers and given to students. Do teachers use the workbook and associated collateral? If not, why not?

Q15. What type of feedback have you received from schools and/or teachers about the curricula, workbook, or in-school activities? *[IF ANY ISSUES REPORTED:]* How have you addressed those issues?

Communication

Q16. Can you describe how does NTC/NEED communicate about the program with Duke Energy? Who do you communicate with, how often, and what about?

Q17. Do you communicate with schools directly in any way? If so, how?

Q18. How often do you or NTC/NEED have to resolve an issue with schools? What types of issues come up?

Q19. How do you call or refer to this program when you talk to NTC/NEED? *[If needed: Do you call it "Energy Efficiency in Schools" as it is noted on the website or do you use another name?]*

Data Tracking of Kits

Let's talk about the kits a little bit.

Q20. The kits include *[LIST MEASURES IN THE KIT]*. Were there any changes to the items in the kit during 2015-2016 program year? Any changes for 2016-2017 program year?

Q21. Based on what we read on the program website, student families must complete the Energy Efficiency Survey to receive a kit. Would it be possible to receive/see this survey data?

Q22. What proportion of student families participating in the program fill out the survey? Are you satisfied with this response rate? If not, why not?

Q23. From the moment families request a kit, how long does it take to receive a kit? Is this time frame typical in terms of how long it takes to receive a kit? *[IF NOT TYPICAL, PROBE to get more information on this topic.]*

Q24. Can you tell us how your vendor tracks and reports the number of kits sent out to student families to Duke Energy? Is there information on kit distribution that you need but are not getting? What?

We are almost done. I have a few more questions.

Wrap Up

Q25. What would you say are the greatest strengths of this program?

Q26. What would you say is the biggest challenge in administering this program?

Q27. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q28. What would you like to learn from the program evaluation?

Those are all of my questions. Thank you very much for your time.

E.2 Implementer Staff In-Depth Interview Guide

Introduction

[Note: Research Into Action staff will schedule calls ahead of time through email contact.]

Hi. My name is _____ and I'm calling from Research Into Action on behalf of Duke Energy [Progress, Indiana or Kentucky]. We are conducting an evaluation of Duke Energy sponsored [if DEP or DEI, say "Energy Efficiency Education Program"; if DEK, say "NEED Project in Kentucky"]. Because your organization is involved in administering and delivering this program, we would like to get your perspective on how the program works to help guide us in our efforts. Our conversation should take about 40 to 60 minutes. Is now still a good time to talk?

[Set up appointment or conduct interview]

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

Q1. Please describe your role in the Duke Energy program:

[If needed:]

1. What is your role in developing curricula?
2. What are your roles and responsibilities relating to recruiting schools and teachers?
3. What about scheduling in-school activities?

Program Delivery and Goals

Q2. Please describe the curricula and in-school activities. How do the curricula and activities vary among schools, if at all?

[Probes – if needed]

1. Do the activities, including in-school presentations, occur in different times of year at different schools? If so...
2. Does the scheduling follow any pattern related to school size, type, location, or other factor? If so, how?
3. Have you gotten any feedback that suggests it's better to start or perform activities at certain times of year than others? If so, what have you heard?

[Ask for any documentation on curricula and activities as well as on scheduling of presentations or other activities in schools]

Q3. How were the curricula developed? Who was involved and what information do you have

on the effectiveness of the curricula in teaching students the target concepts or promoting the target behaviors?

Q4. What are NTC's/the NEED Project's targets in terms of:

1. Number of schools recruited
2. Number of teachers and students involved
3. Activities performed
4. Use of curricula by teachers
5. The number of parents that request energy saving kits
6. Anything else?

Q5. How were those targets set, and by whom?

Q6. What is NTC's/the NEED Project's progress toward its targets:

1. Number of schools recruited
2. Number of teachers and students involved
3. Activities performed
4. Use of curricula by teachers
5. The number of parents that request energy saving kits
6. Anything else?

Q7. What kinds of challenges, if any, have you encountered in recruiting schools?

[If needed:]

1. What characteristics of schools, if any, make them more difficult to recruit? Is it related to location, size, or demographic factors?

Q8. [If challenges identified:] What have you done to address those challenges? How has that worked? What support from Duke Energy would be helpful, if any?

Q9. [IF NTC-RUN PROGRAM:] Please describe the digital workbook of math and science concepts that are provided to teachers and given to students. Do teachers use the workbook and associated collateral? If not, why not?

Q10. How, if at all, does NTC/The NEED Project work with school faculty and staff in getting the curricula and activities set up?

[If needed:]

1. What kind of guidance or assistance does NTC/The NEED Project give to school faculty and staff in the use of curricula?

Q11. What kinds of differences have you noticed among schools, if any, in the level of

APPENDIX E

INSTRUMENTS

involvement of school faculty or staff in the program?

[If needed:]

1. What characteristics of schools, if any, are related to the level of involvement of school faculty or staff in the program?

Q12. What kinds of feedback have you gotten from school faculty or staff about the curricula and activities?

[If needed:]

1. What positive feedback?
2. What negative feedback?
3. Do they use the curricula, collateral, and activities? If not, why not?

Q13. What kinds of challenges, if any, have you encountered in getting students involved in the school activities?

[If needed:]

1. What characteristics of students, if any, make it more difficult to get them involved?

Q14. Tell me about your interactions with Duke Energy – who do you communicate with there, how do you communicate, how often, and what about?

Q15. What role does Duke Energy play, if any, in NTC's/the NEED Project's interactions with schools?

[Probe]

1. What kinds of direction does Duke Energy give you in how to work with schools?

Q16. Have there been any challenges in your interactions with Duke Energy? If so, what were they? How did you address them? Were they resolved? If not, what do you think might resolve them?

Q17. Is there anything that has happened in your interactions with Duke Energy or the schools that you didn't expect? What?

Q18. What have you learned from your experiences so far with this program that would help others doing a similar program?

Wrap Up

Q19. What would you say are the greatest strengths of this program?

Q20. What would you say is the biggest challenge in delivering this program?

Q21. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Those are all of my questions. Thank you very much for your time.

E.3 Teacher Interview Guide

Introduction

Hi, my name is _____ and I'm calling on behalf of Duke Energy. Duke Energy has partnered with National Energy Education Development Project or NEED to provide teacher workshops on classroom activities about the science of energy and energy conservation. We understand you have attended a NEED workshop in the fall of 2015 or spring of 2016. Is this correct?

[IF A CONTACT DID NOT ATTEND A WORKSHOP, TERMINATE.]

[IF ATTENDED THE WORKSHOP, PROCEED WITH THE INTRODUCTION:] We are conducting an evaluation of services that Duke Energy and NEED offer and would like to ask you about the NEED workshop as well as curriculum or instructional materials that you may have received from NEED.

Is now a good time to ask you a few questions?

[IF NEEDED: The interview will take about 20 minutes, depending on how much you have to say.]

Awareness of Duke Energy's Sponsorship

Q1. Before today, were you aware that Duke Energy sponsored the NEED workshops on science of energy and energy conservation?

Q2. *[IF AWARE OF DUKE ENERGY SPONSORSHIP]* How did you learn of Duke Energy's involvement with the NEED Project?

[SELECT ALL THAT APPLY]

- Another teacher
- Administrative school staff
- Duke Energy marketing materials
- NEED staff
- NEED website
- NEED email
- NEED print materials
- Other, please describe: _____

Program Experience and Satisfaction

The next few questions are about the NEED workshop that you attended.

What topics did the workshop cover? *[PROBE: "ANYTHING ELSE?"]*

[INTERVIEWER: RECORD VERBATIM RESPONSES, THEN AFTER THE INTERVIEW IS OVER, CHECK ALL THAT APPLY FROM THE LIST OF CODES GIVEN BELOW. ALSO, IF RESPONSES GIVEN ARE LACKING SUFFICIENT DETAIL, MAKE SURE TO OBTAIN ENOUGH DETAIL.]

- Science of Energy – forms of energy and energy transformation
- Sources of energy (natural gas, renewables, etc.)
- Electricity and magnetism
- Energy usage of transportation
- Energy efficiency concepts, including conservation
- Other – please specify: _____

- Q3. What topics, if any, did the workshop leave out that it should have covered? *[IF NEEDED:]* Why should those topics be covered?
- Q4. What topics, if any, did the workshop cover that you think were not necessary? *[IF NEEDED:]* Why were those topics not necessary?
- Q5. Did the workshop you attended cover content and/or activities designed for elementary or middle school students? Or both?
- *[IF ELEMENTARY SCHOOL CONTENT WAS COVERED:]* Thinking of the workshop content designed for elementary students, was it age appropriate? *[IF NO:]* Why not?
 - *[IF MIDDLE SCHOOL CONTENT WAS COVERED:]* Thinking of the workshop content designed for middle school students, was it age appropriate? *[IF NO:]* Why not?
- Q6. Thinking about how detailed the discussion of the workshop topics was, would you say that, on the whole, the discussion:

[READ AND RECORD RESPONSE]

- Was far too detailed
- Was somewhat too detailed
- Had about the right level of detail
- Should have been a little more detailed
- Should have been far more detailed

[DO NOT READ]

- Don't know

- Q7. *[IF THEY SAID WORKSHOP WAS FAR OR SOMEWHAT TOO DETAILED OR SHOULD HAVE BEEN A LITTLE OR FAR MORE DETAILED, ASK:]* Can you elaborate why the workshop was [too detailed / should have been more detailed]?

APPENDIX E

INSTRUMENTS

Q8. Please rate the clarity with which the information in the workshop was presented, on a scale from 1 to 5, where 1 means "not at all clear" and 5 means "perfectly clear."

[RECORD RATING / RESPONSE:] _____

[IF THEY GAVE RATING OF 1, 2, or 3 AND HAVE NOT ELABORATED AS TO WHY THEY GAVE THAT RATING, ASK:] Why did you give that rating?

Q9. What did you expect to learn from the workshop?

Q10. Based on what you expected to learn, would you say that, on the whole, the workshop:

[READ AND RECORD RESPONSE]

- Far exceeded your expectations
- Somewhat exceeded your expectations
- Met your expectations
- Fell somewhat short of your expectations
- Fell far short of your expectations

[DO NOT READ]

- Don't know

Q11. [IF THE WORKSHOP FELL SHORT OF THEIR EXPECTATIONS, ASK:] Why did you give that response?

Q12. Which materials or activities from the workshop did you use in teaching your students about energy? [PROBE: "ANYTHING ELSE?"]

- [IF NOTHING WAS USED] Why have you not used the materials from the workshop in teaching your students about energy?
- [IF ANYTHING WAS USED] Which materials were most helpful in teaching about energy, and why?
- [IF ANYTHING WAS USED] Were there any concepts covered in the curriculum or instructional materials that your students had particular challenges with? [IF YES:] What concepts?

The next questions are about the curriculum or instructional materials that you have seen or received from NEED.

Q13. What topics, if any, did the materials leave out that should have been covered? [IF NEEDED:] Why should those topics be covered?

- Q14. What topics, if any, did the materials cover that you think were not necessary? *[IF NEEDED:]* Why were those topics not necessary?
- Q15. Please rate your overall satisfaction with curriculum or instructional materials you received from NEED on a scale from 1 to 5, where 1 means "not at all satisfied" and 5 means "completely satisfied."
- [RECORD RATING / RESPONSE:]* _____

Interactions with NEED Staff

- Q16. Using a scale from 1 to 5, where 1 means "not at all satisfied" and 5 means "completely satisfied", how satisfied were you with:
- a. Your interaction with the NEED workshop trainer *[Record Rating:_____]*
 - b. How professional and courteous the NEED trainer was *[Record Rating:_____]*
 - c. How knowledgeable the trainer was about the topics discussed in the workshop *[Record Rating:_____]*

[IF THEY GAVE RATING OF 1, 2, or 3 ON ANY OF THE ITEMS ABOVE AND HAVE NOT ELABORATED AS TO WHY THEY GAVE THAT RATING, PROBE:] Why did you give the rating of *[REPEAT RATING GIVEN ON THE ITEM(S) ABOVE]*?

- Q17. Did you have any other interactions with anyone else from NEED regarding the curriculum or instructional materials your received? *[IF YES:]* Who? What did those interactions address?
- Q18. Please describe the ways in which you were not satisfied with the NEED staff interactions?

Encouragement of Students to Complete Survey, Receive Kit

We understand that the NEED workshop trainer provided you with some student activities to give to your students to take home. The student activities included a paper form for parents to fill out to receive an energy efficiency kit from Duke Energy. This kit contains energy efficient bulbs, low flow showerheads, and a few additional items that students and their parents could install in their home to save energy.

- Q19. Are you familiar with this form?
- Q20. Are you familiar with this kit?
- Q21. Did the workshop trainer say anything about the form and/or the kit? *[IF YES:]* What?

Q22. Did you distribute the kit form to students to take home?

- [IF NO:] Why haven't you distributed the kit form to students?
- [IF YES:]
 - Did you distribute the kit form to all your students or some of your students? [IF SOME:] On average, what percentage of your students received the kit form?
 - On average, what percentage of your students took the kit form home? Your best estimate is fine.
 - After students take the kit form home, do you follow up with them later to find out if their parents completed the form? [IF YES:] On average, what percentage of your students reported their parents completed and sent the form?

Challenges and Opportunities for Improvement

Q23. What suggestions do you have to improve the NEED workshop?

Q24. What suggestions do you have to improve the curriculum or instructional materials received from the NEED?

Overlap with NTC Program

There is another educational program on the science of energy in Kentucky. It is run by the National Theatre for Children. This program offers a live theatrical performance to schools – that is, professional actors put on a show about energy related concepts.

Q25. Did National Theatre for Children perform at your school at any time in the Fall 2015 or Spring 2016? [IF YES:] Have you seen the performance(s)? [IF YES:] What did you think of the performance(s) in terms of motivating students to engage in energy conservation?

Teacher Characteristics

We are almost done. I have two more questions.

Q26. What subjects do you teach?

- Math
- Science
- Other – please specify: _____

Q27. What grade levels do you teach?

- Grade 1
- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Grade 6

APPENDIX E

INSTRUMENTS

- Grade 7
- Grade 8
- Other – please specify: _____

That was my last question. Thank you very much for your input.

E.4 Student Parent Survey

Introduction/ Screening

Q1. Hi, I'm _____, calling on behalf of Duke Energy. We are calling about an energy efficiency educational program that Duke Energy sponsored in your child's school. In addition to sponsoring classroom activities, Duke Energy sent a kit containing energy saving items to your home.

This kit included lightbulbs, a showerhead, and other items that help you save energy in your home. Do you recall receiving this kit?

1. Yes
2. No [If no: Can I speak with someone who may know something about this kit?]
98. Don't know [If DK: Can I speak with someone who may know something about this kit?]
99. Refused [TERMINATE]

[INTERVIEWER INSTRUCTIONS: *If no adults are able to speak about the kit, thank and terminate.*]

Q1a. Do you work at a school that teaches elementary, middle, or high school grades?

1. Yes [-> TERMINATE]
2. No

Program Experience

Q2. Before today, did you know the kit you received was sponsored by Duke Energy?

1. Yes
2. No
98. Don't know
99. Refused

[IF Q2=1]

Q3. How did you learn that the kit was sponsored by Duke Energy? [Select all that apply]

1. Classroom materials brought home by child
2. My child's teacher
3. Information material included in/on the kit
4. Other (specify: _____)
98. Don't know
99. Refused

APPENDIX E

INSTRUMENTS

Q4. Did you read the information about how to save energy in the booklet that came in the kit?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[ASK IF Q4 = 1]

Q5. On a scale from 0 to 10 where 0 is not at all helpful and 10 is very helpful, how helpful was the information in the kit in identifying ways your household could save energy at home?

- 0. Not at all helpful
- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10. Very helpful
- 98. Don't know
- 99. Refused

[ASK IF Q4<7]

Q6. What might have made the information more helpful?

[ASK IF NTC=1]

Q7. In addition to sending the energy saving kits, Duke Energy sponsored a program about energy and energy efficiency at your child's school, which included classroom materials and an in-school performance by the National Theatre for Children. Were you aware of this program before today?

[Interviewer: Record 'yes' if the respondent reported any awareness of any aspect of the school program]

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[ASK IF NEED=1]

Q8. In addition to sending families energy saving kits, Duke Energy sponsored a program about energy and energy efficiency at your child's school, which included classroom activities on energy and conservation. Were you aware of this program before today?

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q7=1 or Q8=1]

Q9. Where did you hear about this program?

[MULTIPLE RESPONSE]

1. From my child/children
2. From a teacher
3. On Duke Energy website
4. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Assessing Energy Saver Kit Installation

We'd like to ask you about the energy saving items included in your kit.

The kit contained an energy-efficient showerhead, faucet aerators for the bathroom and kitchen, energy efficient light bulbs, a night light, and some insulator gaskets for light switches and electricity outlets.

[IF NEEDED: The bathroom and kitchen faucet aerators are small metal pieces that you can screw in to a sink faucet to reduce water flow. The insulator gaskets are made of foam and are the size and shape of a light switch or electric outlet.]

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?

[Interviewer: Throughout interview, remind respondent as needed to report whether someone else in the home installed or uninstalled any items]

[SINGLE RESPONSE]

1. Yes
2. No [-> Q21]
98. Don't know [-> TERMINATE]
99. Refused [-> TERMINATE]

[ASK IF Q10 = 1]

APPENDIX E

INSTRUMENTS

Q11. Your kit contained two energy efficient light bulbs that you can screw into any standard light socket. Do you know if your kit contained CFLs (which have a swirly spiral shape) or LED bulbs (which have a more traditional globe shape)?

1. CFLs
2. LEDs
98. Don't know

[ASK IF Q10 = 1]

Q12. Which of the items did you install, even if they were taken out later?

[Interviewer: Record each response, then prompt with the list items.]

Item	Response
a. Showerhead	1. Yes 2. No 98. DK 99. REF
b. Kitchen faucet aerator	1. Yes 2. No 98. DK 99. REF
c. Bathroom faucet aerator	1. Yes 2. No 98. DK 99. REF
d. Night light	1. Yes 2. No 98. DK 99. REF
e. Energy efficient light bulb(s)	1. Yes 2. No 98. DK 99. REF
f. Insulator gaskets for light switches and electricity outlets	1. Yes 2. No 98. DK 99. REF

[ASK IF Q12E (ENERGY EFFICIENT LIGHT BULB(S)) = 1 (YES)]

Q13. In addition to the night light, there were two light bulbs in the kit. Did you install one or both of the light bulbs in the kit?

[SINGLE RESPONSE]

1. Yes – I installed both
2. No – I installed only one light bulb
98. Don't know
99. Refused

[ASK IF Q11=1 (CFL) and Q13 = 2]

Q14. One bulb was a 13 watt CFL, and the other bulb was a 18 watt CFL. Do you recall which

APPENDIX E

INSTRUMENTS

one you installed?

[If needed: The 13 watt CFL is equivalent to a 60 watt incandescent bulb and the 18 watt CFL is equivalent to a 75 watt incandescent bulb]

[SINGLE RESPONSE]

1. 13 watts
2. 18 watts
98. Don't know
99. Refused

[ASK IF Q12f = 1]

Q15. How many of the light switch gasket insulators from the kit did you [if needed: or anyone else] install in your home?

[SINGLE RESPONSE]

1. None
2. One
3. Two
4. Three
5. Four
98. Don't know
99. Refused

[ASK IF Q12f = 1]

Q16. How many electrical outlet gasket insulators from the kit did you [if needed: or anyone else] install in your home?

[SINGLE RESPONSE]

1. None
2. One
3. Two
4. Three
5. Four
6. Five
7. Six
8. Seven
9. Eight
98. Don't know
99. Refused

[ASK IF ANY PART OF Q12 = 1]

Q17. Overall, how satisfied are you with the item[s] you installed? Please use 0 to 10 scale,

APPENDIX E

INSTRUMENTS

where 0 is very dissatisfied and 10 is very satisfied. How satisfied are you with...

DISPLAY IF	Item	Rating
Q12a = 1	a. Showerhead	0-10 with DK, REF
Q12b = 1	b. Kitchen faucet aerator	0-10 with DK, REF
Q12c = 1	c. Bathroom faucet aerator	0-10 with DK, REF
Q12d = 1	d. Night light	0-10 with DK, REF
Q12e = 1	e. Energy efficient lightbulbs	0-10 with DK, REF
Q12f = 1	f. Insulator gaskets	0-10 with DK, REF

[ASK IF ANY ITEMS IN Q17<7]

Q17a. Can you please explain any dissatisfaction you had with [DISPLAY ALL ITEMS IN Q17 THAT ARE <7]?

[OPEN END: RECORD VERBATIM]

[ASK IF ANY PART OF Q12 = 1]

Q18. Have you since uninstalled any of the items from the kit that you had previously installed?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q18 = 1]

Q19. Which of the items did you uninstall?

[Interviewer: Record the response, then prompt with the list items.]

[MULTIPLE RESPONSE]

1. [DISPLAY IF Q12a = 1] Showerhead
2. [DISPLAY IF Q12b = 1] Kitchen faucet aerator
3. [DISPLAY IF Q12c = 1] Bathroom faucet aerator
4. [DISPLAY IF Q12d = 1] Night light
5. [DISPLAY IF Q12e = 1] Energy efficient light bulbs
6. [DISPLAY IF Q12f = 1] Insulator gaskets

APPENDIX E

INSTRUMENTS

- 98. Don't know
- 99. Refused

[ASK IF Q19 1-6 OPTIONS WERE SELECTED]

Q20. Why were those items uninstalled? Let's start with...

[Interviewer: Read each item]

[MULTIPLE RESPONSE]

DISPLAY ONLY THOSE 1-6 ITEMS THAT WERE SELECTED IN Q19	Item	Reason
	a. Showerhead	1. It was broken 2. I didn't like how it worked 3. I didn't like how it looked 96. Other: (specify) 98. DK 99. REF
	b. Kitchen faucet aerator	Repeat reason options
	c. Bathroom faucet aerator	Repeat reason options
	d. Night light	Repeat reason options
	e. Energy efficient light bulbs	Repeat reason options
	f. Insulator gaskets	Repeat reason options

[ASK IF ANY PART OF Q12 = 2 OR Q10 = 2]

Q21. You said you haven't installed [INPUT ONLY THOSE ITEMS IN Q12 IF Q12a-f = 2].

Which of those items do you plan to install in the next three months?

[Interviewer: Record the response, then prompt with the list items.]

[MULTIPLE RESPONSE] [DISPLAY ALL IF Q10 = 2]

- 1. [DISPLAY IF Q12a = 2] Showerhead
- 2. [DISPLAY IF Q12b = 2] Kitchen faucet aerator
- 3. [DISPLAY IF Q12c = 2] Bathroom faucet aerator
- 4. [DISPLAY IF Q12d = 2] Night light
- 5. [DISPLAY IF Q12e = 2] Energy efficient light bulbs
- 6. [DISPLAY IF Q12f = 2] Insulator gaskets
- 98. None
- 99. Refused

APPENDIX E

INSTRUMENTS

[ASK IF ANY 1-6 OPTIONS WERE NOT SELECTED IN Q21 OR OPTION "NONE" WAS SELECTED]

Q22. What's preventing you from installing those items? Let's start with....

[Interviewer: Read items]

[MULTIPLE RESPONSE]

DISPLAY IF	Item	Reason
Q21a was not selected	a. Showerhead	Use multiple response options below
Q21b was not selected	b. Kitchen faucet aerator	Use multiple response options below
Q21c was not selected	c. Bathroom faucet aerator	Use multiple response options below
Q21d was not selected	d. Night light	Use multiple response options below
Q21e was not selected	e. Energy efficient light bulbs	Use multiple response options below
Q21f was not selected	f. Insulator gaskets	Use multiple response options below

[MULTIPLE RESPONSE OPTIONS FOR Q22]

1. Didn't know what that was
2. Tried it, didn't fit
3. Tried it, didn't work as intended (Please specify: _____)
4. Haven't gotten around to it
5. Current one is still working
6. Takes too much time to install it/No time/Too busy
7. Too difficult to install it, don't know how to do it
8. Don't have the tools I need
9. Don't have the items any longer (threw away, gave away)
10. [DISPLAY IF Q21e was not selected and BULB=CFL] Already have CFLs
11. [DISPLAY IF Q21e was not selected and BULB=LED] Already have LEDs
12. [DISPLAY IF Q21a was not selected] Already have efficient showerhead
13. [DISPLAY IF Q21b was not selected] Already have efficient kitchen faucet aerator
14. [DISPLAY IF Q21c was not selected] Already have efficient bathroom faucet

APPENDIX E

INSTRUMENTS

aerators

- 96. Other, please specify: [OPEN-ENDED RESPONSE]
- 98. Don't know
- 99. Refused

[ASK IF Q12b = 1 AND Q19 KITCHEN FAUCET AERATOR OPTION WAS NOT SELECTED]

Q23. You said you installed the new kitchen faucet aerator. Do you know what your old kitchen faucet aerator's gallon per minute flow was?

[SINGLE RESPONSE]

- 1. Yes - record flow: _____
- 2. No
- 99. Refused

[ASK IF Q12c = 1 AND Q19 BATHROOM FAUCET AERATOR OPTION WAS NOT SELECTED]

Q24. You said you installed the new bathroom faucet aerator. Do you know what your old bathroom faucet aerator's gallon per minute flow was?

[SINGLE RESPONSE]

- 1. Yes - record flow: _____
- 2. No
- 99. Refused

[ASK IF Q12a = 1 AND Q19 SHOWERHEAD OPTION WAS NOT SELECTED]

Q25. You said you installed the new energy efficient showerhead. Do you know what your old showerhead's gallon per minute flow was?

[SINGLE RESPONSE]

- 1. Yes - record flow: _____
- 2. No
- 99. Refused

[ASK IF Q12d = 1 AND Q19 NIGHT LIGHT OPTION WAS NOT SELECTED]

Q26. You said you installed the night light. Did the night light replace an existing night light?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[ASK IF Q26 = 1]

Q27. Did the old nightlight have a bulb that you could take out and replace once it burned out?

APPENDIX E

INSTRUMENTS

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF (Q12e = 1 AND Q19 ENERGY EFFICIENT LIGHTS WERE NOT SELECTED)]

Q28. You said you installed at least one of the energy efficient lights. What type of bulb(s) did you replace with the energy efficient lightbulbs?

1. All incandescent [*Interviewer: describe as an old fashioned light bulb - likely purchased more than two years ago*]
2. All halogen [*Interviewer: describe as bulb that looks like an incandescent, but has a glass tube inside of the bulb*]
All CFL [*Interviewer: describe as spiral, or twisty shape bulb that fit into ordinary light fixtures*]
3. All LED [*Interviewer: describe as a new bulb type that uses little electricity and lasts a long time*]
4. Some combination [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF (Q12e = 1 AND Q19 ENERGY EFFICIENT LIGHT BULBS NOT SELECTED)]

Q29. In what rooms did you install the energy efficient lightbulbs that were included in the kit? [MULTIPLE RESPONSE] [*Interviewer: If the respondent gives more than two responses, remind them that there were only two bulbs.*]

1. Living room
2. Dining room
3. Bedroom
4. Kitchen
5. Bathroom
6. Den
7. Garage
8. Hallway
9. Basement
10. Outdoors
11. Other area (please specify): _____
98. Don't know
99. Refused

Q30. Have you adjusted the temperature of your water heater based on the Hot Water Gauge Card included in your kit?

1. Yes

APPENDIX E

INSTRUMENTS

2. No
3. Don't recall seeing the Hot Water Gauge Card
98. Don't know
99. Refused

[ASK IF Q30=1]

Q31. Do you know what the old temperature setting on your hot water heater was?

1. Yes (*please type in previous temperature setting here*)
2. No

[ASK IF Q30=1]

Q32. And what was the new temperature setting you set your hot water heater to?

[Record response]

[ASK IF Q30=1]

Q33. Is the new water heater temperature setting still in place?

1. Yes
2. No
98. Don't know
99. Refused

[IF Q33=2]

Q34. Why did you change the water heater temperature a second time?

[Record response]

Q35. What is the fuel type of your water heater?

1. Electricity
2. Natural Gas
3. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q36. How old is your water heater?

1. Less than five years old
2. Five to nine years old
3. Ten to fifteen years old
4. More than fifteen years old

98. Don't know

NTG

[IF ANY PART OF Q12 = 1 AND IT'S NOT THE CASE THAT ALL PARTS OF Q19=SELECTED (THAT IS, THEY INSTALLED ANYTHING AND DID NOT UNINSTALL EVERYTHING THEY INSTALLED)]

Q37. If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

1. Yes
2. No
98. Don't know
99. Refused

[If Q37 = 1]

Q38. What items would you have purchased and installed within the next year?

[MULTIPLE RESPONSES]

1. [IF Q12a = 1 AND Q19.1 NOT SELECTED] Energy-Efficient Showerhead
2. [IF Q12b = 1 AND Q19.2 NOT SELECTED] Kitchen Faucet Aerator
3. [IF Q12c = 1 AND Q19.3 NOT SELECTED] Bathroom Faucet Aerator
4. [IF Q12d = 1 AND Q19.4 NOT SELECTED] Energy-Efficient Light Bulbs
5. [IF Q12e = 1 AND Q19.5 NOT SELECTED] Energy-Efficient Night Light
6. [IF Q12f = 1 AND Q19.6 NOT SELECTED] Switch/Outlet Gasket Insulators
7. No I would not have purchased any of the items
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[IF Q38.4 IS SELECTED]

Q39. Would you have purchased and installed the 13W CFL, the 18W CFL, both types of CFLs, or something else?

1. Just the 13W CFL
2. Just the 18W CFL
3. Both the 13W and 18W CFL
- 4.
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[IF (Q12a=1 AND Q19.1 NOT SELECTED) or (Q12b=1 AND Q19.2 NOT SELECTED) or (Q12c=1 AND Q19.3 NOT SELECTED)]

APPENDIX E

INSTRUMENTS

Q40. Now, thinking about the water savings items that were provided in the kit - using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to install the water saving items from the kit? How influential was...

[Interviewer: If respondent says "Not applicable - I didn't get/use that," then follow up with: "So would you say it was "not at all influential?" and probe to code]

[MATRIX QUESTION: SCALE]

Elements	Responses
The fact that the items were free	0-10 scale with DK and REF options
The fact that the items were mailed to your house	0-10 scale with DK and REF options
Information in the kit about how the items would save energy	0-10 scale with DK and REF options
Information that your child brought home from school	0-10 scale with DK and REF options
Other information or advertisements from Duke Energy, including its website	0-10 scale with DK and REF options

[IF Q12e=11 AND Q19.5 NOT SELECTED]

Q41. Using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to install the lightbulbs from the kit? How influential was...

[Interviewer: If respondent says "Not applicable - I didn't get/use that," then follow up with: "So would you say it was "not at all influential?" and probe to code]

[MATRIX QUESTION: SCALE]

Elements	Responses
The fact that the items were free	0-10 scale with DK and REF options
The fact that the items were mailed to your house	0-10 scale with DK and REF options
Information in the kit about how the items would save energy	0-10 scale with DK and REF options
Information that your child brought home from school	0-10 scale with DK and REF options

APPENDIX E

INSTRUMENTS

Other information or advertisements from Duke Energy, including its website	0-10 scale with DK and REF options
---	------------------------------------

[ASK IF MYHER=1]

Q42. I've got just a few final questions about other energy saving activities. First, Duke Energy asked us to ask a couple of questions about the Home Energy Reports it sends to some families. These reports provide detailed information on your home's energy usage and compare your home to similar homes of your neighbors.
During the school year, did you receive any Home Energy Reports from Duke Energy?
[If needed: This is extra information on energy use that is mailed separately from your energy bill.]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q42=1]

Q43. How often do you read those Home Energy Reports?

1. Never
2. Sometimes
3. Always
98. Don't know
99. Refused

[ASK IF Q43=2-3]

Q44. The Home Energy Reports provide specific recommendations for how you can save energy in your home. Have you completed any of the energy saving recommendations from the Home Energy Reports? If so, which ones? [MULTIPLE RESPONSE] [Don't read, probe if needed]

1. Nothing
2. Purchased energy saving products for my home and received a Duke Energy rebate
3. Purchased energy saving products for my home but did not receive a Duke Energy rebate
4. Made energy saving modifications to my home [example if necessary: installed insulation or windows]
5. Adjusted how or when I use energy in my home
6. Looked for additional information on how to save energy
7. Other, please specify:

APPENDIX E

INSTRUMENTS

- 98. Don't know
- 99. Refused

[IF MYHER=1 AND Q44=2-7, READ] Now we'd like to ask you about any other actions you or your child may have taken to save energy in your home. So please focus on any other things you or your child has done other than what you just told me.

[IF MYHER=1 AND Q44=1, 98, OR 99, READ] Okay, so you said that you have not followed any of the energy savings recommendations from your Home Energy Report. I'd still like to ask you about any actions you or your child may have taken to save energy in your home since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy.

[IF MYHER≠1, READ] I'd like to ask you about any actions you or your child may have taken to save energy in your home since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy.

Q45. Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, what **new** behaviors has your child adopted to help save energy in your home? Please only consider new **behaviors** that your child adopted since receiving the kit. [IF NEEDED: like turning off the lights when room is unoccupied] [MULTIPLE RESPONSE] [Interviewer: Do not read list. After each response ask, "Anything else?"]

- 1. Not applicable - no new behaviors
- 2. Turn off lights when not in a room
- 3. Turn off electronics when not using them
- 4. Take shorter showers
- 5. Other (specify: _____)
- 98. Don't know
- 99. Refused

Q46. Since receiving your energy kit from Duke Energy, what new behaviors have you adopted to help save energy in your home? Please only consider new behaviors that you have adopted since receiving the kit. [IF NEEDED: like turning off the lights when room is unoccupied] [MULTIPLE RESPONSE] [Interviewer: Do not read list. After each response ask, "Anything else?"]

- 1. Not applicable - no new behaviors
- 2. Turn off lights when not in a room
- 3. Turn off furnace when not home
- 4. Turn off air conditioning when not home
- 5. Changed thermostat settings to use less energy

APPENDIX E

INSTRUMENTS

- 6. Used fans instead of air conditioning
- 7. Turn off electronics when we are not using them
- 8. Take shorter showers
- 9. Turned water heat thermostat down
- 10. Other (specify: _____)
- 98. Don't know
- 99. Refused

Q47. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how much influence did Duke Energy's kit and materials on saving energy have on your decision to [LIST ALL RESPONSES FROM Q46].

0 – Not at all influential	1	2	3	4	5	6	7	8	9	10 – Extremely influential	98 DK	99 RF
----------------------------	---	---	---	---	---	---	---	---	---	----------------------------	-------	-------

Q48. Since receiving your energy kit from Duke Energy, have you purchased and installed any other **products** or made any improvements to your home to help save energy?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[If Q48 = 1]

Q49. What **products** have you purchased and installed to help save energy in your home?

[Do not read list. After each response, ask, "Anything else?"] [MULTIPLE RESPONSE]

- 1. Bought energy efficient appliances
- 2. Moved into an ENERGY STAR home [VERIFY: "Is Duke Energy still your gas or electricity utility?" Yes/No]
- 3. Bought efficient heating or cooling equipment
- 4. Bought efficient windows
- 5. Added insulation
- 6. Sealed air leaks [NOT DUCT SEALING – PROBE TO CODE]
- 7. Sealed ducts
- 8. Bought LEDs
- 9. Bought CFLs
- 10. Installed an energy efficient water heater
- 11. None – no other actions taken
- 96. Other, please specify: _____
- 98. Don't know

APPENDIX E

INSTRUMENTS

99. Refused

[ASK IF Q49<>11, 98, OR 99]

Q50. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones?

[LOGIC] Item	Response
[IF Q49.1 IS SELECTED] 1. Buy energy efficient appliances	Yes No DK REF
[IF Q49.2 IS SELECTED] 2. Move into an ENERGY STAR home	Yes No DK REF
[IF Q49.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	Yes No DK REF
[IF Q49.4 IS SELECTED] 4. Buy efficient windows	Yes No DK REF
[IF Q49.5 IS SELECTED] 5. Buy additional insulation	Yes No DK REF
[IF Q49.6 IS SELECTED] 6. Seal air leaks	Yes No DK REF
[IF Q49.7 IS SELECTED] 7. Seal ducts	Yes No DK REF
[IF Q49.8 IS SELECTED] 8. Buy LEDs	Yes No DK REF
[IF Q49.9 IS SELECTED] 9. Buy CFLs	Yes No DK REF
[IF Q49.10 IS SELECTED] 10. Install an energy efficient water heater	Yes No DK REF
[IF Q49.96 IS SELECTED] [Q49 open ended response]	Yes No DK REF

[ASK IF ANY ITEM IN Q49 WAS SELECTED]

Q51. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the Duke Energy schools program have on your decision to...

[MATRIX QUESTION: SCALE]

[LOGIC] Item	Response
[IF Q49.1 IS SELECTED] 1. Buy energy efficient appliances	0-10 scale with DK and REF
[IF Q49.2 IS SELECTED] 2. Move into an ENERGY STAR home	0-10 scale with DK and REF

APPENDIX E

INSTRUMENTS

[IF Q49.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	0-10 scale with DK and REF
[IF Q49.4 IS SELECTED] 4. Buy efficient windows	0-10 scale with DK and REF
[IF Q49.5 IS SELECTED] 5. Buy additional insulation	0-10 scale with DK and REF
[IF Q49.6 IS SELECTED] 6. Seal air leaks	0-10 scale with DK and REF
[IF Q49.7 IS SELECTED] 7. Seal ducts	0-10 scale with DK and REF
[IF Q49.8 IS SELECTED] 8. Buy LEDs	0-10 scale with DK and REF
[IF Q49.9 IS SELECTED] 9. Buy CFLs	0-10 scale with DK and REF
[IF Q49.10 IS SELECTED] 10. Install an energy efficient water heater	0-10 scale with DK and REF
[IF Q49.96 IS SELECTED] [Q49 open ended response]	0-10 scale with DK and REF

[ASK IF Q49.1 IS SELECTED AND Q51.1 <> 0]

Q52. What kinds of appliance(s) did you buy?

[Do not read list] [MULTIPLE RESPONSE]

1. Refrigerator
2. Stand-alone Freezer
3. Dishwasher
4. Clothes washer
5. Clothes dryer
6. Oven
7. Microwave
96. Other, please specify: _____
98. Don't know
99. Refused

[ASK IF Q52 = 1-96]

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

APPENDIX E

INSTRUMENTS

99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q52]

[ASK IF Q52 = 5]

Q54. Does the new clothes dryer use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q49.3 IS SELECTED AND Q51.3 > 0]

Q55. What type of heating or cooling equipment did you buy?

[Do not read list] [MULTIPLE RESPONSE]

1. Central air conditioner
2. Window/room air conditioner unit
3. Wall air conditioner unit
4. Air source heat pump
5. Geothermal heat pump
6. Boiler
7. Furnace
8. Wifi-enabled thermostat
96. Other, please specify: _____
98. Don't know
99. Refused

[ASK IF Q55= 6-7]

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q55= 1-7, 96]

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No

APPENDIX E

INSTRUMENTS

- 98. Don't know
- 99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q55, EXCLUDING wifi-enabled thermostat]

[ASK IF Q49.4 IS SELECTED AND Q51.4 > 0]

Q58. How many windows did you install?

- 1. [RECORD VERBATIM _____]
- 98. Don't know
- 99. Refused

[ASK IF Q49.5 IS SELECTED AND Q51.5 > 0]

Q59. Did you add insulation to your attic, walls, or below the floor?

[Do not read list] [MULTIPLE RESPONSE]

- 1. Attic
- 2. Walls
- 3. Below the floor
- 98. Don't know
- 99. Refused

[ASK IF Q59<>98-99]

[PROGRAMMER: REPEAT Q60 FOR EACH ITEM MENTIONED IN Q59]

Q60. Approximately what proportion of the [ITEM MENTIONED IN Q59] space did you add insulation?

- 1. [RECORD VERBATIM AS % - INPUT MID-POINT IF RANGE IS OFFERED:]
_____ [IF NEEDED: *Your best estimate is fine*]
- 2. Don't know
- 99. Refused

[ASK IF Q49.8 IS SELECTED AND Q51.8 > 0]

Q61. How many of LEDs did you install in your property?

- 1. [RECORD VERBATIM:] _____ [IF NEEDED: *Your best estimate is fine*]
- 2. Don't know
- 99. Refused

[ASK IF Q49.9 IS SELECTED AND Q51.9 > 0]

Q62. How many of CFLs did you install in your property?

- 1. [RECORD VERBATIM:] _____ [IF NEEDED: *Your best estimate is fine*]
- 2. Don't know

99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]

Q63. Does the new water heater use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]

Q64. Which of the following water heaters did you purchase?

1. A traditional water heater with a large tank that holds the hot water
2. A tankless water heater that provides hot water on demand
3. A solar water heater
4. Other, please specify: _____
98. Don't know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]

Q65. Is the new water heater an ENERGY STAR model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

Demographics

Lastly, we have some basic demographic questions for you. Please be assured that your responses are confidential and are for statistical purposes only.

Q66. Which of the following types of housing units would you say best describes your home?
It is . . . ?

1. Single-family detached house
2. Single-family attached home (such as a townhouse or condo)
3. Duplex, triplex or four-plex
4. Apartment or condominium with 5 units or more
5. Manufactured or mobile home
6. Other _____
98. Don't know

APPENDIX E

INSTRUMENTS

99. Refused

Q67. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

1. Less than 500 square feet
 2. 500 to under 1,000 square feet
 3. 1,000 to under 1,500 square feet
 4. 1,500 to under 2,000 square feet
 5. 2,000 to under 2,500 square feet
 6. 2,500 to under 3,000 square feet
 7. Greater than 3,000 square feet
98. Don't know
99. Refused

Q68. Do you or members of your household own your home, or do you rent it?

1. Own / buying
 2. Rent / lease
 3. Occupy rent-free
98. Don't know
99. Refused

Q69. Including yourself, how many people currently live in your home year-round?

1. I live by myself
 2. Two people
 3. Three people
 4. Four people
 5. Five people
 6. Six people
 7. Seven people
 8. Eight or more people
98. Don't know
99. Refused

Q70. What was your total annual household income for 2015, before taxes?

1. Under \$20,000
2. 20 to under \$30,000
3. 30 to under \$40,000
4. 40 to under \$50,000
5. 50 to under \$60,000
6. 60 to under \$75,000
7. 75 to under \$100,000

APPENDIX E

INSTRUMENTS

- 8. 100 to under \$150,000
- 9. 150 to under \$200,000
- 10. \$200,000 or more
- 98. Don't know
- 99. Prefer not to say

Q71. What is the highest level of education achieved among those living in your household?

- 1. Less than high school
- 2. Some high school
- 3. High school graduate or equivalent (such as GED)
- 4. Trade or technical school
- 5. Some college (including Associate degree)
- 6. College degree (Bachelor's degree)
- 7. Some graduate school
- 8. Graduate degree, professional degree
- 9. Doctorate
- 98. Don't know
- 99. Prefer not to say