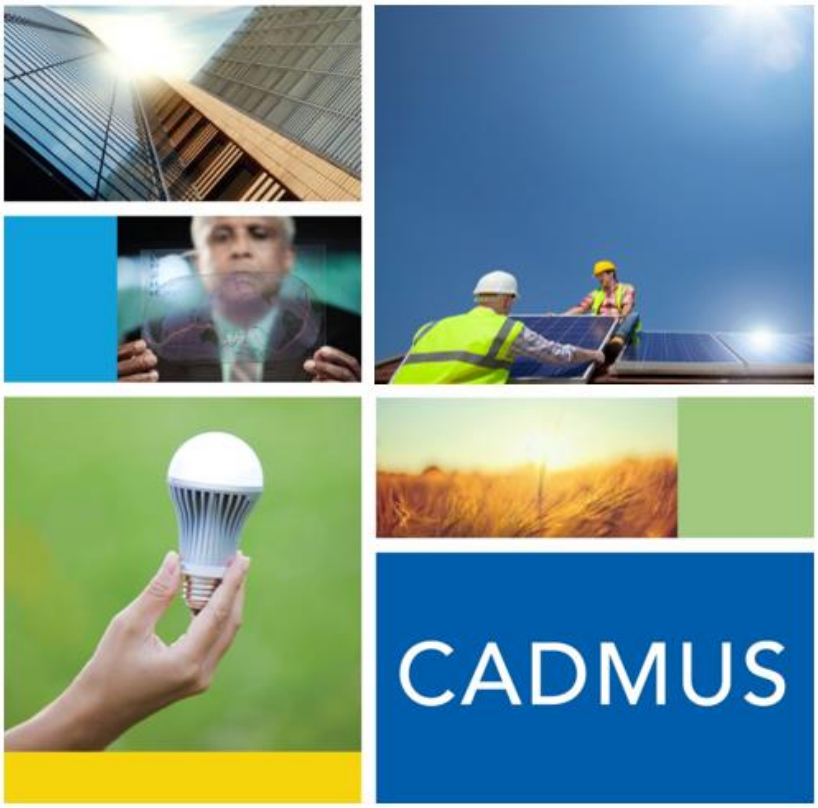


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List of Acronyms

Acronym	Term
ACS	American Community Survey
AFUE	Annual fuel utilization efficiency
AVERT	AVoided Emissions and geneRation Tool
CALP	Common Area Lighting Package
CDD	Cooling degree day
CF	Coincidence factor
CFL	Compact fluorescent lamp
CREED	Consortium for Retail Energy Efficiency Data
CSA	Conditional savings analysis
CSS	Cross-sector sales
CY	Calendar year
DIO	Days incentive outstanding
DLC	DesignLights Consortium
DNAC	Difference in normalized annual consumption
ECM	Electronically commutated motor
EER	Energy efficiency rating
EIA	U.S. Energy Information Administration
EISA	Energy Independence and Security Act of 2007
EM&V	Evaluation, measurement, and verification
EPA	U.S. Environmental Protection Agency
EUL	Effective useful life
EWG	Energy Working Group
HDD	Heating degree day
HOU	Hours of use
Hz	Hertz
HVAC	Heating, ventilation, and air conditioning
IAC	UW-Milwaukee Industrial Assessment Center
ILLC	Integrated Luminaire Level Controls
ISP	Internet service provider
ISR	In-service rate
KAM	Key account manager
KBtu/h	Thousand British thermal units per hour
KPI	Key performance indicator
kW	Kilowatt
kWh	Kilowatt hour
LED	Light-emitting diode
LMP	Locational marginal pricing
lm	Lumen
MBh	Megabytes per hour

Acronym	Term
MBps	Megabytes per second
MG&E	Madison Gas and Electric
MISO	Midcontinent Independent Transmission System Operator, Inc.
MMBtu	Million British thermal units
MThm	Megatherm
MWh	Megawatt hour
NAC	Normalized annual consumption
NCP	National Consumer Panel
NCTA	The Internet and Television Association
NOAA	National Oceanographic and Atmospheric Administration
NPS	Net promoter score
NRA	National rebate administrator
NTG	Net-to-gross
OLS	Ordinary least squares
POS	Point-of-sale
POSTNAC	Post-installation weather-normalized
PRISM	PRInceton Scorekeeping Method
PRENAC	Pre-installation weather-normalized
PSC	Public Service Commission of Wisconsin
PSI	Pounds per square inch
Psig	Pounds per square inch gauge
PV	Photovoltaic
QA/QC	Quality assurance/quality control
RIM	Ratepayer impact measure
RPP	Retail Products Platform
SEER	Seasonal energy efficiency rating
SEERA	Statewide Energy Efficiency and Renewable Administration
SEM	Strategic energy management
SMI	State median income
SMP	Standard market practice
SPECTRUM	Statewide Program for Energy Customer Tracking, Resource Utilization, and Data Management
TMY	Typical meteorological year
TRC	Total resource cost (test)
TRM	Technical reference manual
UAT	Utility administrator test
UCT	Utility cost test
UEC	Unit energy consumption
UMP	Uniform Methods Project
UPC	Universal Product Code
VFD	Variable-frequency drive (also known as variable-speed drive, or VSD)

Acronym	Term
WHF	Waste heat factor
WSTA	Wisconsin State Telecommunications Association

CADMUS

Introduction

Volume II of the Focus on Energy CY 2017 Evaluation Report presents program-specific evaluation findings and details about specific evaluation approaches and results for the residential and nonresidential programs, including pilot programs. This introduction presents additional details on the overall roles and responsibilities of the Evaluation Team,[1] as well as descriptions of standard evaluation practices and approaches the Team used across multiple program evaluations

The diagram presented in Figure 3 of Volume I, and repeated below as Figure 1 of Volume II of the CY 2017 Evaluation Report, is a useful summary of the steps involved in the calculation of net savings from the gross savings recorded in the program tracking databases. In addition to these steps, there are many planning and coordination activities that are a part of the evaluation process. The remainder of Volume II of the evaluation report presents program-specific evaluation findings and greater details about specific evaluation approaches and results.

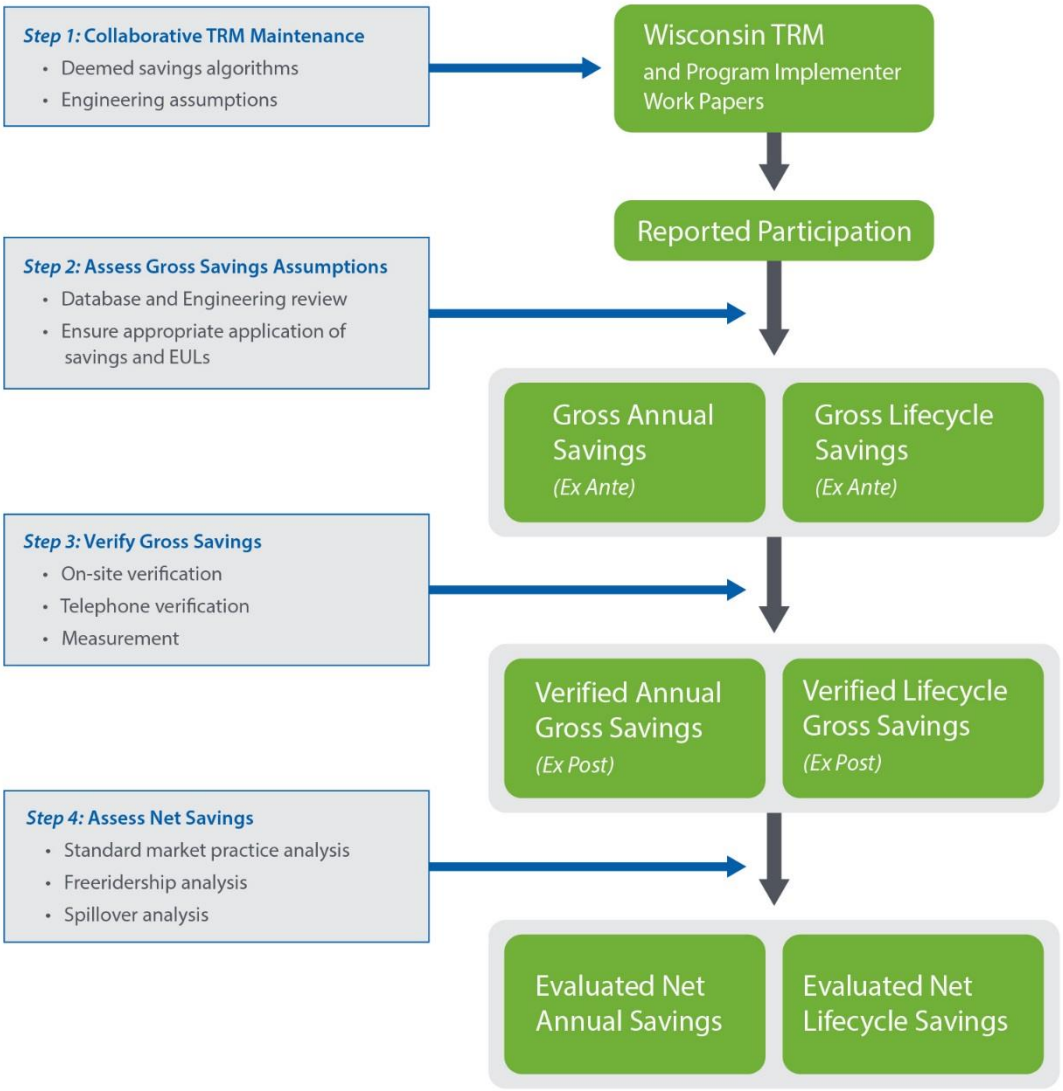
To accomplish steps 1 through 3 in Figure 1, the Evaluation Team coordinates with staff from the Public Service Commission of Wisconsin (PSC), the Program Administrator, and Program Implementers to assess the measures expected to be installed across programs in future years. To determine priorities for additional research, the Evaluation Team also reviews the deemed savings or algorithms contained in the Wisconsin Technical Reference Manual (TRM) and entered into Statewide Program for Energy Customer Tracking, Resource Utilization, and Data Management (SPECTRUM), the program tracking database. The Evaluation Team prioritizes measures for evaluation, measurement, and verification (EM&V) that demonstrate the highest priority by meeting one or more of the following criteria:

- New to the programs
- Expected to contribute an increasing share of savings
- Have experienced technical or other market changes (such as increased energy codes or standards)
- Have significant uncertainty around the savings calculation (independent measurement of key assumptions are dated)

The Team then applies the findings from these activities to the savings calculations summarized in the Evaluation Report, which ultimately end up in the TRM.

[1] The Evaluation Team comprises Cadmus, Apex Analytics, and St. Norbert College Strategic Research Institute.

Figure 1. Quadrennium Evaluation Steps



Wisconsin Technical Reference Manual

The Wisconsin TRM is a document managed collaboratively by the Program Administrator, Program Implementers, Evaluation Team, and PSC staff. The information contained in the TRM presents the consensus calculations of the electric and gas energy savings and the electric demand reductions achieved from installing the energy efficiency and renewable energy technologies supported by Focus on Energy programs. The TRM is publicly available on the Focus on Energy website.[2]

The values presented in the TRM fall into one of two categories:

- **Deemed Savings.** Specific per-unit savings (or demand reduction) values the Program Administrator, Program Implementer, Evaluation Team, and the PSC have accepted as reliable because the measures, and the uses for these measures, are consistent and because sound research supports the savings achieved.
- **Savings Algorithms.** The equations used for calculating savings (or demand reductions) based upon project- and measure-specific details. The TRM also makes these calculations transparent by identifying and justifying all relevant formulas, variables, and assumptions.

The TRM is also a reference guide for how program stakeholders classify measures in SPECTRUM, the programs' tracking database. The Evaluation Team revises the document annually to account for any changes to the programs and technologies.

Deemed Savings Report

The annual deemed savings report details changes or updates to deemed savings or savings algorithms in the TRM based upon evaluation measurement and verification activities. The Evaluation Team prepares and circulates the report for review among the primary members of the Focus on Energy team including the Program Administrator, and the Program Implementers, and the PSC. After this review process, the Evaluation Team incorporates the findings into the next iteration of the TRM.

Work Papers

Although evaluation activities often initiate updates to the TRM through the deemed savings report process, Program Implementers can also initiate revisions or additions to the TRM. Rather than a deemed savings report, Program Implementers prepare work papers to present the savings assumptions for new measures or, when appropriate, revisions to the savings calculations for existing measures. Implementers submit these work papers to the Program Administrator, who forwards them to the Evaluation Team and the PSC for review, comment, and approval. Once a work paper receives final approval from the PSC, the Evaluation Team incorporates the work paper into the next iteration of the TRM.

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[2] Public Service Commission of Wisconsin. *Focus on Energy, Wisconsin Focus on Energy Technical Reference Manual.* Prepared by Cadmus. October 2016. Available online: http://www.focusonenergy.com/about/evaluation-reports

Standard Evaluation Methods

The Evaluation Team uses several standard methods across evaluation cycles to assess the impact of Focus on Energy programs: tracking database review, project audits, and on-site inspections. This chapter details each of these methods. Individual program chapters specify when the Evaluation Team applied these (or other methods) during the current or previous evaluation cycles.

Tracking Database Review

For each program, the Evaluation Team reviews the tracking database, SPECTRUM, for completeness and quality of data. The review includes the following activities:

- Downloading and reviewing data for projects completed during the program year (January 1 to December 31 for each calendar year [CY], based on the "payment approved date" in SPECTRUM)
- Checking program totals against program status reports generated by SPECTRUM
- Verifying the presence and completeness of key data fields (savings, incentives, quantities, etc.)
- Checking for duplicate entries
- Reassigning adjustment measures to original application IDs (where possible) using supplemental tracking databases from the Program Administrator

Project Audits (Engineering Desk Review)

The Evaluation Team reviews SPECTRUM for complete and accurate key project documentation, including the following information:

- Project applications
- Savings workbooks
- Savings calculations performed by participants or third-party contractors (if applicable)
- Energy audits or feasibility studies
- Customer metered data
- Customer billing data (monthly utility bills)
- Invoices for equipment or contracting services
- Other documentation submitted to Focus on Energy

On-Site Inspections

For projects selected for evaluation, Evaluation Team inspectors verify the presence of equipment at a project site and collect data through a variety of methods such as installing data loggers or taking spot measurements of power usage. Inspectors may also gather data by reviewing daily operations and maintenance logs, gathering operations data from central energy management systems, and reviewing historical trend data. (Inspectors may also ask customers to initiate trends during a site visit to collect real-time energy consumption data and then follow up with the customer several weeks later to obtain the results.)

Residential Segment Programs

Multifamily Programs

Through the Multifamily Energy Savings Program, Multifamily New Construction Program, and Multifamily Direct Install Program (collectively referred to as the Multifamily Programs), Focus on Energy provides education and energy-saving opportunities to multifamily owners and tenants by offering free direct install measures and incentives for energy-efficient upgrades. In CY 2017, the Multifamily Programs continued to be administered by APTIM (Program Administrator) and implemented by Franklin Energy (Program Implementer).

Focus on Energy offers two types of rewards through the Multifamily Energy Savings Program: prescriptive rebates for eligible measures, which includes discounts for common area lighting, and custom incentives for performance-based projects.

Through the Multifamily New Construction Program (a new offering in CY 2017), Focus on Energy offers additional support to property owners and developers, and prescriptive incentives for multifamily new construction projects and measures that do not qualify for the Design Assistance Program, such as projects or measures that arise after completing the building design phase, or after the funds from the Design Assistance Program have been exhausted. In CY 2017, the Design Assistance Program referred 18 projects to the Multifamily New Construction Program.

Through the Multifamily Direct Install Program, Focus on Energy offered free, direct installation of LEDs, specialty CFLs, pipe insulation, pre-rinse sprayers, faucet aerators, and showerheads as well as water heater temperature setback services. For multifamily owners and managers, this Program also offered vending misers and LED retrofits for exit signs in common areas. Focus on Energy discontinued this Program at the end of CY 2017, replacing it with tenant-or-condominium-installed offerings available through the Simple Energy Efficiency Program.

Table 1 lists actual spending, savings, participation, and cost-effectiveness for the Multifamily Programs.

Table 1. Multifamily Programs Summary

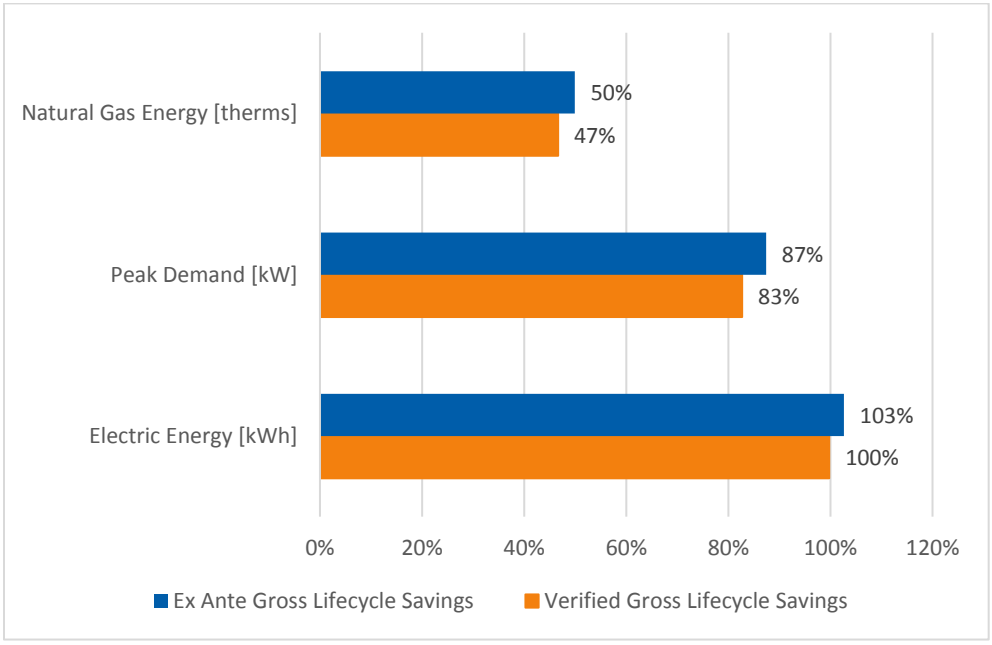
Item	Units	CY 2017	CY 2016	CY 2015
Multifamily Energy Savings Program				
Incentive Spending	$	$913,289	$1,266,039	$1,925,153
Participation[1]	Number of Participants	270	341	472
Verified Gross Lifecycle Savings	kWh	110,801,510	144,210,468	152,842,241
	kW	791	1,104	1,132
	therms	2,062,155	5,424,269	6,039,574
Verified Gross Lifecycle Realization Rate	MMBtu	96%	93%	94%
Net Annual Savings	kWh/yr	6,522,913	8,885,067	9,484,683
	kW	637	872	928
	therms/yr	106,828	278,942	314,608
Annual Net-to-Gross Ratio	MMBtu	81%	79%	82%
Cost-Effectiveness[2]	Total Resource Cost Test: Benefit/Cost Ratio	3.33	2.57	2.11

Multifamily Direct Install Program				
Incentive Spending	$	$329,684	$286,026	$400,205
Participation[1]	Number of Participants	177	129	124
Verified Gross Lifecycle Savings	kWh	63,890,954	58,743,089	35,983,696
	kW	235	268	200
	therms	1,063,945	1,459,536	1,136,700
Verified Gross Lifecycle Realization Rate	MMBtu	91%	95%	94%
Net Annual Savings	kWh/yr	4,212,647	3,868,738	3,119,305
	kW	235	268	200
	therms/yr	105,175	142,638	114,398
Annual Net-to-Gross Ratio	MMBtu	100%	100%	100%
Cost-Effectiveness[2]	Total Resource Cost Test: Benefit/Cost Ratio	3.48	3.81	2.97
Multifamily New Construction Program				
Incentive Spending	$	225,983	n/a	n/a
Participation[1]	Number of Participants	38		
Verified Gross Lifecycle Savings	kWh	31,373,887		
	kW	364		
	therms	1,283,988		
Verified Gross Lifecycle Realization Rate	MMBtu	83%		
Net Annual Savings	kWh	1,289,043		
	kW	293		
	therms	63,979		
Annual Net-to-Gross Ratio	MMBtu	81%		
Cost-Effectiveness[2]	Total Resource Cost Test: Benefit/Cost Ratio	1.64		

[1] The total number of participants represents the sum of unique participants for both Programs in each year. Participants are defined as the multifamily building owners or managers.
[2] The cost-effectiveness test represents results across all the Multifamily Program offerings in CY 2017.

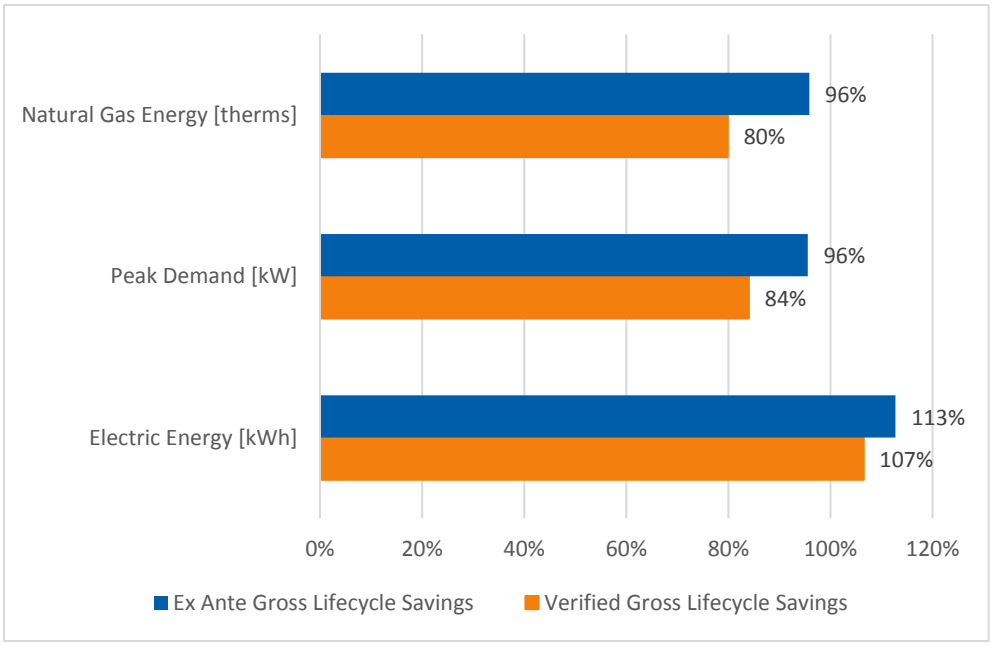
Figure 2, Figure 3, and Figure 4 show the percentage of gross lifecycle savings goals achieved by the Multifamily Programs in CY 2017. The Multifamily Energy Savings Program, Multifamily Direct Install Program, and Multifamily New Construction Program achieved the *ex ante* electric savings goals, but did not achieve the *ex ante* therm savings and demand goals in all areas except one (New Construction Program demand savings).

Figure 2. Multifamily Energy Savings Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



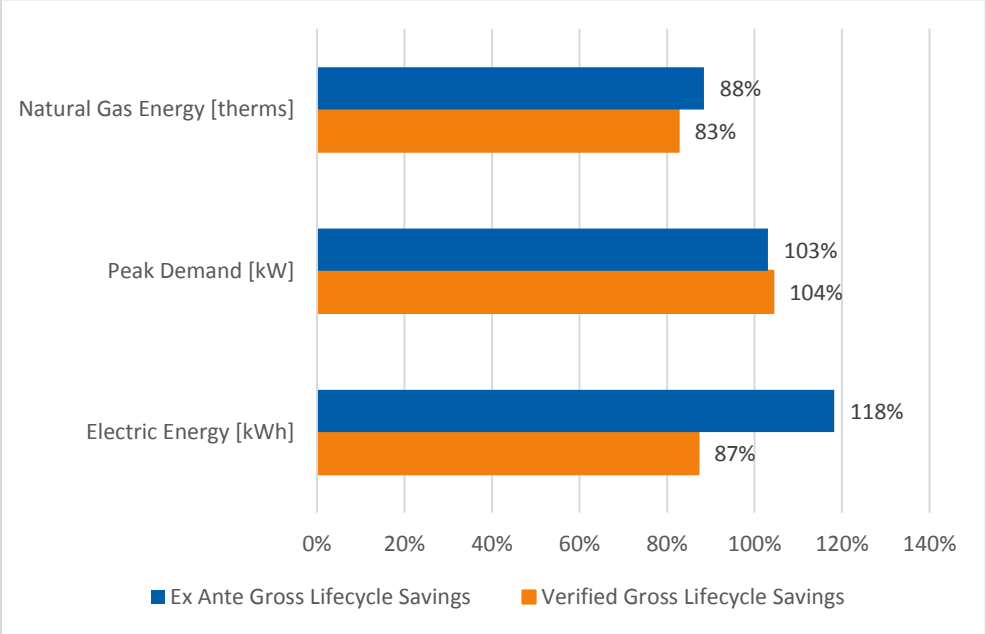
[1] The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Figure 3. Multifamily Direct Install Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Figure 4. Multifamily New Construction Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations of the Multifamily Programs in CY 2017 to answer these key questions:

- What are the gross and net electric and natural gas savings?
- How can the Multifamily Programs increase energy savings and demand reduction?
- How satisfied are participant end users with the Multifamily Programs and their energy-efficient upgrades?

Specific to the Multifamily Energy Savings Program, the Evaluation Team sought to determine what the barriers to increasing property owners and managers participation are, and how the Program stakeholders are addressing barriers. Specific to the Multifamily Direct Install Program, the Evaluation Team also explored how replacing the direct install program design with that of a mailed kit program might influence adoption of in-unit measures.

The Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Programs' performance. Table 2 lists the specific data collection activities and sample sizes used in the evaluations, specific to each Program.

Table 2. Multifamily Programs' Data Collection Activities and Sample Sizes

Activity	Multifamily Energy Savings Program	Multifamily Direct Install Program	Multifamily New Construction Program
Program Actor Interviews	2		
Tracking Database Review	Census		
Property Manager or Owner Interviews	12	n/a	n/a
Ongoing Participant Satisfaction Survey	29	17	2
Engineering Desk Review	38	42	17
Verification Site Visits	9	11	4

Program Actor Interviews

The Evaluation Team interviewed the Program Administrator and Program Implementer during the summer of CY 2017 to learn about the status of the Multifamily Programs, assess related objectives and performance, and investigate challenges and solutions to implementation. The interview topics emphasized changes to the Programs' design and delivery.

Tracking Database Review

The Evaluation Team reviewed a census of projects in the Multifamily Programs' tracking database, SPECTRUM, which involved the following tasks:

- Thoroughly reviewing the data to ensure that the totals in SPECTRUM matched the totals reported by the Program Administrator
- Reassigning savings from a number of database adjustment measures to the corresponding program measures
- Checking for complete and consistent application of information across data fields (measure names, application of lifetime savings, application of effective useful life (EUL), etc.)

Property Manager or Owner Interviews

The Evaluation Team conducted in-depth interviews with 12 building owners and managers who participated in the Multifamily Energy Savings Program in CY 2017 but whose property had not participated in the Multifamily Direct Install Program. Respondents provided input on their experiences, decision-making process, project barriers, and reactions to the CY 2018 Simple Energy Efficiency Program change, which will allow tenants and condo owners to request and install measures contained in an energy-saving kit.

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct satisfaction surveys beginning in CY 2015 for the 2015–2018 quadrennial. The goal of these surveys is to provide a quick and easy opportunity for recent Program participants to provide feedback shortly after their experience, to reveal problems at any time of year, and to identify energy efficiency opportunities for follow up with interested participants. The

Evaluation Team also used survey data to assess the Program Implementer's performance in meeting contractual obligations related to satisfaction key performance indicators (KPIs).

The Program Administrator deployed online surveys through SPECTRUM to all CY 2017 participants with an email address within two weeks of their completing participation in the Program. The Evaluation Team gathered online survey results via SPECTRUM and collected mailed survey responses, combining them with the online results for quarterly and annual reporting.

Seventeen Multifamily Direct Install Program participants, 29 Multifamily Energy Savings Program participants, and two Multifamily New Construction participants responded to the participant satisfaction survey in CY 2017.

Engineering Desk Review

The Evaluation Team conducted a detailed review of all available project documentation in SPECTRUM for a sample of 38 measures from the Multifamily Energy Savings Program, 42 measures from the Multifamily Direct Install Program, and 17 measures from the Multifamily New Construction Program. This review included an assessment of the savings calculations and methodology applied by the Program Implementer. The Evaluation Team relied on the applicable TRMs (2017 TRM and 2017 TRM Update) and other relevant secondary sources as needed. Secondary sources included energy codes and standards, case studies, and energy efficiency program evaluations of applicable measures (based on geography, sector, measure application, and date of issue). For prescriptive measures in Wisconsin, the Focus on Energy TRM and associated workpapers were the primary sources used by the Evaluation Team to determine methodology and data in nearly all cases. For custom and hybrid measures, the Evaluation Team reviewed the Focus on Energy TRM and adjusted inputs and methodologies as necessary based on engineering judgment and project documentation. The evaluation sample for these reviews is selected using a weighted, random stratified sampling approach known as PPS (Probability Proportional to Size, here lifecycle total energy savings).

Verification Site Visits

The Evaluation Team conducted nine verification site visits for the CY 2017 Multifamily Energy Savings Program, 11 verification site visits for the CY 2017 Multifamily Direct Install Program, and four verification site visits for the CY 2017 Multifamily New Construction Program. Site visits involved verifying the type and quantity of equipment installed, determining how the installed equipment is controlled, and documenting the operating hours of the installed equipment.

The Team relied on-site observations of various key parameters in order to determine how best to apply approved Wisconsin methodology. For the Multifamily Direct Install Program, the Team collected data to calculate a measure-specific ISR. The ISR for the Multifamily Direct Install Program offering can be impacted by a number of factors, including a miscount of installed equipment in the provided documentation, or the removal/migration of equipment by residents (residents might remove their showerhead and give to their neighbor, or take with them when their lease is up).

Impact Evaluation

The Evaluation Team used the following methods to conduct an impact evaluation of the Programs:

- Tracking database review
- Engineering desk reviews
- Verification site visits

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data to determine reported installations, then applied the results from engineering desk reviews and verification site visits to calculate verified gross savings.

As a part of the tracking database review, the Team evaluated the census of CY 2017 Multifamily Energy Savings Program, Multifamily Direct Install Program, and Multifamily New Construction Program data contained in SPECTRUM to verify appropriate and consistent application of unit-level savings and effective useful life (EUL) values in alignment with the applicable TRM (2017 TRM and 2017 TRM Update). The Evaluation Team found that the overall accounting of demand and energy savings in the SPECTRUM database was generally accurate and adhered to industry best practices. There were several instances of errors that were corrected in the *ex post* calculations, as described by each program below.

In the Multifamily New Construction Program, there were two modifications that had a substantial effect on the program realization rate:

- The Evaluation Team identified one measure for which savings calculations did not align with the 2017 TRM, the 2017 TRM Update, or current approved workpapers. The Team found that for one prescriptive HVAC measure (MMID #2701), utilized in one project, there were no current or past TRM workpapers from which to model calculations. For this project, the Team utilized the Illinois TRM to derive the appropriate formula and standard inputs for this calculation.
- For one prescriptive boiler measure (MMID #2743), utilized in one project, the Team found that the input capacity of the boiler system was used instead of the TRM specified rated capacity. The Team adjusted the verified savings from this measure using rated capacity inputs.

In the Multifamily Direct Install Program, there were three modifications that had a substantial effect on the program realization rate. The Evaluation Team found that savings calculations for measures MMID #2156, MMID #2155, and MMID #2139 did not align with the 2017 TRM, the 2017 TRM Update, or current approved workpapers. In the absence of current workpapers for these measures, the Team adjusted the verified savings from them using a draft TRM workpaper. These modifications affected 10 projects related to low flow bathroom aerator and showerhead installations.

In the Multifamily Energy Savings Program, there were four modifications that had a substantial effect on the program realization rate:

- The Team identified a steam trap measure (MMID #3271) that was incorrectly applied. This measure ID refers to systems with less than 50 pounds per square inch (psi) steam delivery, but

the project's steam delivery system ranged from 1.5 to 3 psi. The Team adjusted the project's verified savings using the more appropriate measure (MMID #2772, designed for systems with <10 psi). This single project accounted for 14% of the evaluation sample savings and therefore significantly influenced the overall program realization rate.

- The Team made a sizable adjustment to one hybrid measure (MMID #2249) based on observed operating parameters (shutoff temperatures), which differed from the proposed design that formed the basis of the *ex ante* calculations, and resulted in greater verified savings.
- For one prescriptive lighting measure (MMID #2564), used in one project, the Team found that there were no current or past TRM workpapers from which to model calculations. For this project, the Team used the New York TRM and MMID #3746 to derive the appropriate formula and standard inputs for this calculation, resulting in greater verified savings.
- For one prescriptive lighting measure (MMID #3954), related to common area bulb replacement, the Team found that the incorrect measure was used and that the rate of bulb installation was very low. The bulbs were meant for in-unit installation (MMID #3959) and only 74 of the total 600 were installed at the time of the verification site visit. The verification calculations were adjusted to reflect these two modifications.

In-Service Rates

The ISR represents the percentage of measures still installed, in use, and operating properly following installation by the Program Implementer. In CY 2017, participant surveys were not conducted, so the Evaluation Team derived the ISR from the combined weighted average ISRs of CY 2015 and CY 2016. The Team also conducted site visits to verify the installed measures and calculate a site-specific ISR. The Team applied a combined, weighted ISR of 96% to all Multifamily Energy Savings Program and Multifamily New Construction engineering reviews without a completed site visit. For Multifamily Direct Install, the Team applied a weighted average ISR of 97% for all measures, based on CY 2015 and CY 2016 evaluations. The Evaluation Team applied a site-specific ISR to all measures where verification site visits were performed.

CY 2017 Verified Gross Savings Results

Table 3, Table 4, and Table 5 present the annual and lifecycle realization rates for the CY 2017 Multifamily Program offerings. Overall, the Multifamily Programs achieved first-year evaluated realization rates below 100%, weighted by total MMBtu energy savings.[3] First-year and lifecycle realization rates are generally the same for a given demand reduction or energy savings type unless they are influenced by an EUL adjustment.

[3] The Evaluation Team calculated realization rates by dividing annual verified gross savings by *ex ante* savings.

Table 3. CY 2017 Multifamily Energy Savings Program Annual and Lifecycle Realization Rates

Annual Realization Rate				Lifecycle Realization Rate		
kWh	kW	Therms	MMBtu	kWh	therms	MMBtu
90%	95%	87%	89%	97%	93%	96%

Table 4. CY 2017 Multifamily Direct Install Program Annual and Lifecycle Realization Rates

Annual Realization Rate				Lifecycle Realization Rate		
kWh	kW	Therms	MMBtu	kWh	therms	MMBtu
94%	88%	83%	89%	94%	83%	91%

Table 5. CY 2017 Multifamily New Construction Program Annual and Lifecycle Realization Rates

Annual Realization Rate				Lifecycle Realization Rate		
kWh	kW	Therms	MMBtu	kWh	therms	MMBtu
64%	101%	94%	79%	74%	93%	83%

Table 6, Table 7, and Table 8 list the *ex ante* and verified annual gross savings for the CY 2017 Multifamily Programs.

Table 6. CY 2017 Multifamily Energy Savings Program Annual Gross Savings Summary

Measure	*Ex Ante Gross First Year*			Verified Gross First Year		
	kWh	kW	Therms	kWh	kW	Therms
Aeration	0	0	0	0	0	0
Boiler	0	0	57,751	0	0	50,031
Chiller	174,244	19	0	157,585	18	0
Controls	382,921	19	2,039	346,310	18	1,766
Delamping	35,343	5	0	31,964	4	0
Fluorescent, Compact (CFL)	59,594	5	0	53,896	5	0
Fluorescent, Linear	95,863	12	0	86,698	11	0
Furnace	3,500	1	553	3,165	1	479
Insulation	7,583	1	30,543	6,858	1	26,461
Light Emitting Diode (LED)	7,977,455	750	0	7,214,732	710	0
Motor	34,090	6	0	30,830	6	0
Other	20,184	2	10,683	18,254	2	9,255
Packaged Terminal Unit (PTAC, PTHP)	300	0	0	271	0	0
Rooftop Unit/Split System AC	5,540	9	0	5,010	9	0
Steam Trap	0	0	51,331	0	0	44,470
Variable Speed Drive	123,755	4	0	111,923	4	0
Water Heater	32,227	4	160	29,146	3	139
Total First Year	**8,952,599**	**835**	**153,060**	**8,096,642**	**791**	**132,601**

Table 7. CY 2017 Multifamily Direct Install Program Annual Gross Savings Summary

Measure	*Ex Ante Gross First Year*			Verified Gross First Year		
	kWh	kW	Therms	kWh	kW	Therms
Aeration	871,152	55	58,554	817,300	49	48,803
Controls	12,917	0	1,169	12,119	0	975
Insulation	150,030	0	1,770	140,755	0	1,475
Light Emitting Diode (LED)	2,293,282	171	0	2,151,517	151	0
Other	212,041	0	0	198,933	0	0
Showerhead	950,800	40	64,698	892,024	36	53,923
Total First Year	**4,490,222**	**268**	**126,190**	**4,212,647**	**235**	**105,175**

Table 8. CY 2017 Multifamily New Construction Program Annual Gross Savings Summary

Measure	*Ex Ante Gross First Year*			Verified Gross First Year		
	kWh	kW	Therms	kWh	kW	Therms
Aeration	46,160	3	13,731	29,764	3	12,875
Boiler	0	0	26,638	0	0	24,975
Clothes Washer	9,855	0	0	6,354	0	0
Fluorescent, Linear	10,152	1	0	6,546	1	0
Furnace	79,500	32	12,561	51,261	32	11,777
Light Emitting Diode (LED)	1,962,939	208	0	1,265,685	210	0
Other	20,493	0	31,745	13,214	0	29,764
Packaged Terminal Unit (PTAC, PTHP)	220,668	-1	0	142,285	-1	0
Rooftop Unit/Split System AC	32,612	105	0	21,028	107	0
Variable Speed Drive	98,285	11	0	63,213	11	0
Water Heater	821	0	25	529	0	23
Total First Year	**2,481,485**	**360**	**84,700**	**1,600,039**	**364**	**79,415**

Table 9, Table 10, and Table 11 list the *ex ante* and verified gross lifecycle savings by measure category for the Multifamily Programs in CY 2017.

Table 9. CY 2017 Multifamily Energy Savings Program Lifecycle Gross Savings Summary

Measure	*Ex Ante Gross First Year*			Verified Gross First Year		
	kWh	kW	Therms	kWh	kW	Therms
Aeration	0	0	0	0	0	0
Boiler	0	0	1,155,518	0	0	1,079,449
Chiller	3,484,880	19	0	3,388,301	18	0
Controls	3,063,160	19	10,199	2,978,269	18	9,528
Delamping	353,430	5	0	343,635	4	0
Fluorescent, Compact (CFL)	769,985	5	0	748,646	5	0
Fluorescent, Linear	1,437,945	12	0	1,398,094	11	0
Furnace	63,000	1	9,954	61,254	1	9,299
Insulation	189,618	1	561,272	184,363	1	524,323
Light Emitting Diode (LED)	101,320,682	750	0	98,512,721	710	0
Motor	613,575	6	0	596,570	6	0
Other	236,039	2	160,244	229,498	2	149,695
Packaged Terminal Unit (PTAC, PTHP)	4,500	0	0	4,375	0	0
Rooftop Unit/Split System AC	83,102	9	0	80,799	9	0
Steam Trap	0	0	307,985	0	0	287,710
Variable Speed Drive	1,856,424	4	0	1,804,976	4	0
Water Heater	483,405	4	2,304	470,008	3	2,152
Total Lifecycle	**113,959,745**	**835**	**2,207,476**	**110,801,510**	**791**	**2,062,155**

Table 10. CY 2017 Multifamily Direct Install Program Lifecycle Gross Savings Summary

Measure	*Ex Ante Gross First Year*			Verified Gross First Year		
	kWh	kW	Therms	kWh	kW	Therms
Aeration	8,715,096	55	585,537	8,233,237	49	488,025
Controls	79,445	0	17,544	75,052	0	14,622
Insulation	2,250,444	0	26,474	2,126,017	0	22,065
Light Emitting Diode (LED)	44,956,856	171	0	42,471,183	151	0
Other	2,120,402	0	0	2,003,165	0	0
Showerhead	9,508,000	40	646,976	8,982,301	36	539,232
Total Lifecycle	**67,630,243**	**268**	**1,276,531**	**63,890,954**	**235**	**1,063,945**

Table 11. CY 2017 Multifamily New Construction Program Lifecycle Gross Savings Summary

Measure	*Ex Ante Gross First Year*			Verified Gross First Year		
	kWh	kW	Therms	kWh	kW	Therms
Aeration	438,406	3	137,864	323,327	3	128,898
Boiler	0	0	532,906	0	0	498,250
Clothes Washer	108,405	0	0	79,949	0	0
Fluorescent, Linear	152,280	1	0	112,307	1	0
Furnace	1,431,000	32	226,098	1,055,370	32	211,394
Light Emitting Diode (LED)	34,920,158	208	0	25,753,791	210	0
Other	204,275	0	476,179	150,654	0	445,212
Packaged Terminal Unit (PTAC, PTHP)	3,310,020	-1	0	2,441,156	-1	0
Rooftop Unit/Split System AC	489,180	105	0	360,773	107	0
Variable Speed Drive	1,474,286	11	0	1,087,293	11	0
Water Heater	12,565	0	250	9,267	0	234
Total Lifecycle	**42,540,575**	**360**	**1,373,297**	**31,373,887**	**364**	**1,283,988**

CY 2017 Verified Net Savings Results

The Evaluation Team did not perform any new participant surveys in CY 2017 for any of the three multifamily offerings and, therefore, did not calculate new freeridership or spillover estimates. The net-to-gross (NTG) ratio for the CY 2017 Multifamily Energy Savings Program was determined using the same program's CY 2015 and CY 2016 net savings data (sum of net savings from CY 2015 and CY 2016, divided by the sum of the gross savings from CY 2015 and CY 2016), which was based on participant surveys in CY 2015 and CY 2016. This yielded an overall NTG estimate of 81% for the Multifamily Energy Savings Program. This NTG value for the Multifamily Energy Savings Program was applied to the Multifamily New Construction program as well because the New Construction program was new in CY 2017; no past data for New Construction was available and the Energy Savings Program provided the best available data to apply to NTG.

The Multifamily Direct Install Program has historically been deemed at an NTG of 100% since it is a direct install offering, and this is an accepted industry practice for direct install programs.

Table 12 shows total annual gross and net savings and NTG ratios for all three Multifamily programs.

Table 12. CY 2017 Annual Net Savings and NTG

Program	Total Annual Gross Verified Savings (MMBtu)	Total Annual Net Savings (MMBtu)	Program NTG Ratio
Multifamily Energy Savings Program	40,886	32,939	81%
Multifamily Direct Install Program	24,891	24,891	100%
Multifamily New Construction Program	13,401	10,796	81%

Table 13, Table 14, and Table 15 show the annual net demand and energy impacts (kWh, kW, and therms) by measure category for the Multifamily offerings. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 13. CY 2017 Multifamily Energy Savings Program Annual Net Savings

Measure Category	Annual Net Savings		
	kWh	kW	therms
Aeration	0	0	0
Boiler	0	0	40,307
Chiller	126,955	14	0
Controls	278,998	14	1,423
Delamping	25,751	4	0
Fluorescent, Compact (CFL)	43,421	4	0
Fluorescent, Linear	69,846	9	0
Furnace	2,550	1	386
Insulation	5,525	1	21,318
Light Emitting Diode (LED)	5,812,418	572	0
Motor	24,838	4	0
Other	14,706	2	7,456
Packaged Terminal Unit (PTAC, PTHP)	219	0	0
Rooftop Unit/Split System AC	4,036	7	0
Steam Trap	0	0	35,826
Variable Speed Drive	90,169	3	0
Water Heater	23,481	3	112
Total First Year	**6,522,913**	**637**	**106,828**

Table 14. CY 2017 Multifamily Direct Install Program Annual Net Savings Summary

Measure Category	Annual Net Savings		
	kWh	kW	therms
Aeration	817,300	49	48,803
Controls	12,119	0	975
Insulation	140,755	0	1,475
Light Emitting Diode (LED)	2,151,517	151	0
Other	198,933	0	0
Showerhead	892,024	36	53,923
Total First Year	**4,212,647**	**235**	**105,175**

Table 15. CY 2017 Multifamily New Construction Program Annual Net Savings Summary

Measure Category	Annual Net Savings		
	kWh	kW	therms
Aeration	23,978	2	10,372
Boiler	0	0	20,121
Clothes Washer	5,119	0	0
Fluorescent, Linear	5,274	1	0
Furnace	41,297	26	9,488
Light Emitting Diode (LED)	1,019,677	170	0
Other	10,645	0	23,979
Packaged Terminal Unit (PTAC, PTHP)	114,629	-1	0
Rooftop Unit/Split System AC	16,941	86	0
Variable Speed Drive	51,056	9	0
Water Heater	426	0	19
Total First Year	**1,289,043**	**293**	**63,979**

Table 16, Table 17, and Table 18 list the lifecycle net demand and energy impacts (kWh, kW, and therms) by measure category for the Multifamily offerings.

Table 16. CY 2017 Multifamily Energy Savings Program Lifecycle Net Savings

Measure Category	Lifecycle Net Savings		
	kWh	kW	therms
Aeration	0	0	0
Boiler	0	0	869,639
Chiller	2,729,724	14	0
Controls	2,399,388	14	7,676
Delamping	276,843	4	0
Fluorescent, Compact (CFL)	603,133	4	0
Fluorescent, Linear	1,126,349	9	0
Furnace	49,348	1	7,491
Insulation	148,529	1	422,411
Light Emitting Diode (LED)	79,364,985	572	0
Motor	480,616	4	0
Other	184,891	2	120,599
Packaged Terminal Unit (PTAC, PTHP)	3,525	0	0
Rooftop Unit/Split System AC	65,094	7	0
Steam Trap	0	0	231,788
Variable Speed Drive	1,454,146	3	0
Water Heater	378,653	3	1,734
Total Lifecycle	**89,265,225**	**637**	**1,661,338**

Table 17. CY 2017 Multifamily Direct Install Program Lifecycle Net Savings

Measure Category	Lifecycle Net Savings		
	kWh	kW	therms
Aeration	8,233,237	49	488,025
Controls	75,052	0	14,622
Insulation	2,126,017	0	22,065
Light Emitting Diode (LED)	42,471,183	151	0
Other	2,003,165	0	0
Showerhead	8,982,301	36	539,232
Total Lifecycle	**63,890,954**	**235**	**1,063,945**

Table 18. CY 2017 Multifamily New Construction Program Lifecycle Net Savings

Measure Category	Lifecycle Net Savings		
	kWh	kW	therms
Aeration	260,482	2	103,845
Boiler	0	0	401,406
Clothes Washer	64,410	0	0
Fluorescent, Linear	90,478	1	0
Furnace	850,239	26	170,306
Light Emitting Diode (LED)	20,748,074	168	0
Other	121,372	0	358,677
Packaged Terminal Unit (PTAC, PTHP)	1,966,673	-1	0
Rooftop Unit/Split System AC	290,650	85	0
Variable Speed Drive	875,958	9	0
Water Heater	7,466	0	188
Total Lifecycle	**25,275,802**	**293**	**1,034,422**

Process Evaluation

In CY 2017, the Evaluation Team conducted interviews and a participant satisfaction survey focused on these key topics for the Multifamily Programs:

- Property owner and manager satisfaction with components of the Multifamily Programs
- Barriers to participation and opportunities in other market segments, particularly with mixed-use and condominium properties
- Trade Ally engagement, satisfaction, and value propositions
- Satisfaction with the data tracking processes and coordination between the Program Administrator and Program Implementer

The Evaluation Team also used these interviews and surveys to follow up on issues identified in the CY 2016 process evaluation recommendations:

- Tracking leads and future opportunities through SPECTRUM
- Implementing strategies to increase awareness and long-term engagement among previous participants

Program Design, Delivery, and Goals

Focus on Energy began offering its Multifamily Programs in CY 2001, providing prescriptive and custom incentives through the Multifamily Energy Savings Program. In CY 2017, Focus on Energy introduced the Multifamily New Construction Program and discontinued the Multifamily Direct Install Program at the end of the year.

Multifamily Energy Savings Program Design

Through the Multifamily Energy Savings Program, Focus on Energy offers prescriptive incentives for eligible retrofit projects. Property owners may also take advantage of increased retrofit prescriptive incentives through the Common Area Lighting Package (CALP) and custom incentives available for performance-based retrofit projects.

The Program Implementer introduced CALP in CY 2013 and revised its incentive structure in CY 2017. Participating property owners and managers provide a co-pay that is determined by the amount of wattage reduced, to receive the following common area lighting upgrades:[4]

- LED fixtures, exit signs, retrofit kits, and linear lamps
- Occupancy sensors
- Low ballast factor T8 ballasts and lamps

The Program Implementer also revised the CALP application in CY 2017 so that it mirrors the catalog format used for all Multifamily Energy Savings Program prescriptive offerings. It also introduced T8 LED, linear retrofit LED kits, and screw-in or pin-based LED products in common areas as part of the CY 2017 CALP offerings.

Only registered Trade Allies are eligible to promote CALP, and only specific Trade Allies (currently 12) are authorized to deliver CALP.[5] These Trade Allies may receive CALP leads from the Multifamily Direct Install Program, or they may find participants through their own marketing efforts. CALP contributions to the Multifamily Energy Savings Program savings increased considerably from CY 2016 to CY 2017 (from 2% of the Program lifecycle MMBtus in CY 2016 to 11% in CY 2017). Table 19 shows *ex ante* electric savings for CALP measures from CY 2015 to CY 2017.

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[4] Fixtures must operate for 12 or more hours per day

[5] The list of authorized CALP Trade Allies is available on the Focus on Energy website: https://focusonenergy.com/sites/default/files/Application_PDFs/CALP_TA_List.pdf

Table 19. CALP Lifecycle Electric Savings

CALP Measure	CY 2017 *Ex Ante* Gross Lifecycle kWh	CY 2016 *Ex Ante* Gross Lifecycle kWh	CY 2015 *Ex Ante* Gross Lifecycle kWh
CFL fixtures	721,838	342,875	27,292,200
LED fixtures	14,307,725	2,264,729	4,376,159
LED exit signs	1,087,062	1,124,760	2,003,501
Linear Fluorescent Fixtures	410,490	1,628,610	4,266,276
Occupancy Sensors and Controls	672,638	103,837	2,710,851
Total (Percentage of Program MMBtu Contribution)	**17,199,753 (11%)**	**5,464,811 (2%)**	**40,648,987 (12%)**

During interviews, the Program Implementer reported success in engaging Trade Allies and property owners and managers in the CALP offering in CY 2017 but said that maintaining the Program's cost-effectiveness constrained the budget available for CALP and limited participation. In addition, changes to the incentive structure and expansion of the CALP Trade Ally network and the measures offered through CALP increased interest among owners and landlords. For these reasons, the Program Implementer said the offering was fully subscribed within two weeks of launching the CY 2017 CALP promotion.

Property owners and managers are also eligible for energy savings rewards for retrofit projects that do not qualify for prescriptive incentives. Focus on Energy provides custom incentives based on anticipated project energy savings performance. Similar to previous years, it offered a tiered incentive structure for Multifamily Energy Savings Program custom measures (shown in Table 20), providing higher incentives for projects that achieved greater energy savings. Incentive levels did not change from CY 2016 to CY 2017.

Table 20. CY 2017 Multifamily Energy Savings Program: Custom Measure Incentives

Custom Tier	Peak Demand Incentive ($/kW reduced)[1]	Electric Incentive ($/kWh saved)	Natural Gas Incentive ($/therm saved)
Tier 1: <20% Savings over Baseline	$100	$0.05	$0.80
Tier 2: ≥20% Savings over Baseline	$125	$0.07	$1.00

[1] The Program Implementer determined peak demand incentives using the estimated reduction in kW load that occurred between 1:00 p.m. and 4:00 p.m. on weekdays during the months of June, July, and August 2017.

Multifamily Direct Install Program Design

The Program Administrator and Program Implementer designed the Multifamily Direct Install Program to achieve energy savings by installing free energy-efficient measures in multifamily building tenant units. In CY 2017, the Multifamily Direct Install Program offerings shifted from CFLs to LED lamps and introduced LED retrofit kits and linear LED lamps for common spaces. Table 21 lists the Multifamily Direct Install Program measures and installation requirements.

Table 21. Multifamily Direct Install Program Measures and Installation Requirements

Measure	Installation Requirement
Showerhead (1.5 gpm)	Replaces showerhead with flow rate ≥2.0 gpm
Handheld showerhead (1.5 gpm)	Replaces showerhead with flow rate ≥2.0 gpm
Kitchen faucet aerator (1.5 gpm)	Replaces faucet aerator with flow rate ≥2.0 gpm
Bathroom faucet aerator (1.0 gpm)	Replaces faucet aerator with flow rate ≥1.5 gpm
Pre-rinse sprayer (1.28 gpm)	Replaces sprayer with flow rate ≥2.0 gpm
CFL (specialty)	Replaces incandescent or halogen lamps
LED lamps, retrofit kits	Replaces incandescent or halogen lamps
Linear LED lamps	Replaces linear fluorescent lamps
Domestic hot water pipe insulation	Up to nine feet of insulation for water heater piping located in tenant units and/or within common area(s) in unconditioned space
Water heater temperature setback	Existing temperature of 130°F to 150°F reduced to 120°F to 125°F
LED exit sign retrofit	Replaces incandescent lamp or CFLs in common area exit sign(s)
Vending misers	For vending machine(s) located in common areas

In CY 2017k the Program Administrator assessed the potential to shift the program design from a direct install program to a kit program. The Program Administrator reasoned that by opening the eligibility requirements for the Simple Energy Efficiency Program to include multifamily residents, Focus on Energy would increase its reach to multifamily tenants and condo owners. The Program Administrator said that although the Multifamily Direct Install Program delivers value to Focus on Energy through high per-measure savings and exceptional customer satisfaction results, it would be unnecessary to continue this Program in 2018 if a greater number of residents, particularly in underserved areas of the state, can receive similar benefits through its kit program.

Determining that the combination of greater cost-effectiveness and lower non-incentive cost would create higher savings potential, the Program Administrator discontinued the Multifamily Direct Install Program in CY 2018 and revised the eligibility criteria of the Simple Energy Efficiency Program to include multifamily customers.

Multifamily New Construction Program Design

Through the Multifamily New Construction Program, Focus on Energy offers prescriptive incentives for multifamily new construction projects or measures that do not qualify for the Design Assistance Program, such as projects and measures that arise after completing the building design phase or after the Design Assistance Program's funds have been exhausted. Energy Advisors work primarily with developers and property owners to encourage and reward energy-efficient equipment installation.

The Program Implementer and Program Administrator spent the first half of CY 2017 resolving the details of how this Program's theory worked compared to the Design Assistance Program, and how to guide property owners and managers and Trade Allies toward the most appropriate path for their specific projects.

The Program Implementer and Program Administrator determined that the Multifamily New Construction Program should be separate from the Design Assistance Program and be one that could typically capture projects beyond the design phase but with the potential to implement high-efficiency equipment through a prescriptive incentive path.

Because of the delays in launching this Program and difficulties in determining the potential for projects that fall outside the Design Assistance Program's reach, the Program Implementer reported some challenges with establishing a marketing plan and pipeline, and the Program Administrator and Program Implementer decreased the lifecycle savings and demand goals in December 2017.

However, lifecycle *ex ante* electric savings, demand impacts, and lifecycle *ex ante* therm savings achievements increased 99%, 105%, and 84%, respectively, from Q3 to Q4 of the year. The Program Implementer worked on building relationships with the builder and developer network to better understand the project opportunities available to this Program and intends to develop materials and website content that limits the confusion of property developers over whether the Design Assistance Program or the Multifamily New Construction Program is the best path for their project.

Program Management and Delivery Structure

The Program Implementer's Program Manager is supported by Energy Advisors, engineers, field technicians, and staff who handle marketing, Trade Ally engagement, direct installation, and application processing.

For the Multifamily Energy Savings and Multifamily New Construction programs, Energy Advisors conduct outreach marketing to Trade Allies and property managers and owners. For the Multifamily Direct Install Program, Energy Advisors recruit property managers and owners then schedule the installation and recommend any common area opportunities. Program staff then encourage property managers and owners to contact a Trade Ally to pursue future opportunities, including CALP.

Program Goals

The Multifamily Programs' overall objective is to encourage multifamily building owners, managers, and tenants to use more energy-efficient products. The Multifamily Programs' savings goals and results for CY 2017 are shown in Table 22.

Table 22. Multifamily Programs' CY 2017 Goals and Achievements

Performance Metric	CY 2017 Goal	CY 2017 Actual *Ex Ante*
Multifamily Energy Savings Program		
Lifecycle electric savings (kWh)	111,033,413	113,959,745
Lifecycle natural gas savings (therms)	4,420,042	2,207,476
Demand reduction (kW)	956	835
Multifamily Direct Install Program		
Lifecycle electric savings (kWh)	59,988,109	67,630,243
Lifecycle natural gas savings (therms)	1,331,478	1,276,531
Demand reduction (kW)	280	268
Participation (units)	5,700	
Multifamily New Construction Program		
Lifecycle electric savings (kWh)	35,986,392	42,540,575
Lifecycle natural gas savings (therms)	1,552,724	1,373,297
Demand reduction (kW)	349	360

The Multifamily Energy Savings Program, Multifamily Direct Install Program, and Multifamily New Construction Program achieved the *ex ante* electric savings goals but did not achieve the *ex ante* therm savings and demand goals in all areas except one (New Construction Program demand savings).

The Program Implementer tracked KPIs in addition to energy and participation achievements to measure Program performance. The Program Administrator and Program Implementer set achievement goals for the Multifamily Programs to target rural communities and condominiums and coordinate efforts across utility and Program staff in CY 2017 (Table 23). The Program also established property owner and manager satisfaction, application processing, and quality improvement goals specific to its Multifamily New Construction Program offering.

One new CY 2017 goal set across the Multifamily Programs was to develop two quality initiative improvements during the year. The Program Implementer initiated a Quality AccuTracker to document issues with Program or delivery quality and a Quality Action Register to track and document the resolution of quality issues. The Program Implementer said most of the findings involved processing applications with errors or missing documentation and that these issues were resolved prior to submitting to the Program Administrator for fulfillment.

Table 23 shows the KPIs and CY 2017 results as reported by the Program Implementer and that the Evaluation Team verified through SPECTRUM where possible. The Program Implementer reached most of its KPI goals.

Table 23. Multifamily Programs' CY 2017 Key Performance Indicators

KPI	Goal	CY 2017 Result	CY 2017 Result Source
Multifamily Program Portfolio			
Quality Initiative Improvement	Implement two quality initiative improvements	Reached goal (implemented Quality AccuTracker and Quality Action Register)	Reported by Program Implementer
Multifamily Energy Savings Program			
Satisfaction	Maintain or improve the CY 2015 overall satisfaction score of 8.75 (on a scale of 0 to 10)	Reached goal (9.2)	Evaluation Team's ongoing participant satisfaction survey
Support Marketing Efforts	Provide Program Administrator at least four success stories	Did not reach goal (3 stories)	Reported by Program Implementer
	Coordinate at least two direct mail marketing efforts with utilities	Reached goal (2 mailings)	Reported by Program Implementer
Rural Territory Reach	20% of buildings in communities with a population under 30,000	Reached goal (40%)	Reported by Program Implementer
Processing Time	32 days from receipt of prescriptive application to providing incentive payment	Reached goal (27)	SPECTRUM. Application Received/Received Complete Date compared to Date of Status Change to Paid
Multifamily Direct Install Program			
Satisfaction	Maintain or improve the CY 2015 overall satisfaction score of 8.3 (on a scale of 0 to 10)	Reached goal (8.6)	Evaluation Team's ongoing participant satisfaction survey
Participant Type	5% of buildings as condominiums	Did not reach goal (4%)	SPECTRUM. Application Options field
Multifamily New Construction Program			
Satisfaction	Maintain or improve the CY 2015 overall satisfaction score of 8.75 (on a scale of 0 to 10)	n/a (only two respondents)	Evaluation Team's ongoing participant satisfaction survey
Processing Time	32 days from receipt of prescriptive application to providing incentive payment	Reached goal (32)	SPECTRUM. Application Received/Received Complete Date compared to Date of Status Change to Paid
Quality Initiative Improvement	Provide outreach to at least 16 new construction decision makers	Reached goal (16 contacts)	Reported by Program Implementer

Data Management and Reporting

The Program Administrator and Program Implementer identified no significant changes to the tracking system or reporting features from CY 2016 to CY 2017. The Program Implementer continued to manage data and generate reports through SPECTRUM. It tracks prospective projects through SPECTRUM upon hearing about them through property owner and manager outreach or when sharing or receiving leads

with its staff for other Focus on Energy programs, and in CY 2017 it began to formally manage these leads and opportunities through SPECTRUM.

Marketing and Outreach

The Program Implementer's CY 2017 operations manual highlighted tactics, campaigns, and objectives for the Multifamily Programs, with targeted outreach to property owners and managers and Trade Allies to increase their awareness and participation and to improve utility coordination. The CY 2017 marketing strategies included the following elements:

- Content for multifamily industry association newsletters, meetings, and tradeshows
- Content for two utility direct mail campaigns
- Direct outreach to targeted property owners and managers with sell sheets and email blasts
- Program success stories, which the Program Administrator posted to the focus on Energy website
- Email blasts, webinars, and sell sheets promoted directly to Trade Allies (including developers, builders, and property owners for the New Construction component)

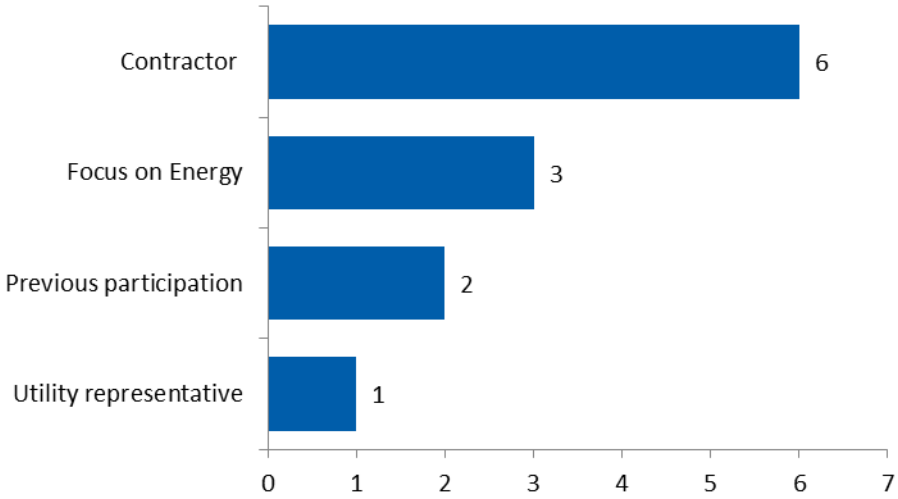
The Program Administrator and Program Implementer continued to report a large barrier to outreach in identifying and targeting property managers and owners who have been previously underserved, specifically members of condo associations and mixed-used property owners. In CY 2017, the Program Implementer performed outreach to condo associations through property management companies and cross-promoted the Multifamily Programs to prospective owners of mixed-use buildings through its Business Incentive Program real estate customer marketing campaign.

The Multifamily Energy Savings Program delivered two new digital campaigns: a virtual multifamily property walk-through that highlighted energy savings opportunities and a maintenance calendar that included tips to use throughout the year. The Program Implementer reported receiving 37 requests to access the virtual walk-through tool and 108 requests to download the maintenance calendar.

Property Owner and Manager Awareness

The Evaluation Team interviewed 12 multifamily property owners and managers who participated in the Multifamily Energy Savings Program in CY 2017. Nine of these said they had worked with Focus on Energy on other projects in the past. Respondents most often learned about the Program incentives for their CY 2017 project through their contractor, followed by Focus on Energy. Figure 5 shows the complete breakdown of responses.

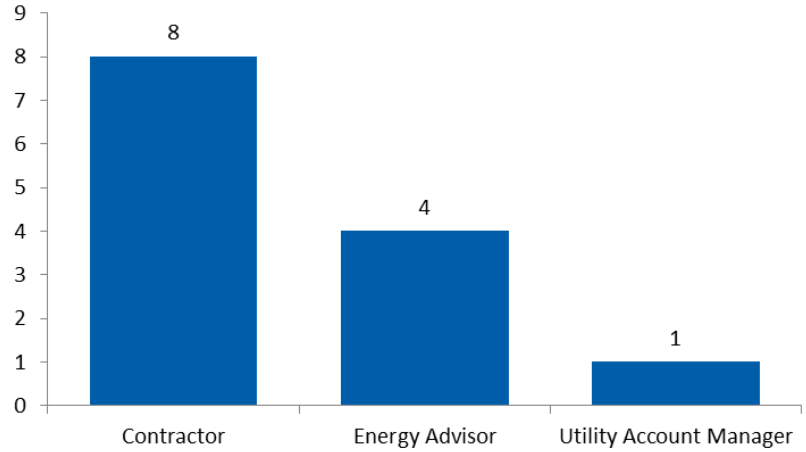
Figure 5. How Property Owners and Managers Learned of Multifamily Energy Savings Program Incentives



Source: CY 2017 Multifamily Energy Savings Program Participant Interview Question B1: "How did your organization learn about the incentives available for this project?" Multiple responses allowed (n=12)

Property owners and managers said contractors were also the most common resource for helping them initiate their projects. Two-thirds of respondents (eight of 12) said contractors were involved in initiating their projects, followed by Energy Advisors (four of 12) and Utility Account Managers (one of 12), with some respondents providing more than one answer, as shown in Figure 6. Two respondents said they were solely involved in initiating their projects and said they used to request assistance from their contractors and Focus on Energy, but now understand the process and can spearhead the projects on their own.

Figure 6. Multifamily Energy Savings Program Project Initiation Source



Source: CY 2017 Multifamily Energy Savings Program Participant Interview Question C1: "I'm going to read you a short list. Please tell me who, if anyone, was involved in helping you initiate your energy efficiency project." (n=12)

The Team asked the four respondents who interacted with an Energy Advisor about their satisfaction with the quality of communication. Three said they were *very satisfied*. One, a property manager, reported being *somewhat satisfied* and said that, although he consulted with the Energy Advisor on products the Program covered, he had purchased an item that did not qualify for an incentive.

Multifamily Programs' Property Owner and Manager Experience

The Evaluation Team conducted two separate research efforts with a sample of building owners and property managers to learn about their experiences participating in the Multifamily Programs:

- Ongoing participant satisfaction survey, administered quarterly, in which the Team collected responses from 29 Multifamily Energy Savings Program and 17 Multifamily Direct Install Program participating property owners and managers
- Participant interviews with 12 Multifamily Energy Savings Program participating property owners and managers whose property has no record of participating in the Multifamily Direct Install Program since CY 2013

The Evaluation Team used these surveys and interviews to investigate decision-making, participation barriers, participation benefits, satisfaction with the Program and its components, likelihood to recommend the Program, and likelihood to initiate another energy efficiency project. During the in-depth participant interviews, the Team also asked respondents about their willingness to let tenants or condo owners install measures from the Simple Energy Efficiency Program kits and to promote the Program to their residents.

Annual Results from Ongoing Participant Satisfaction Survey

Throughout CY 2017, the Evaluation Team surveyed participating building owners and property managers to measure their satisfaction with various aspects of the Multifamily Programs.[6] Respondents answered satisfaction and likelihood questions on a scale of 0 to 10, where 10 indicates the highest satisfaction or likelihood and 0 the lowest.[7]

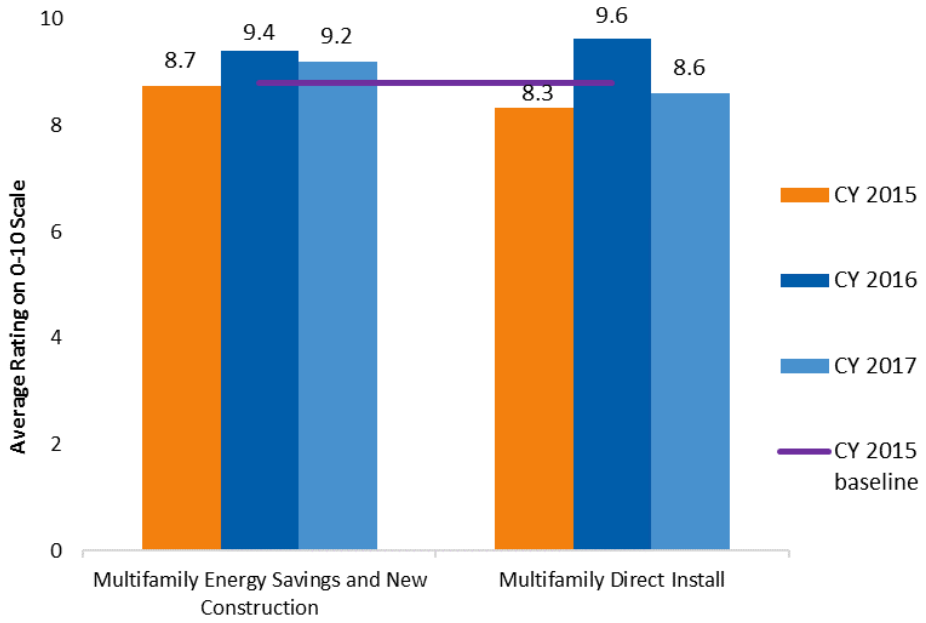
As shown in Figure 7, average ratings for overall satisfaction in CY 2017 are 9.2 for Multifamily Energy Savings and New Construction participants and 8.6 for Multifamily Direct Install Program participants. Satisfaction with Multifamily Direct Install fell by a statistically significant amount from CY 2016 (9.6),

[6] The Evaluation Team found that some surveys did not include identifying information to allow it to match survey responses to program participation dates. Survey responses without participation dates were included in the year-end total but not the quarterly breakdown.

[7] The number of participants who completed a survey does not always match the number of responses for each question, as some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

though there were fewer than 20 surveys for this Program in either year.[8,9] Satisfaction with Multifamily Direct Install in CY 2017 was statistically equivalent to the portfolio baseline of 8.8.[10] Satisfaction ratings from Multifamily Energy Savings and New Construction participants (9.2) are statistically higher than the portfolio baseline, and statistically equivalent to CY 2016 ratings for Multifamily Energy Savings (9.4).[11]

Figure 7. Overall Multifamily Programs Satisfaction



Source: Multifamily Energy Savings Program, Multifamily New Construction, and Multifamily Direct Install Program Ongoing Participant Satisfaction Survey Question: "Overall, how satisfied are you with the Program?" (Multifamily Energy Savings Program CY 2015 n=87, CY 2016 n=35, CY 2017 n=31 including two Multifamily New Construction responses; Multifamily Direct Install Program CY 2015 n=22, CY 2016 n=16, CY 2017 n=17) The portfolio baseline (8.8) is indicated by a purple line.

As shown in Figure 8, CY 2017 Multifamily Energy Savings and New Construction Program participants, on average, rated their satisfaction with the upgrades they received as 9.4, while Multifamily Direct Install Program participants' ratings averaged 8.7. Ratings for upgrades in both programs were statistically equivalent to CY 2016.

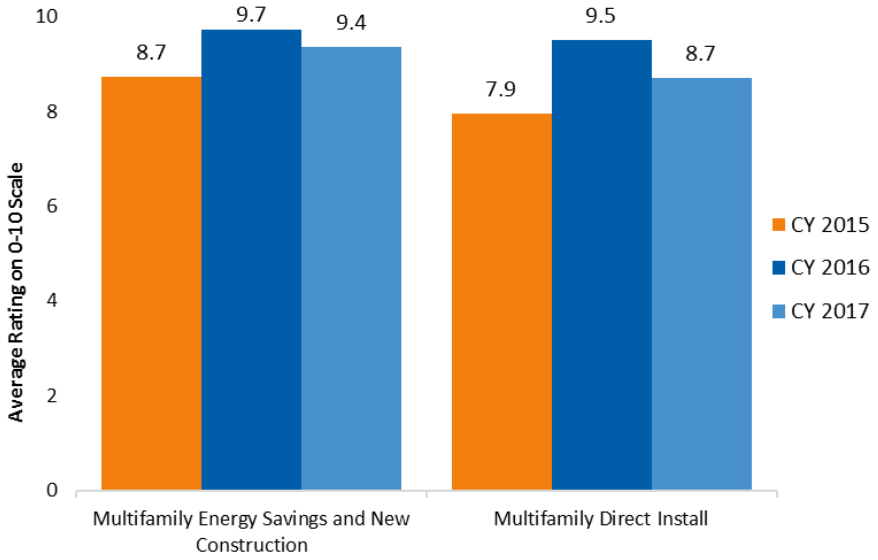
[8] Two of the 31 respondents included in this section's Multifamily Energy Savings Program findings were Multifamily New Construction program participants

[9] $p < 0.10$ using binomial t-test.

[10] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[11] $p < 0.05$ using binomial t-test.

Figure 8. Satisfaction with Multifamily Program Upgrades

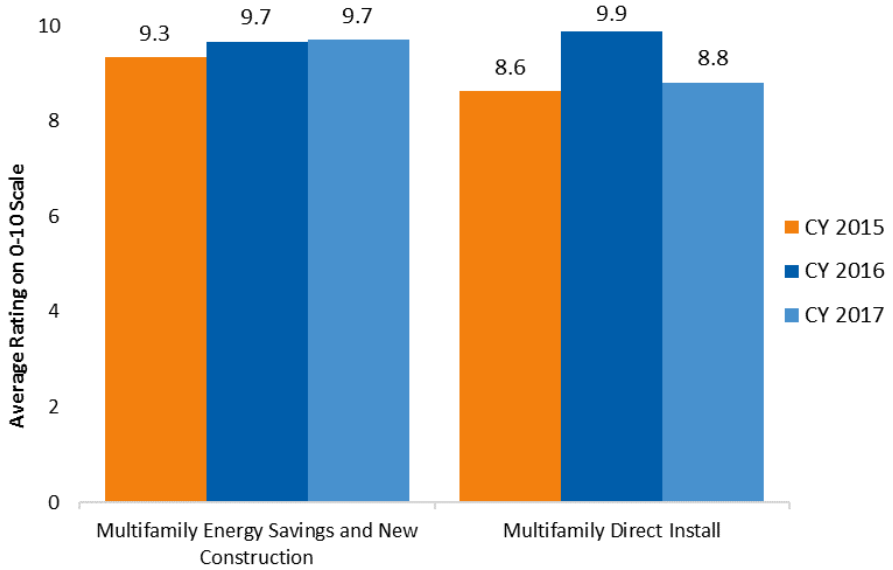


Source: Multifamily Energy Savings Program, Multifamily New Construction, and Multifamily Direct Install Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient upgrades you received?" (Multifamily Energy Savings Program CY 2015 n=81, CY 2016 n=33, CY 2017 n=30 including two Multifamily New Construction responses; Multifamily Direct Install Program CY 2015 n=19, CY 2016 n=16, CY 2017 n=16)

Participants gave the Focus on Energy staff who assisted them high satisfaction ratings, averaging 9.7 among Multifamily Energy Savings Program participants and 8.8 among Multifamily Direct Install Program participants (Figure 9). Compared to CY 2016, the CY 2017 decrease in staff ratings from Multifamily Direct Install Program participants was statistically significant, though there were fewer than 20 survey responses for either year.[12]

[12] $p < 0.05$ using binomial t-test.

Figure 9. Multifamily Program Satisfaction with Focus on Energy Staff

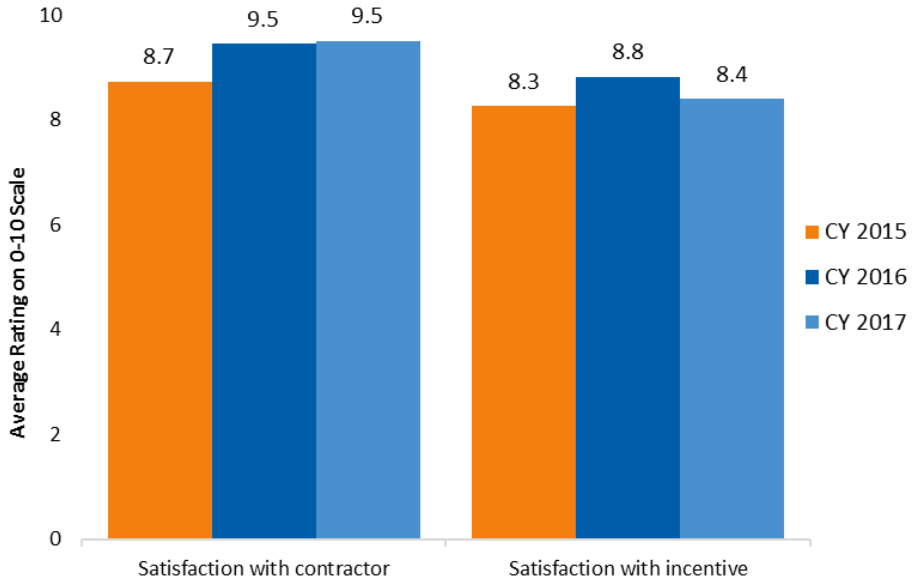


Source: Multifamily Energy Savings Program, Multifamily New Construction, and Multifamily Direct Install Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the Focus on Energy staff who assisted you?" (Multifamily Energy Savings Program CY 2015 n=76, CY 2016 n=26, CY 2017 n=22 including two Multifamily New Construction responses; Multifamily Direct Install Program CY 2015 n=21, CY 2016 n=16, CY 2017 n=17)

The Evaluation Team asked Multifamily Energy Savings Program participants to rate their satisfaction with the contractor who performed services for them, and with the amount of incentive they received.[13] Figure 10 shows the average contractor satisfaction rating was 9.5, statistically equivalent to CY 2016 participants' ratings. Multifamily Energy Savings and Multifamily New Construction Program participants, on average, rated their satisfaction with the incentive amount as 8.4, which was not significantly different from CY 2016.

[13] The Evaluation Team did not ask Multifamily Direct Install Program participants either of these questions because they are not relevant to the Program design and delivery structure. Multifamily New Construction Program participants were not asked to rate contractors, but they did rate their Program incentive.

Figure 10. Multifamily Energy Savings Program Satisfaction with Contractor and Program Incentives

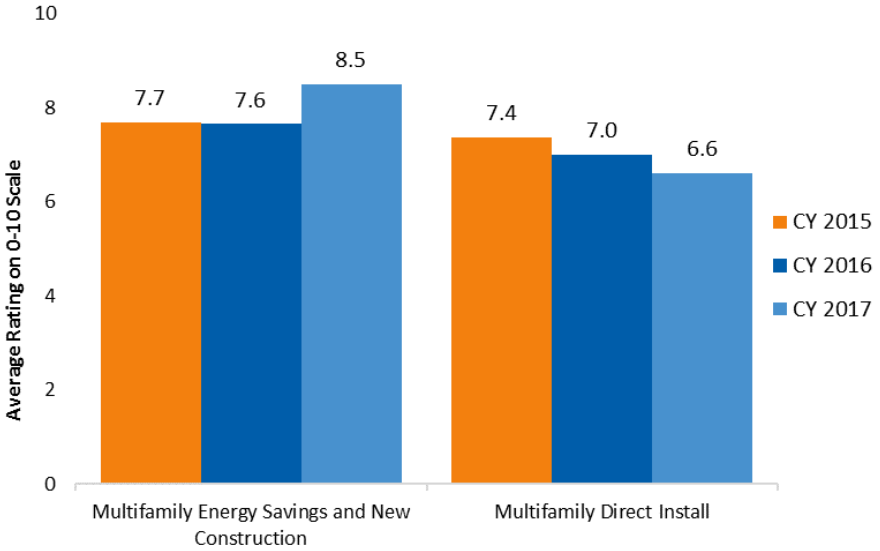


Source: Multifamily Energy Savings Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the contractor who provided the service?" (CY 2015 n=77, CY 2016 n=31, CY 2017 n=27) and Multifamily Energy Savings Program and Multifamily New Construction Program Survey Question: "How satisfied are you with the amount of incentive you received?" (CY 2015 n=85, CY 2016 n=33, CY 2017 n=31 including two Multifamily New Construction responses).

Figure 11 shows the likelihood of respondents to initiate another energy efficiency project in the next 12 months. Multifamily Energy Savings and Multifamily New Construction Program participants, on average, rated the likelihood to implement another project at 8.5, while Multifamily Direct Install participants' ratings averaged 6.6. Neither of these ratings was significantly different from likelihood ratings participants provided in CY 2016.

For participants in the Multifamily Direct Install Program, the survey included a question about what projects they intend to accomplish in the next 12 months. Two respondents who mentioned specific equipment planned to install lighting, insulation, and windows.

Figure 11. Likelihood of Initiating Energy Efficiency Improvement



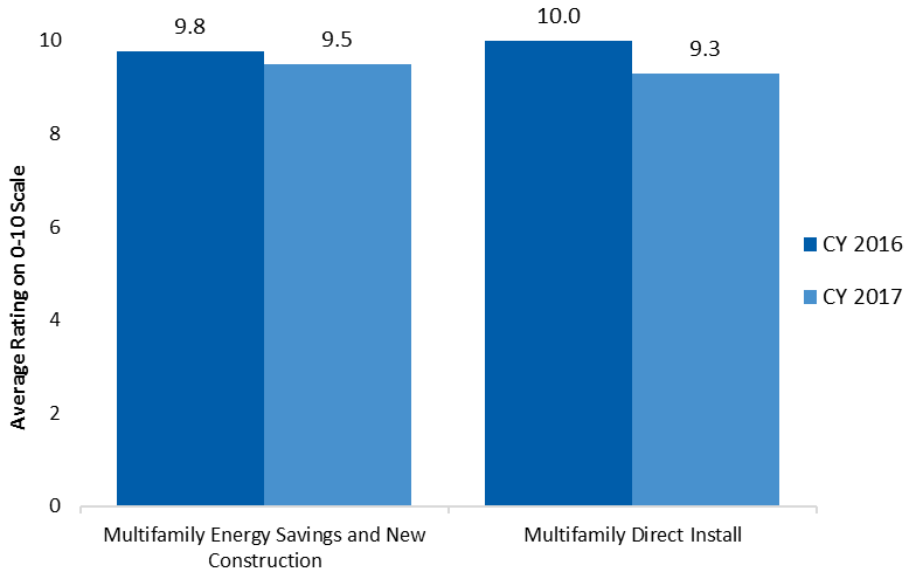
Source: Multifamily Energy Savings Program, Multifamily New Construction Program, and Multifamily Direct Install Program Ongoing Participant Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (Multifamily Energy Savings Program CY 2015 n=79, CY 2016 n=34, CY 2017 n=29 including two Multifamily New Construction Program responses; Multifamily Direct Install Program CY 2015 n=19, CY 2016 n=10, CY 2017 n=14)

Figure 12 shows that respondents' ratings for the likelihood they would recommend this Program to others was 9.5 among Multifamily Energy Savings and Multifamily New Construction Program participants and 9.3 among Multifamily Direct Install Program participants.[14] Using these survey data, the Evaluation Team calculated a net promoter score (NPS) based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6).

The combined Multifamily Energy Savings and Multifamily New Construction Program NPS is +84, based on 27 of 31 participants identifying as promoters and one identifying as a detractor. The Multifamily Direct Install Program NPS is +86, based on 13 of 14 participants identifying as promoters and one identifying as a detractor.

[14] Customers who said they already have recommended the Program were counted in mean ratings as a rating of 10 (most likely).

Figure 12. CY 2016 Likelihood of Recommending the Program



Source: Multifamily Energy Savings Program, Multifamily New Construction Program, and Multifamily Direct Install Program Ongoing Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to others?" (Multifamily Energy Savings Program CY 2016 n=35, CY 2017 n=31 including two Multifamily New Construction Program responses; Multifamily Direct Install Program CY 2016 n=15, CY 2017 n=14)

The ongoing participant satisfaction surveys also included questions about whether respondents had any comments or suggestions for improving the Programs.

Of the 31 participants who responded to the Multifamily Energy Savings Program and New Construction surveys, 8 (26%) provided open-ended feedback. Of these comments, five were positive or complimentary (63%), and three were suggestions for improvement (38%). All of the positive comments complimented the Program staff and Trade Allies or expressed a generally positive experience. The three suggestions for improvement included increasing Program scope (offer incentives for electric water heaters), improving communications (notify customers of available programs), and contractors providing more accurate information about incentives.

Of the 17 participants who responded to the Multifamily Direct Install Program survey, four (24%) provided open-ended feedback, and all of their comments were suggestions for improvement. Two suggested that participants should be allowed to keep the old lighting and aerators that were removed by installation contractors. One suggested that the Program should have provided outdoor and basement lighting, as well as motion detectors. The fourth respondent reported that some Program equipment had failed, and that the Program installers were "poorly behaved."

The Multifamily Direct Install Program survey included a question to ask if respondents had any specific comments or suggestions regarding the Focus on Energy staff who had assisted them: 11 participants made comments, and six of these comments were complimentary (55%). The other five comments were suggestions for improvement, with one comment each about: rushing the job, not cleaning up a

worksite, not letting the customer keep their old, removed measures, scheduling problems, and rudeness.

Multifamily Direct Install Program respondents were also asked if they had concerns about any of the measures installed through the Program. Fourteen of the 17 survey respondents did not have concerns about any measures (82%), though three had concerns about showerheads, two mentioned concerns regarding lighting, and one mentioned concern with efficient aerators. Statements about aerators all specified that tenants had complained about low water pressure.

Multifamily Energy Savings Program Property Owner and Manager Interviews

Through the Multifamily Energy Savings Program property owner and manager interviews, respondents shared their Program participation experiences in a discussion format. Building owners and property managers answered questions about decision-making influences, participation barriers, and benefits to participation and gave their reactions to changes in the eligibility requirements for the Simple Energy Efficiency Program. The 12 respondents represented the following ownership models or building characteristics:

- 2 condominium associations
- 10 standard residential apartment buildings without commercial leased space (two of these properties funded and managed through a housing authority)
- 10 owned or managed at least one other multifamily property in Wisconsin

Property Owner and Manager Decision Influences

The 12 respondents represented a variety of organizational roles: six were property managers, two identified as both property managers and owners, three were maintenance or facilities managers, and one was the property owner.

Both condominium (owner-occupied) building managers said they are required to obtain approval for building upgrades from a board of directors.

Of 10 apartment (tenant-occupied) respondents, nine said multiple decision-makers in their organization must be involved in order to proceed with capital upgrades for their buildings. Decision-makers include property managers and/or property owners/presidents (eight of 10), housing authority boards of directors where there is no owner (two of 10), facility maintenance directors or managers (three of 10), and chief financial officers (one of 10).

To determine if differences in ownership and leasing models affect how property managers and owners make decisions about building upgrades, the Team asked condo and housing authority property manager respondents to share details about their decision-making process.

The two condo association respondents said building upgrade decision making is fairly standardized, starting with a recommendation from a condo owner, maintenance staff, or board staff member to assess building needs, followed by a request for proposals and vendor selection. Both property

managers said building upgrades that exceed the operating budget (respondents reported annual maintenance budgets of $2,000 and $4,000) require the approval of the board of directors, and upgrades exceeding the maintenance budget require the approval of both condo owners and the board of directors. If the board and association decide to replace equipment before failure, and funds are not presently available, the project budget is allocated to a future year.

The process is similar for housing authorities as for condo associations. Respondents said board approval is required on projects exceeding the property's operating budget.

Kit Product Installations

The Evaluation Team asked respondents for feedback on changes to participant eligibility for the Simple Energy Efficiency Program to understand how receptive property managers and owners would be to occupants installing energy- and water-saving products in the units. The Evaluation Team first explained that the Simple Energy Efficiency Program offers homeowners products such as LEDs, efficient showerheads, faucet aerators, pipe insulation, water heater temperature cards, and advanced power strips, along with installation instructions. The Team then said Focus on Energy planned to change the Program's design so tenants and condo owners of multifamily buildings could also order and install the kits themselves.

Respondents shared the likelihood that their company would allow residents to install the measures. All 12 respondents were willing to let tenants or condo owners install and use an advanced power strip in their units. However, responses for the remaining kit contents varied by property type.

Both condo building property respondents said their organizations would let condo owners install all of the kit contents, but one said the organization would require association involvement when installing pipe insulation or using the water heater temperature card to adjust the water heater thermostat because the property used a central water heating system.

Eight of 10 apartment building property respondents were supportive of their tenants installing the kits' light bulbs but were hesitant to let residents install any measures related to water heater savings. Two said they would let their tenants install the water-saving showerhead with reservations. Of these, one said that facility staff would normally be responsible for this installation but would let tenants install the item themselves. The other would consider letting tenants' family members install the showerhead but, because the property's tenants are elderly, would not be comfortable with these residents performing the installation. All 10 apartment building property respondents said they would not let their tenants install the bath faucet aerators or the pipe insulation or use the temperature cards to adjust their water heater thermostats. When the Team asked respondents why they had reservations with tenants installing the showerheads and faucet aerators, most identified concerns with property damage.

The following are examples of respondents' concerns:

- "No, we want to [perform the installation]. A mistake could be very expensive, and the tenant may not tell us right away if there is a mistake."
- "We would have one of our managers install that for them, just to make sure it's installed properly."
- "We wouldn't want them installing anything related to plumbing themselves because if they do it improperly we would have to have someone out to fix it."

Nine of the 10 respondents who said they would not allow apartment tenants to install pipe insulation or use the temperature card to adjust their water heater thermostat gave these reasons: eight said tenants do not have access to their pipes and water heaters, and seven said the building provides hot water through a central system. The other respondent said that although some units have their own water heater and access to the pipes, the property owner would prefer to install the insulation and would not allow tenants to adjust the temperature because each tenant's hot water preferences are subjective. The respondent who manages a senior apartment building said the State of Wisconsin regulates hot water temperatures for this type of facility; therefore, tenants would not be allowed to adjust the thermostat.

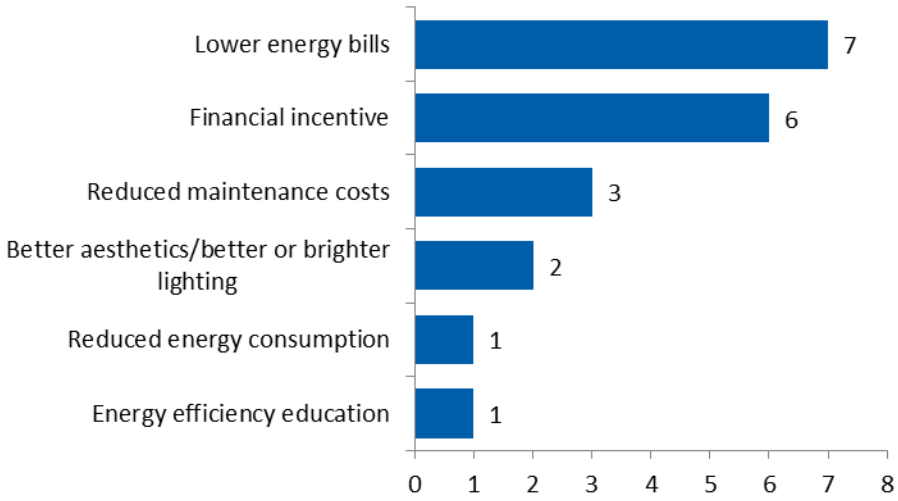
When asked about their willingness to promote the Simple Energy Efficiency Program kits to their tenants, both condo building property respondents were interested in promoting the offer through email, displaying a poster in the common area, and offering installation assistance. Six of 10 apartment building property respondents were willing to promote the kits directly as an offer that the facility staff would install, and two of these expressed interest in a poster in the common area.

The Evaluation Team also asked what level of interest respondents had in installing Simple Energy Efficiency Program kits themselves. The 12 respondents gave a 6.8 mean score for ordering kits for facility staff to install, on a scale of 1 to 10, where 1 is *not at all likely* and 10 is *extremely likely*. Two of the five respondents who scored a 5 out of 10 or lower gave reasons for their score: one respondent was apprehensive about the products offered compared to the property's current fixtures; the other respondent was concerned about the quality or applicability of the products offered and was not likely to install all of the kit contents if the installation was complicated.

Multifamily Energy Savings Program Participation Benefits

Multifamily property manager and owner respondents identified several benefits their company experienced by working with Focus on Energy on their project. Of 12 respondents, seven said saving money on their energy bills, and six said the financial incentive. All benefits mentioned are detailed in Figure 13.

Figure 13. Benefits of Working with Focus on Energy



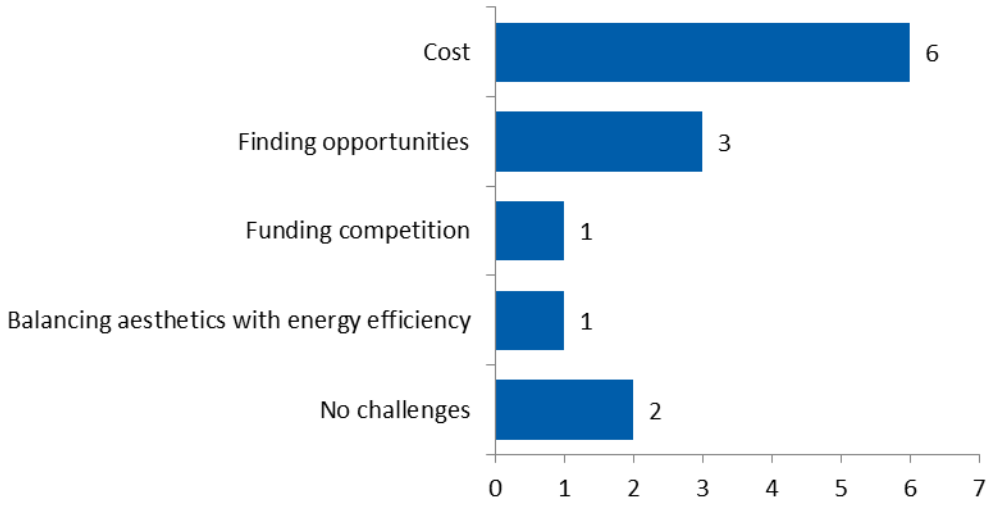
Source: CY 2017 Multifamily Energy Savings Program Participant Interview Question F1: "What would you say are the main benefits your company has experienced as a result of working with Focus on Energy on your energy efficiency upgrades?" Multiple responses allowed (n=12)

Property Owner and Manager Barriers to Participation

The interviewed property owners and managers cited several barriers to participating in the Multifamily Energy Savings Program in the future. As shown in Figure 14, respondents most frequently reported high initial costs as the primary barrier. The second most common barrier was finding additional opportunities, especially if they had already upgraded most of their properties' equipment.

One respondent said other building upgrades competed for available budget, and another said it was difficult to find aesthetically pleasing products that are also energy-efficient and eligible for Program incentives.

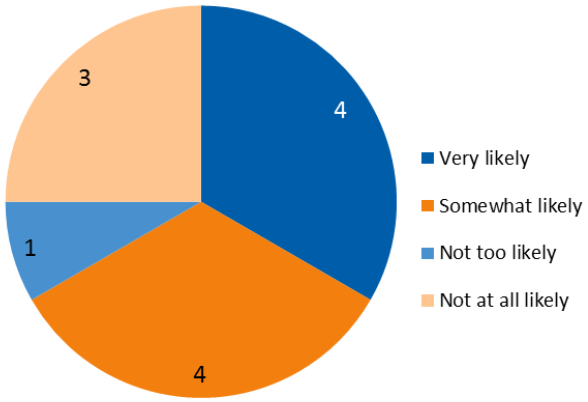
Figure 14. Barriers to Implementing Future Multifamily Energy Savings Program Projects



Source: CY 2017 Multifamily Energy Savings Program Participant Interview Question D1: "What do you see as the biggest challenges to making future energy-efficient improvements at your property or properties?" Multiple responses allowed (n=12)

The Evaluation Team asked respondents about the likelihood that their organization would pursue an energy efficiency project in the next few years (Figure 15). Two-thirds (eight of 12) said they were *very* or *somewhat likely* to implement another energy efficiency project, with five of 12 indicating they intend to pursue a project in the next year.

Figure 15. Likelihood to Pursue Future Energy Efficiency Project



Source: CY 2017 Multifamily Energy Savings Program Participant Interview Question D2: "How likely is your organization to pursue an energy efficiency project for the property in the next few years?" (n=12)

When asked how Focus on Energy could help with their future projects, seven of eight respondents shared a variety of suggestions:

- Financial incentives (three respondents)
- Program guidance, such as navigating incentives available and Program eligibility (three respondents)
- Technical guidance, such as determining building opportunities and eligible equipment (two respondents)
- Maintain contact with organization (one respondent)

Multifamily Energy Savings Program Improvement Recommendations

Of the 12 respondents who participated in the in-depth interviews, five provided open-ended feedback on ways that Focus on Energy could improve their overall program experience. Three suggested improving communication; two of these three requested a direct program representative contact, and the third suggested that program representatives be fully versed in product eligibility. The two other respondents suggested increasing the incentive amount.

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 24 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Multifamily Energy Savings Program.

Table 24. Multifamily Energy Savings Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$912,839	$1,265,281	$1,925,153

The Evaluation Team found the CY 2017 Multifamily Energy Savings Program was cost-effective (3.33). Table 25 lists the evaluated costs and benefits.

Table 25. Multifamily Energy Savings Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$256,931	$329,869	$305,431
Delivery Costs	$585,918	$752,249	$696,518
Incremental Measure Costs	$1,307,220	$3,400,605	$5,231,112
Total Non-Incentive Costs	**$2,150,070**	**$4,482,724**	**$6,233,060**
Benefits			
Electric Benefits	$4,973,392	$6,769,894	$7,388,053
Gas Benefits	$1,135,204	$3,087,346	$3,942,209
Emissions Benefits	$1,043,315	$1,647,883	$1,841,351
Total TRC Benefits	**$7,151,912**	**$11,505,123**	**$13,171,613**
Net TRC Benefits	**$5,001,842**	**$7,022,399**	**$6,938,553**
TRC B/C Ratio	**3.33**	**2.57**	**2.11**

Table 26 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Multifamily Direct Install Program.

Table 26. Multifamily Direct Install Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$329,684	$286,026	$405,581

The Evaluation Team found the CY 2017 Multifamily Direct Install Program was cost-effective (3.48). Table 27 lists the evaluated costs and benefits.

Table 27. Multifamily Direct Install Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$244,627	$251,800	$221,822
Delivery Costs	$557,859	$574,217	$505,852
Incremental Measure Costs	$646,616	$542,024	$365,091
Total Non-Incentive Costs	**$1,449,102**	**$1,368,042**	**$1,092,764**
Benefits			
Electric Benefits	$3,509,816	$3,368,800	$1,931,482
Gas Benefits	$763,917	$1,049,055	$804,243
Emissions Benefits	$772,285	$793,084	$506,075
Total TRC Benefits	**$5,046,018**	**$5,210,938**	**$3,241,800**
Net TRC Benefits	**$3,596,917**	**$3,842,896**	**$2,149,035**
TRC B/C Ratio	**3.48**	**3.81**	**2.97**

Table 28 lists the CY 2016 and CY 2017 incentive costs for the Multifamily New Construction Program.

Table 28. Multifamily New Construction Program Incentive Costs

	CY 2017
Incentive Costs	$225,983

The Evaluation Team found the CY 2017 Multifamily New Construction Program was cost-effective (1.64). Table 29 lists the evaluated costs and benefits.

Table 29. Multifamily New Construction Program Costs and Benefits

Cost and Benefit Category	CY 2017
Costs	
Administration Costs	$94,163
Delivery Costs	$214,734
Incremental Measure Costs	$1,346,016
Total Non-Incentive Costs	**$1,654,913**
Benefits	
Electric Benefits	$1,644,139
Gas Benefits	$758,185
Emissions Benefits	$315,646
Total TRC Benefits	**$2,717,970**
Net TRC Benefits	**$1,063,057**
TRC B/C Ratio	**1.64**

Table 30 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the combined Multifamily Programs.

Table 30. Multifamily Programs Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$1,468,506	$1,551,307	$2,330,734

The Evaluation Team found the CY 2017 Program was cost-effective (2.84). Table 31 lists the evaluated costs and benefits.

Table 31. Multifamily Programs Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$595,722	$581,670	$527,252
Delivery Costs	$1,358,511	$1,326,466	$1,202,370
Incremental Measure Costs	$3,299,852	$3,942,630	$5,596,203
Total Non-Incentive Costs	**$5,254,085**	**$5,850,766**	**$7,325,824**
Benefits			
Electric Benefits	$10,127,347	$10,138,693	$9,319,535
Gas Benefits	$2,657,307	$4,136,401	$4,746,452
Emissions Benefits	$2,131,247	$2,440,967	$2,347,426
Total TRC Benefits	**$14,915,900**	**$16,716,061**	**$16,413,413**
Net TRC Benefits	**$9,661,816**	**$10,865,295**	**$9,087,589**
TRC B/C Ratio	**2.84**	**2.86**	**2.24**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Multifamily Programs.

Outcome 1. The Multifamily New Construction Program experienced a slow start in CY 2017, and Program staff had difficulty establishing a clear direction for prospective property owners and managers to participate. Participation improved over the course of CY 2017, but the Program did not meet its new construction energy savings or demand goals.

Because multifamily property owners have two options for participating in a Focus on Energy program—the Design Assistance Program or the Multifamily New Construction Program—the Program Implementer and Program Administrator revised the eligibility criteria and will market the Multifamily New Construction Program in CY 2018 as a secondary, stand-alone offer. Additional opportunities exist for Focus on Energy to increase Program participation. After decreasing the goals by about 30% in December, the New Construction Program achieved 118% of its *ex ante* kWh, 103% of its *ex ante* kW, and 88% of its *ex ante* therm goal. The Program Implementer attributed the shortfalls to delayed outreach efforts and difficulty in establishing project pipelines. The Program achieved about half of its savings and demand results in the fourth quarter, suggesting the Program may be building the momentum necessary to perform effectively in CY 2018.

Recommendation 1: To increase engagement in CY 2018, collect input on the usefulness of the Multifamily New Construction Program webpages and marketing materials that are specific to multifamily projects. The Program Implementer said it is prepared to deliver comprehensive marketing and outreach to the new construction market by providing general information and specific methods for coordinating with the Design Assistance Program to limit market confusion. Messaging may not reach property owners and managers or prove useful for the target audience. Consider monitoring marketing

material use (like the methods used in the Program Implementer's targeted marketing campaigns) to quantify interest. Seek input from Trade Allies and property owners and managers about the usefulness of marketing materials in conveying Program offers, paths to participation, and energy-savings potential.

Outcome 2. Condominium property managers are receptive to changing the eligibility criteria to allow condo owners to order and install kits offered through the Simple Energy Efficiency Program, but property managers and owners of apartment buildings have reservations with components of the kit.

In interviews, the two condo property manager respondents welcomed the idea of residential condo owners installing all of the Program's kit contents, but one needed to coordinate with the association to allow adjustment to the water heater and access to the domestic water piping. However, property managers and owners of apartment buildings expressed apprehension with their tenants installing the water-related measures in the Simple Energy Efficiency Program kits. Most apartment owners and managers were concerned with property damage. Regarding the pipe insulation and water heater temperature card, most apartment owners and managers said that their tenants do not have access to the pipes and water heaters, or that the building provides hot water through a central system.

To address apartment owner and manager concerns, in early 2018 the Program Administrator created additional language for renters in its Simple Energy Efficiency kit order form, advising that "renters should reference lease agreements as some products require landlord approval prior to installation."[15]

Recommendation 2a: To assess Program effectiveness, track multifamily resident participation in the Simple Energy Efficiency Program separate from single-family resident participation. Set multifamily participant achievement goals to benchmark against the CY 2017 Multifamily Direct Install Program's 5,700 multifamily tenant unit goal.[16]

Recommendation 2b: Assess whether opportunities exist to offer multifamily property managers and owners incentives for purchasing and installing measures previously available through the Multifamily Direct Install Program for central water heating systems. Promote these measures through the Multifamily Energy Savings Program as low-cost, high-impact ways to improve energy efficiency in tenant units.

Outcome 3. Property owners and managers of apartment buildings are interested in marketing and installing energy efficiency kit opportunities for Focus on Energy.

Although apartment property managers and owners had reservations with their tenants installing portions of the Simple Energy Efficiency Program kits, six of the 10 respondents were willing to promote the kits directly as an offer their facility staff would install. Two of these six expressed interest in a

[15] Focus on Energy. "Create an account." Available online: https://www.energyfederation.org/focusonenergy/customer/account/create/

[16] This recommendation is also included in the Simple Energy Efficiency Program chapter.

common area poster. Both condominium property managers were interested in promoting kits to residents.

Recommendation 3: Consider implementing strategies to build awareness of the Program among multifamily tenants and condo owners by giving property managers and owners promotional materials such as email templates, common area posters, and flyers or registration forms for new tenant welcome packets, for which tenants could sign off the kit for the maintenance staff to install.[17]

[17] This recommendation is also included in the Simple Energy Efficiency Program chapter.

Appliance Recycling Program

The Appliance Recycling Program was relaunched in January 2017 to expedite the retirement of old, inefficient appliances in order to reduce peak demand and increase annual energy savings. The Program was suspended temporarily from November 2015 through December 2016 because of complications with the program implementer at that time. In CY 2017, APTIM was the Program Administrator and ARCA was the new Program Implementer.

The Program offered customers free pick-up and recycling of old appliances, with a $35 incentive for each refrigerator or freezer recycled (limited to two per address, every three years). To be eligible for pick-up through the Program, customers' refrigerators or freezers had to be in working condition and between 10 and 30 cubic feet in size in addition to other logistical requirements. The Program Implementer arranged for these appliances to be dismantled and recycled in an environmentally responsible manner.

This chapter presents the impact and process findings for the CY 2017 Appliance Recycling Program. Table 32 lists the Program's actual spending, savings, participation, and cost-effectiveness.

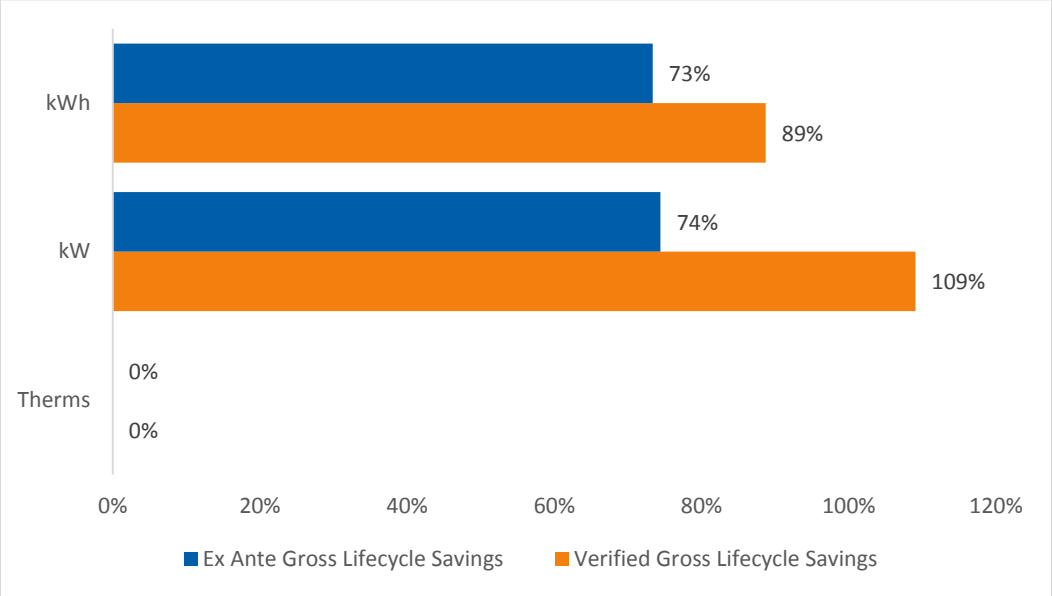
Table 32. Appliance Recycling Program Summary[1]

Item	Units	CY 2017	CY 2015
Incentive Spending	$	$446,845	$742,080
Verified Gross Lifecycle Savings	kWh	98,578,539	140,892,285
	kW	1,233	2,057
	therms	0	0
Verified Gross Lifecycle Realization Rate	% (MMBTU)	85%	87%
Net Annual Savings	kWh	5,448,059	6,743,824
	kW	660	790
	therms	0	0
Net Annual Net-to-Gross	% (MMBTU)	54%	38%
Participation	Number of Participants	11,423	16,785
Cost-Effectiveness	TRC B/C Ratio	1.10	1.97

[1] CY 2016 data are not available because the program was suspended.

Figure 16 shows the percentage of gross lifecycle savings goals achieved by the Program in CY 2017. The Program met its CY 2017 goals for verified gross lifecycle kW savings (109% of goal), but it did not achieve its verified gross lifecycle kWh savings goal (89% of goal) or it *ex ante* gross savings (73% of goal for kilowatt hours [kWh] and 74% of goal for kilowatts [kW]).

Figure 16. Appliance Recycling Program Achievement of CY 2017 Gross Lifecycle Savings Goals[1]



[1] For *ex ante* gross lifecycle savings, 100% reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations for the Program in CY 2017. It designed its EM&V approach to integrate multiple perspectives in assessing the Program's performance over the remaining quadrennium. Table 33 lists the specific data collection activities and sample sizes used in the evaluations.

Table 33. Appliance Recycling Program Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Program Actor Interviews (Administrator and Implementer)	2
Tracking Database Review	Census
Participant Surveys	171
Ongoing Participant Satisfaction Surveys	2,025

Program Actor Interviews

In September and October 2017, the Evaluation Team interviewed staff from the Program Administrator and the Program Implementer to learn about the status of the Program at that time. The interviews covered topics such as Program design and goals, marketing strategies, and data tracking to gain a better understanding of high-level changes, successes, and concerns with the Program.

Tracking Database Review

The Evaluation Team conducted a review of the census of Program's SPECTRUM tracking data, which involved these tasks:

- A thorough review of the data to ensure the SPECTRUM totals matched the totals that the Program Administrator reported
- Reassigning adjustment measures to measure names
- Checking for complete and consistent application of data fields (measure names, application of first-year savings, application of effective useful lives, etc.)

Participant Surveys

The Evaluation Team conducted telephone surveys with 171 customers who participated in the CY 2017 Program. The survey asked questions about the following:

- How the participant became aware of the Program
- How the units were used prior to being recycled (i.e., as a primary or secondary unit)
- Replacement of recycled units
- Attitudes toward energy usage
- Household demographics.

The Evaluation Team randomly selected customers from the total participants in the SPECTRUM database as of August 2017 and structured the sample to achieve 90% confidence at ±10% precision for participants who recycled refrigerators (100 surveys) and participants who recycled freezers (71 surveys).

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct quarterly satisfaction surveys beginning in CY 2015 for the CY 2015–CY 2018 quadrennium. In the prior evaluation cycle (CY 2011–CY 2014), the Program Administrator had designed, administered, and reported on customer satisfaction metrics. The goals of the survey were to accomplish the following:

- Understand customer satisfaction on an ongoing basis and to respond to any changes in satisfaction before the end of the annual reporting schedule
- Help to facilitate timely follow-up with customers to clarify and address service concerns

The Evaluation Team also used survey data to assess the Program Implementer's performance in meeting contractual obligations related to satisfaction key performance indicators (KPIs).

The Evaluation Team used SPECTRUM data to sample CY 2017 participants and administered web-based satisfaction surveys. In total, 2,025 customers responded to the survey between February of 2017 and January of 2018.

The ongoing participant satisfaction surveys asked participants about these topics:

- Overall satisfaction
- Satisfaction with Program staff
- Satisfaction with the incentive
- Likelihood of recommending the program
- Likelihood of initiating another energy efficiency improvement
- Open feedback regarding the program (i.e., comments, suggestions)

Impact Evaluation

To calculate gross savings, the Evaluation Team reviewed the Program tracking data provided by the Program Implementer then combined these data with results from the participant surveys. To calculate net savings, the Evaluation Team used participant survey data to determine freeridership.

This section provides impact evaluation findings for the Program, based on these methods:

- Tracking database reviews
- Participant surveys
- Multivariate regression modeling

Evaluation of Gross Savings

The Evaluation Team reviewed SPECTRUM as well as the Program Implementer's tracking database and applied the most recent research to estimating the gross savings, as described below.

Tracking Database Review

The Evaluation Team reviewed the CY 2017 data in SPECTRUM and in the Program Implementer's tracking database for completeness and quality. The Program tracking database review was necessary because SPECTRUM does not contain many of the appliance characteristics—most importantly, size, age, and configuration of Program units—that are necessary for estimating verified gross savings.

The Evaluation Team received preliminary Program tracking data in September 2017 and drew the sample for participant surveys. The Evaluation Team made no other adjustments to the SPECTRUM *ex ante* savings after reviewing the tracking data.

Verified Unit Energy Savings

In CY 2017, as in prior evaluations, the Evaluation Team calculated gross savings for the Appliance Recycling Program following the steps below. A detailed explanation of the multivariate regression modeling and the part-use factor methodology and results can be found in Appendix H.

1. Model unit energy consumption (UEC) by applying CY 2017 Program measure characteristics to regression models that are based on metered data
2. Apply part-use factors (derived through CY 2017 participant surveys) to the UEC to calculate the average per-unit gross savings for the CY 2017 appliances

3. Apply the per-unit energy savings to all measures in the tracking data to calculate gross Program savings.

Table 34 shows the modeled UEC and calculated part-use factors for refrigerators and freezers. UEC decreased from CY 2015 (1,158 for refrigerators and 1,077 for freezers) because newer, more efficient units were recycled through the program in CY 2017. It is common for appliance recycling programs to experience this decrease in UEC as they mature and deplete the inventory of older appliances in homes.

The part-use factor for refrigerators decreased slightly, from 0.88 in CY 2015 to 0.86 in CY 2017. The freezer part-use factor increased from 0.73 in CY 2015 to 0.76 in CY 2017. These changes in part-use factors between CY 2015 and CY 2017 were not statistically significant for either appliance.

Table 34. CY 2017 Appliance Recycling Program Gross Per-Unit Savings by Measure

Measure	Unit Energy Consumption (UEC) (kWh/Year)	CY 2017 Part-Use Factors	Verified Gross Per-Unit Energy Savings (kWh/Year) (UEC x Part-Use Factor)
Refrigerator	962	0.86	825
Freezer	926	0.76	702

CY 2017 Verified Gross Savings Results

Overall, the Program achieved an annual evaluated realization rate of 85%, weighted by energy (as shown in Table 35).[18] Verified gross savings were lower than *ex ante* savings because of adjustments for measured energy consumption and the application of part-use factors.

Table 35. CY 2017 Appliance Recycling Program Annual and Lifecycle Realization Rates by Measure Type

Measure	Annual Realization Rate				Lifecycle Realization Rate			
	kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
Freezer	86%	81%	n/a	86%	86%	81%	n/a	86%
Refrigerator	84%	90%	n/a	84%	84%	90%	n/a	84%
Total	**85%**	**88%**	-	**85%**	**85%**	**88%**	-	**85%**

[18] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

Table 36 lists the *ex ante* and verified annual gross savings for the Program for CY 2017.

Table 36. CY 2017 Appliance Recycling Program Annual Gross Savings Summary by Measure

Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
	kWh	kW	therms	kWh	kW	therms
Freezer	2,601,452	321	0	2,246,479	259	0
Refrigerator	9,388,445	1,083	0	7,898,214	974	0
Total Annual	**11,989,897**	**1,404**	**0**	**10,144,693**	**1,233**	**0**

Table 37 lists the *ex ante* and verified gross lifecycle savings by measure type for the Program in CY 2017.

Table 37. CY 2017 Appliance Recycling Program Lifecycle Gross Savings Summary by Measure

Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
Freezer	25,054,444	321	0	21,635,714	259	0
Refrigerator	91,460,354	1,083	0	76,942,825	974	0
Total Lifecycle	**116,514,798**	**1,404**	**0**	**98,578,539**	**1,233**	**0**

Evaluation of Net Savings

The Evaluation Team employed a decision-tree approach, described in the Uniform Methods Project (UMP),[19] to calculate and present net Program savings. The decision tree—populated by the responses of surveyed CY 2017 Program participants and information gathered from interviewed market actors from other appliance recycling program evaluations—presents all of the Program's possible savings scenarios.

The decision tree accounts for what the participating household would have done independent of the Program *and* the possibility that the unit was transferred to another household, regardless of whether the would-be acquirer of that refrigerator or freezer finds an alternate unit instead.

To calculate the NTG ratio, the Evaluation Team used the following equation to combine all of the net impacts described in Table 38. The Team applied the measure-level NTG ratios to the appliance recycling measures, resulting in a Program-level NTG of 54%. A detailed description of the net savings analysis is included in Appendix I.

$$Net\ Savings\ (MWh\ per\ year) = Gross\ Savings - Freeridership\ \&\ Secondary\ Market\ Impact + Spillover$$

[19] National Renewable Energy Laboratory. *Uniform Methods Project for Determining Energy Efficiency Program Savings for Specific Measures.* "Chapter 7: Refrigerator Recycling Evaluation Protocol." September 2017. Available online: https://www.nrel.gov/docs/fy17osti/68563.pdf

Table 38. Appliance Recycling Program Final NTG Ratio by Appliance

Measure	CY 2017 Gross Per-Unit Savings (kWh)	Freeridership and Secondary Market Impacts (kWh)	Induced Additional Savings (Spillover) (kWh)	Net Savings (kWh)	CY 2017 NTG	CY 2015 NTG
Freezer	702	255	-	447	64%	48%
Refrigerator	825	405	-	420	51%	36%

The increase in NTG from 2015 is driven by several factors. First, induced replacement is not accounted for. The UMP protocol was updated in September 2017 and induced replacement was removed from the protocol.[20]

Additionally, the percentage of survey respondents who would have kept their appliance absent the program increased for both refrigerators and freezers. In CY 2017, 39% of respondents who recycled a refrigerator would have kept their appliance, compared with 34% in CY 2015. In CY 2017, 59% who recycled a freezer would have kept their freezer, compared with 43% in CY 2015.

Finally, the percentage of respondents who would have transferred their refrigerators to another household increased to 17% in CY 2017 from 9% in CY 2015. These units would have likely continued to operate rather than being permanently removed from the grid.

CY 2017 Verified Net Savings Results

Table 39 shows the annual net energy impacts (kWh and kW) by measure for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 39. CY 2017 Appliance Recycling Annual Net Savings

Measure	Annual Net	
	kWh	kW
Freezer	1,429,981	165
Refrigerator	4,018,078	495
Total Annual	**5,448,059**	**660**

[20] Induced replacement attempted to measure units added to the grid due to program influence – that is, if the program influenced a customer to purchase a replacement unit that they otherwise would not have. Feedback from the evaluation community found induced replacement difficult to measure and the impact was often negligible. The citation for the updated protocol is included in the footnote on page 5.

Table 40 shows the lifecycle net energy impacts (kWh and kW) by measure for the Program.

Table 40. CY 2017 Appliance Recycling Lifecycle Net Savings

Measure	Lifecycle Net	
	kWh	kW
Freezer	13,772,071	165
Refrigerator	39,143,310	495
Total Lifecycle	**52,915,381**	**660**

Process Evaluation

In CY 2017, the Evaluation Team addressed key process research questions by conducting in-depth interviews with Program actors and surveys with participating customers. This is the first process evaluation following the suspension of the Appliance Recycling Program at the end of CY 2015 and the subsequent relaunch in CY 2017 with a new Program Implementer. The process evaluation focused on these topics:

- Success of re-launching the Program
- Program accomplishments
- Opportunities to streamline Program delivery
- Drivers of participation
- Customer awareness and satisfaction

Program Design, Delivery, and Goals

The Program Implementer operated the CY 2017 Program as designed, with some significant changes from previous years:

- The incentive payment in CY 2017 was $35 per appliance, reduced from the $40 incentive offered in CY 2015.
- The current Program did not include partnerships with appliance retailers, whereas the previous program had a limited partnership with Sears.
- The Program Implementer hired a subcontractor (Top Hat) to provide and manage the trucks and crews that pick up appliances.

According to the Program Administrator and Program Implementer, the CY 2017 Program ran smoothly with few customer issues or complaints, most of which were limited to the early part of the year when the Program was relaunching. Program Administrator and Program Implementer data systems were successfully integrated and operated effectively, and the Program Implementer took steps to improve customer service and scheduling options by subcontracting drivers.

The Program Administrator reported a positive working relationship with the Program Implementer and frequent contact among staff members. In addition to weekly reports and meetings, the Program

Implementer regularly uploaded records to SPECTRUM, allowing the Program Administrator to access participant data.

Program Management and Delivery Structure

In CY 2017, the Program Administrator was responsible for management and administration of the Program, which involved general management, monthly reports to the PSC, and overseeing marketing. The Program Implementer oversaw all aspects of Program delivery including appliance pick-up and recycling, producing and distributing marketing materials, managing the call center and online scheduler, and data reporting. In September 2017, the Program Implementer hired a subcontractor to provide the trucks and pick-up crews, which was intended to improve scheduling and logistics by distributing more drivers and dispatch points around the state. Although scheduling cycle times did not improve immediately following this change, participation did increase by nearly 60% during Q4, while average cycle times remained within the range seen in earlier quarters.

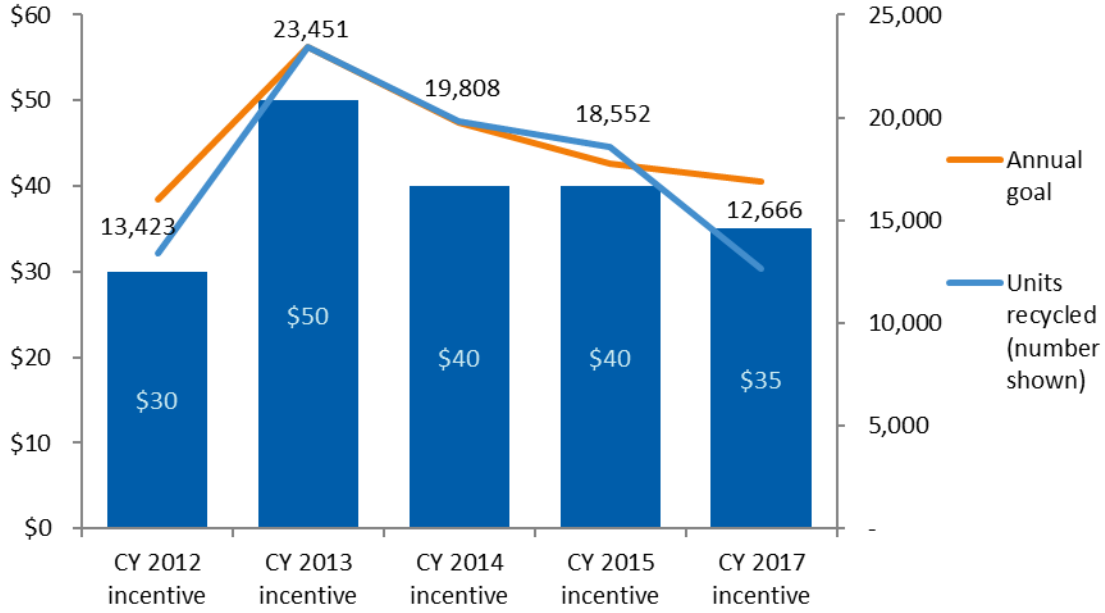
Program Goals

In CY 2017, participants recycled 12,666 appliances through the Appliance Recycling Program, which was 75% of the annual goal of 16,859 units. According to the Administrator, the main cause of this shortfall was that the Program took longer than projected to reach anticipated participation rates. Following the January 2017 relaunch with a new Program Implementer, enrollment rates did not reach a level consistent with the annual target until April.[21] In addition, during normal program years there would be pick-ups occurring in January that had been scheduled at the end of the previous year, while in CY 2017 the Program began with zero appointments booked from the previous year.

Incentive levels have historically played a major role in the achievement of Program goals, as demonstrated by the relationship between the incentive levels and recycled units over that last four years. Figure 17 shows a consistent pattern of higher participation in the Program when the incentive levels were higher and less participation when incentives were lower. When the Appliance Recycling Program was relaunched in CY 2017, the Program Administrator established a lower rebate amount and lower unit goal in part out of concern that pent-up demand from the Program's suspension could outpace the budget available for the year (e.g., that higher incentives would cause the Program to run out of money before December).

[21] In April 2017, 1,533 participants enrolled in the program, which was the first month in 2017 where enrollment exceeded 1,000 (Source: SPECTRUM). To meet the CY 2017 target of 16,859 units recycled, participation would have to average at least 1,405 units per month for the entire year. In total, 1,901 participants enrolled in the Program during Q1, against a goal of 4,215 for the quarter (i.e., one-fourth of the annual goal).

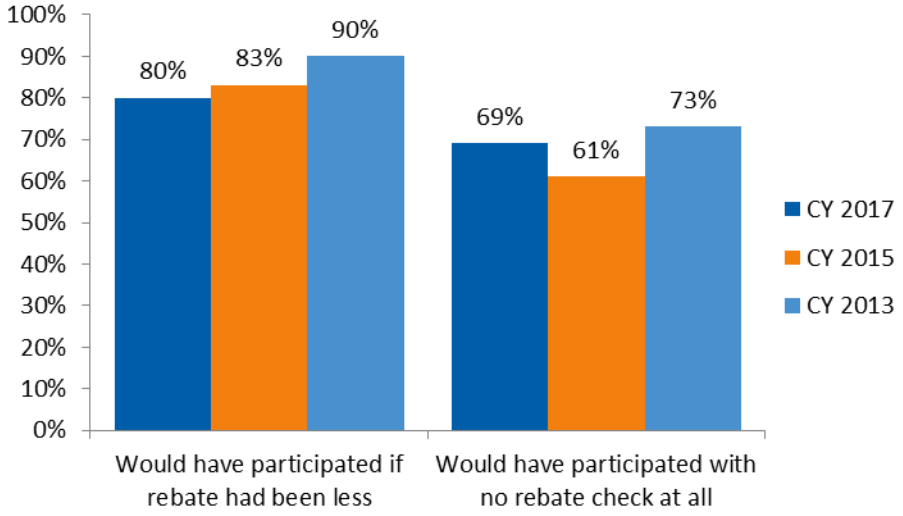
Figure 17. Appliance Recycling Program Annual Goals, Units Recycled, and Incentive Levels



Source: SPECTRUM database and Administrator interview.

The Evaluation Team explored the impact of the incentive level on participation through the CY 2013, CY 2015, and CY 2017 participant surveys. As Figure 18 shows, 80% of CY 2017 respondents said they would have participated in the Program even if the rebate had been smaller, and 69% said they would have participated without any rebate at all. Although high, this proportion is down from CY 2013 in both categories. These decreases may be in response to the change in incentive from $50 to $40 in CY 2014 and from $40 to $35 in CY 2017. The lack of a Program to recycle appliances in CY 2016 may also have influenced these responses, in that there may have been pent-up demand from participants who were waiting for the Program to become active again.

Figure 18. Potential Participation with a Lower Rebate Amount



Source: 2017 Residential Appliance Recycling Program Participant Surveys. Questions E7 and E8: "Would you have participated in the Program if the amount of the rebate had been less?" (n=163) and "Would you have participated in the Program with no rebate check at all?" (n=167); Identical Questions E7 (n=162) and E8 (n=163) from 2015 Residential Appliance Recycling Program Participant Survey, and G8 (n=124) and G9 (n=128) from 2013 Residential Appliance Recycling Program Participant Survey

Data Management and Reporting

The Program Implementer tracked participation in Focus on Energy's SPECTRUM and reported that the initial process of learning to use the database had been time-consuming. Nevertheless, neither the Program Implementer nor the Program Administrator reported any ongoing concerns with using it.

Marketing and Outreach

The Program Implementer produced marketing materials for the Program, which convey Focus on Energy branding and are sometimes co-branded with participating utilities. The Program Implementer also purchased media for advertising (including online), and on some occasions the Program Administrator and the Program Implementer combined advertising budgets to take advantage of lower bulk rates. The Program Implementer also tracked advertising effectiveness and shifted funds to better-performing channels (for example, during CY 2017, online advertising was reduced and radio and bill inserts were increased). The Program Administrator maintained the Focus on Energy website and managed outreach through social media, with content provided by the Program Implementer.

The Program used the following marketing materials and activities to promote the CY 2017 Program:

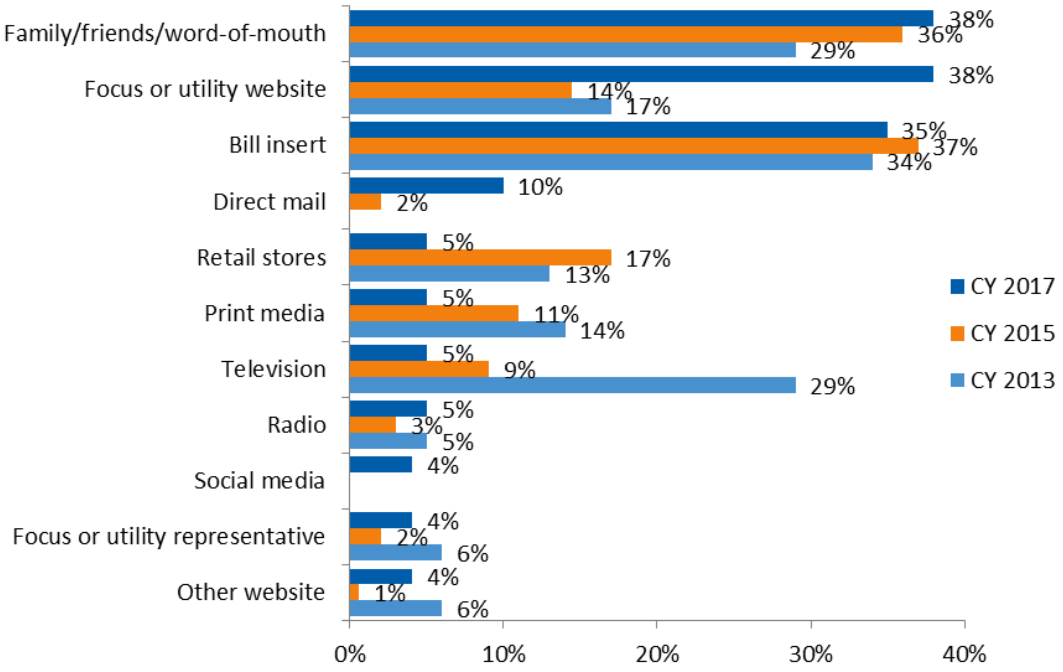
- Utility bill inserts
- Direct mail (postcards)
- Email campaigns
- Social media posts
- Online advertisements (banners and pop-ups)
- Search engine marketing (paid results)
- Radio advertisements (including Pandora)
- Utility newsletters/websites
- Displays and booths at community events
- Tear-away sheets explaining the Program (for distribution at events and trade shows)
- Earned media (news articles and reports about the Program)

Marketing Effectiveness

The Evaluation Team surveyed 171 Program participants—100 who recycled a refrigerator and 71 who recycled a freezer—to gain a better understanding of the Program's marketing effectiveness and reach.

Survey results show that bill inserts remain a highly effective outreach method; as in past evaluations, over a third of respondents said they learned about the Program through bill inserts, also the most frequent response in CY 2013 and CY 2015 (Figure 19). However, word of mouth and the Focus on Energy website were the most common sources of awareness in CY 2017, both mentioned by 38% of respondents.

Figure 19. Customer Source of Awareness of Program



Source: 2017 Residential Appliance Recycling Program Participant Survey. Question B1: "Where did you MOST RECENTLY learn about Focus on Energy's appliance pick-up and recycling program?" and Question B2: "Are there any other ways you heard about the program?" (n=165); Identical Questions B1 and B2 from 2015 Residential Appliance Recycling Program Participant Survey (n=166) and 2013 Residential Appliance Recycling Program Participant Survey (n=128)

The Focus on Energy website was mentioned significantly more often than in prior evaluations, and direct mail mentions also increased significantly to 10%.[22] Awareness from retail stores and print media declined significantly in CY 2017, which may be due in part to the Program's suspension during CY 2016.[23] Fewer respondents mentioned television as a source of awareness in CY 2017 (5%) and CY 2015 (9%) compared to 2013 (29%).[24] The Program has not paid for any television advertising since at least CY 2014, only earned media.

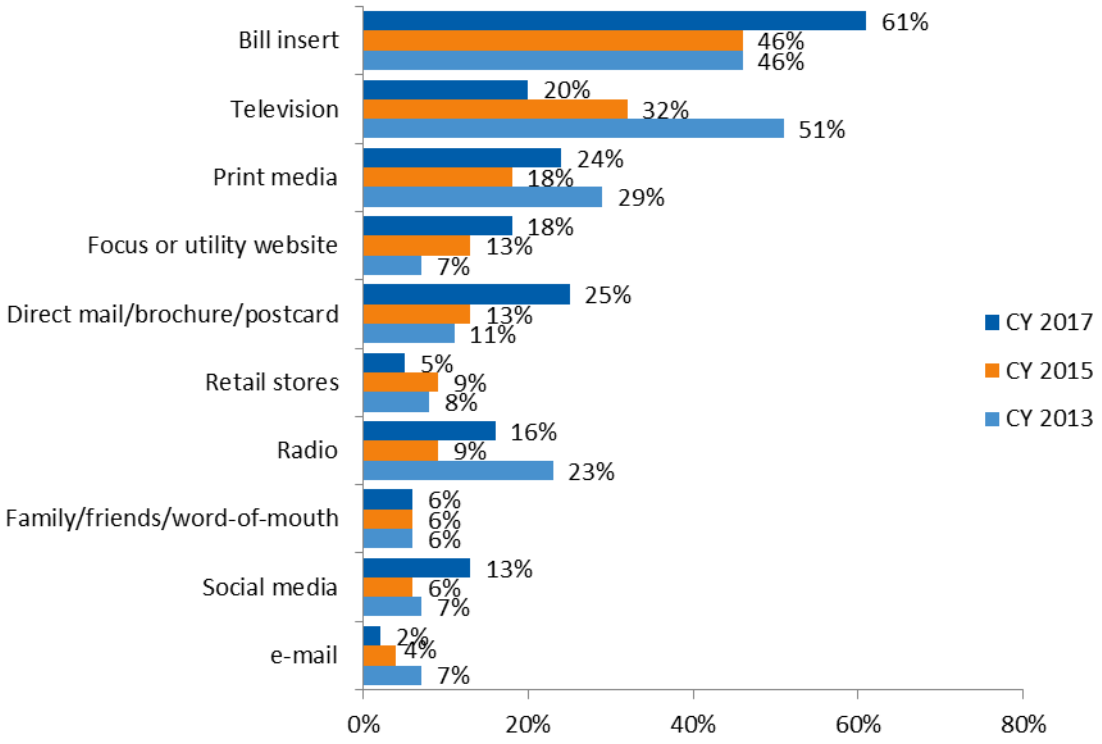
[22] Results using binomial t-tests: $p < 0.01$ (Focus on Energy website), $p < 0.01$ (direct mail)

[23] Results using binomial t-tests: $p < 0.01$ (retail stores), $p < 0.05$ (print media)

[24] Results using binomial t-tests: $p < 0.01$ (CY 2017 compared to CY 2013), $p < 0.01$ (CY 2015 compared to CY 2013)

As shown in Figure 20, survey respondents identified several ways they could be reached with information about energy efficiency programs.

Figure 20. Best Methods for Contacting Customers



Source: 2017 Residential Appliance Recycling Program Participant Survey. Question B7: "What do you think is the best way for Focus on Energy to inform the public about energy efficiency programs?" (n=161); Identical Question B7 from 2015 Residential Appliance Recycling Program Participant Survey (n=159) B7 from 2013 Residential Appliance Recycling Program Participant Survey (n=118)

In CY 2017, a majority of survey respondents (61%) preferred bill inserts, followed by direct mail and print media. Compared to the previous evaluations, CY 2017 respondents were much less likely to mention television (20%), which was the most-mentioned method of communication in CY 2013.[25] Additionally, 18% of CY 2017 survey respondents said they preferred getting information from the Focus on Energy and utility websites, continuing the upward trend between CY 2013 (7%) and CY 2015 (13%) surveys, and there was also an increase in respondents mentioning social media (13%, up from 6% in CY 2015).[26]

[25] $p < 0.01$ using binomial t-test.

[26] $p < 0.05$ using binomial t-test.

Customer Experience

The Evaluation Team asked the 171 participant survey respondents about their experiences with various program components, customer decision-making, and barriers to participation. The Team also surveyed 2,025 participants regarding satisfaction with their Program experience.

Participation and Awareness of Other Focus on Energy Programs

The Evaluation Team asked participants about their awareness of and participation in other Focus on Energy programs. Table 41 shows the percentage of respondents who were aware of and participated in other programs.

Table 41. Customer Awareness and Participation in Other Focus on Energy Programs

Program	Aware Other Programs[1]			Participated Other Programs[2]		
	CY 2013	CY 2015	CY 2017	CY 2013	CY 2015	CY 2017
Home Performance with ENERGY STAR	8%	9%	13%	2%	4%	9%
New Homes	2%	1%	2%	1%	0%	0%
Simple Energy Efficiency (Express Energy Efficiency)	0%	5%	13%	0%	1%	9%
Residential Lighting	12%	8%	27%	9%	3%	20%
Residential Rewards	3%	7%	n/a	1%	4%	n/a
Renewable Rewards	n/a	n/a	2%	n/a	n/a	1%
Multifamily Direct Install	n/a	n/a	2%	n/a	n/a	1%
Appliance Recycling Program in a previous year	n/a	n/a	n/a	n/a	n/a	8%

[1] Multiple response; CY 2013 Residential Appliance Recycling Program Participant Survey. Question B4: "Which programs, rebates or projects [are you aware of]?" (n=131); CY 2015 Residential Appliance Recycling Program Participant Survey. Identical Question B4 (n=170); CY 2017 Residential Appliance Recycling Program Participant Survey. Identical Question B4 (n=170).

[2] Multiple response; CY 2013 Residential Appliance Recycling Program Participant Survey. Question B6: "Which programs, rebates or projects [have you participated in]?" (n=131); CY 2015 Residential Appliance Recycling Program Participant Survey. Identical Question B6 (n=170); CY 2017 Residential Appliance Recycling Program Participant Survey. Identical Question B6 (n=170).

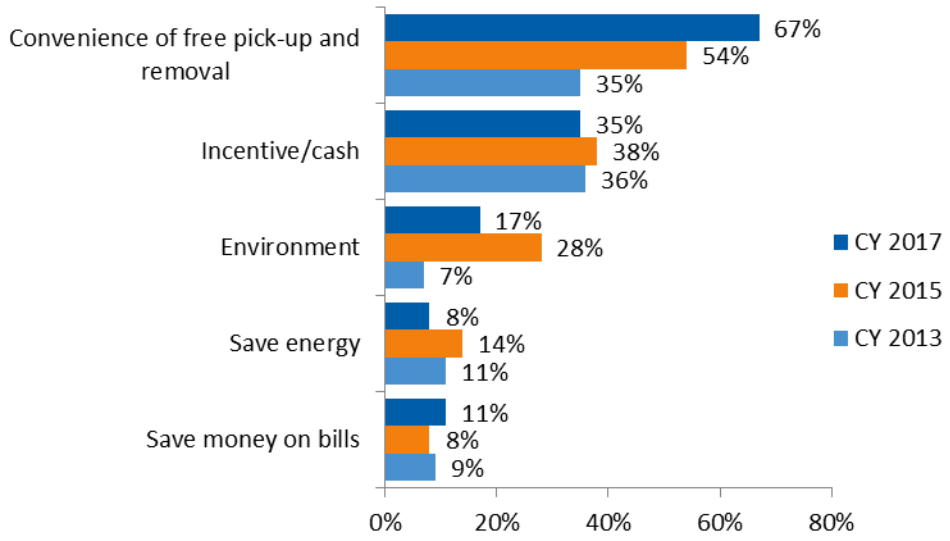
In CY 2017, 45% of survey respondents said they were aware of other Focus on Energy programs, which is significantly higher than 24% in CY 2015 and 32% in CY 2013. Of those who were aware of other Focus programs, 78% had previously participated in a program, significantly higher than 34% in CY 2015 and 60% in CY 2013. Overall, 35% of surveyed CY 2017 Program participants said they had participated in another Focus program, up significantly from 8% in CY 2015 and 19% in CY 2013.[27] The Focus program with the most awareness and participation was the Retail Lighting and Appliance Program, with 27% awareness and 20% participation among Appliance Recycling Program participants.

[27] Results using binomial t-tests: $p < 0.01$ (compared to CY 2015), $p < 0.01$ (compared to CY 2013).

Decision-Making Process

Figure 21 shows the reasons participants gave for recycling their refrigerators and freezers through the Program.

Figure 21. Motivation for Participating in Appliance Recycling Program

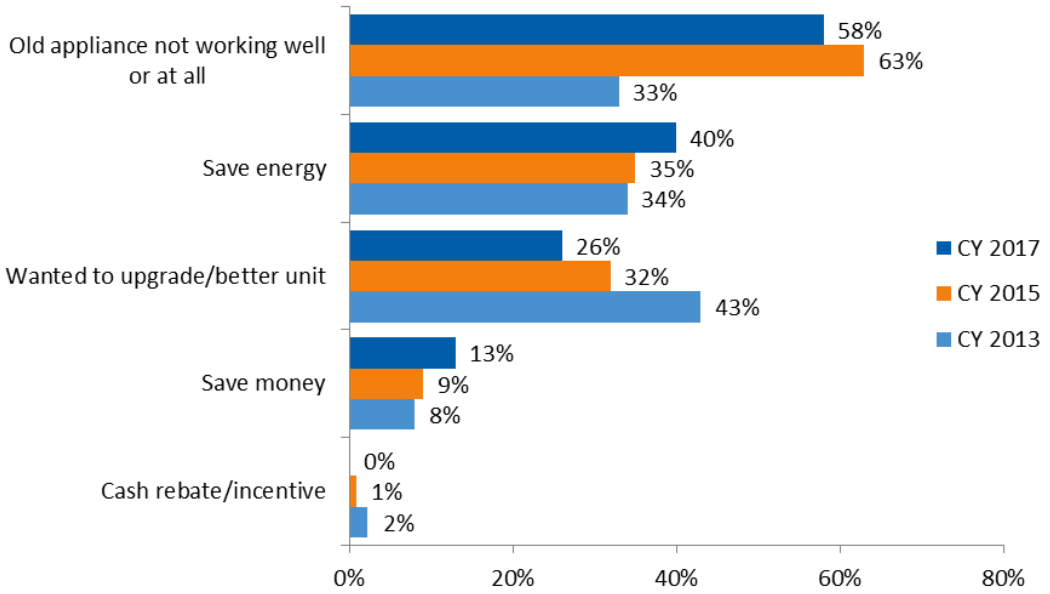


Source: 2017 Residential Appliance Recycling Program Participant Survey. Question B8: "What motivated you to participate in Focus on Energy's Appliance Recycling Program?" (n=168); 2015 Residential Appliance Recycling Program Participant Survey. Identical Question B8 (n=169); 2013 Residential Appliance Recycling Program Participant Survey. Question B8: "What motivated you to recycle your [appliance] through Focus on Energy's program?" (n=131)

In CY 2017, respondents most frequently said they participated in the Program for the convenience of free pick-up and removal (67%), followed by the cash incentive (35%) and helping the environment (17%). These reasons were consistent with evaluations of appliance recycling programs in other states. Compared to CY 2013 and CY 2015, the Program continued to see an increase in the percentage of participants who mentioned the convenience of free pick-up and removal as a reason for participating. This upward trend is also consistent with Appliance Recycling Program evaluation findings in other states. The percentage of participants reporting they participated because of the incentive and other reasons has stayed about the same since CY 2013 and CY 2015.

In CY 2017, 62% of surveyed participants said they replaced their recycled unit; this is similar to the CY 2015 and CY 2013 findings in which 69% and 67% of respondents, respectively, said they replaced their recycled units. Figure 22 shows the reasons participants gave for replacing their recycled units in the CY 2017 survey, very similar to the results in CY 2015.

Figure 22. Reasons for Replacing Recycled Units



Source: 2017 Residential Appliance Recycling Program Participant Survey. Question D2: "Why did you decide to replace your old [APPLIANCE]?" (n=104); Identical Question D2 from 2015 Residential Appliance Recycling Program Participant Survey (n=117), and F2 from 2013 Residential Appliance Recycling Program Participant Survey (n=88)

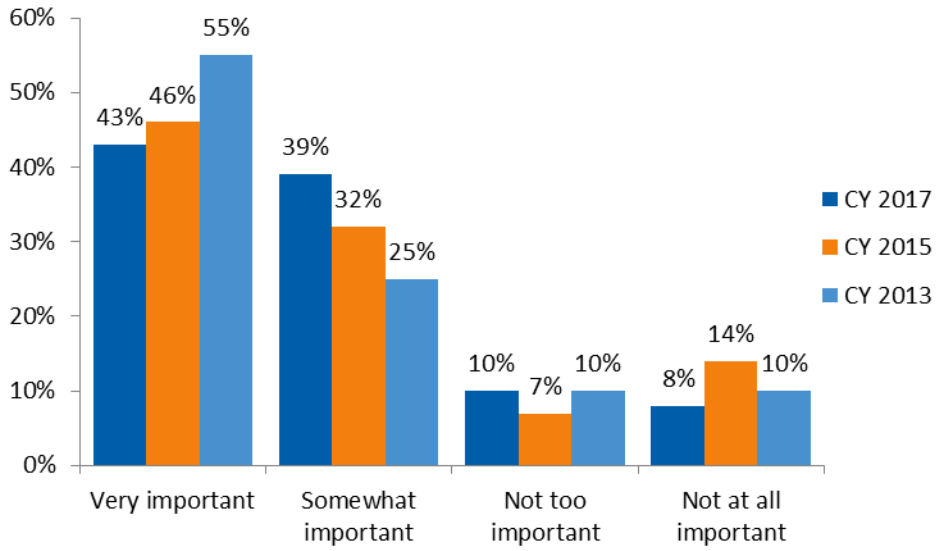
In CY 2017, most survey respondents said they replaced their recycled units because they were not working well or at all (58%), which was significantly higher than CY 2013 (33%) but comparable to the CY 2015 result (63%).[28]

Eighty-nine percent of respondents who replaced their recycled units in CY 2017 said their new unit was high efficiency, which is similar to the survey results in CY 2015 (85%) and CY 2013 (89%), and most of these said that their decision to purchase a more efficient model was influenced by their participation in the Program. Eighty-two percent said their participation in the Program was *very important* or *somewhat important* in this decision. This is comparable to the CY 2015 and CY 2013 surveys, in which 79% and 80% of respondents, respectively, said the Program's influence was *very important* or *somewhat important*.

[28] $p < 0.01$ using binomial t-test.

Figure 23 shows the full breakdown of survey results for the Program's Influence on efficiency level of the replacement unit.

Figure 23. Program Influence on Efficiency Level of Replacement Unit



Source: 2017 Residential Appliance Recycling Program Participant Survey. Question D5: "How important was the Program in your decision to replace your old unit with an ENERGY STAR or high-efficiency model?" (n=83); Identical Questions D7 from 2015 Residential Appliance Recycling Program Participant Survey (n=99), and F5 from 2013 Residential Appliance Recycling Program Participant Survey (n=77)

Scheduling and Check Payment Cycle Times

The Evaluation Team used program records from SPECTRUM and supplemental Program data from the Program Implementer to measure cycle times for scheduling (number of days from enrollment to pick-up) and check payment (number of days from pick-up to check mailing). Results of both cycle times are shown in Table 42.

Scheduling cycle times were consistent across quarters, despite a six-fold increase in participation from Q1 (average 15.5 days between scheduling and pick-up) to Q4 (average 17.6 days). For CY 2017 overall, the average scheduling cycle was 16.5 days, and 23% of participants waited 21 days or more for pick-up (comparable to the KPI of 14 business days, or about three weeks, for scheduling in outlying areas). However, check payment cycles increased every quarter, from an average of 26.8 days in Q1 to 38.1 days in Q4, with 43% of Q4 customers waiting 35 days or more for their checks to be mailed. Overall, the average check cycle for CY 2017 was 34 days, comparable to the KPI of 25 business days (five weeks) for check payment.

Table 42. Scheduling and Check Payment Cycle Times

Period	Scheduling Cycle Time[1]			Check Payment Cycle Time[2]		
	Valid Count	Average in Days	% 21 Days or More	Valid Count	Average in Days	% 35 Days or More
Q1	795	15.5	20%	715	26.8	31%
Q2	3,077	17.5	26%	3166	30.2	14%
Q3	3,055	14.1	15%	3060	33.2	21%
Q4	4,895	17.6	25%	4895	38.1	43%
CY 2017 Total	**11,822**	**16.5**	**23%**	**11,836**	**34.0**	**29%**

[1] Scheduling cycle time is the difference between *Application Received Date* in SPECTRUM and *Pick-Up Date* in supplemental ARCA data.

[2] Check payment cycle time is the difference between *Pick-Up Date* in supplemental ARCA data and *Status Changed To Paid* Date in SPECTRUM.

Annual Results from Ongoing Customer Satisfaction Surveys

Throughout CY 2017, the Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Program.[29] Respondents answered satisfaction and likelihood questions on a scale of 0 to 10, where 10 indicates the highest satisfaction or likelihood and 0 the lowest.[30]

As shown in Figure 24, the average overall Appliance Recycling Program satisfaction rating among CY 2017 participants was 9.3, which was the highest average satisfaction for any residential program in CY 2017.[31] This program's satisfaction rating was significantly above the portfolio baseline for CY 2017 and every quarter of the year.[32,33] Overall satisfaction with the program in CY 2017 was statistically equivalent to CY 2015 for the first three quarters of the year and CY 2017 overall, though in Q4 of 2017 the program received significantly lower ratings than the CY 2015 program.[34]

[29] The Evaluation Team found that some surveys did not include identifying information that would allow it to match survey responses to Program participation dates. The Team included survey responses without participation dates in the year-end total but not in the quarterly breakdown.

[30] The number of participants who completed a survey does not always match the number of responses for each question, as some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

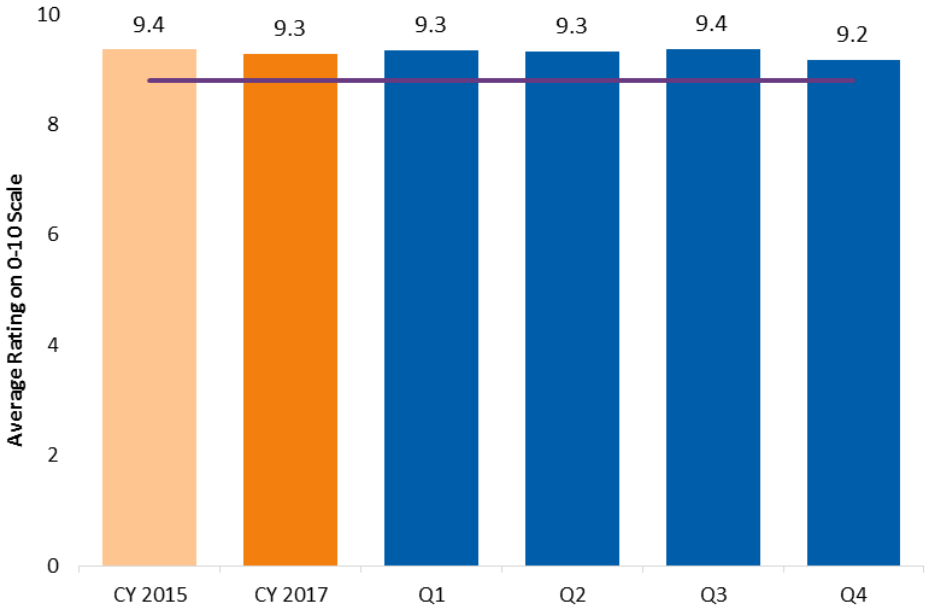
[31] The average satisfaction rating for the Appliance Recycling Program (9.3) was significantly higher than ratings for the Simple Energy Efficiency (8.9) and Home Performance with ENERGY STAR (9.0) programs, at $p < 0.05$ using t-tests, and was statistically equivalent to the average rating for Renewable Rewards (9.2).

[32] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[33] All four quarters and CY 2017 were significantly higher than the portfolio baseline ($p < 0.01$) using t-tests.

[34] Q4 ratings were significantly lower than CY 2015 ($p < 0.05$) using t-test.

Figure 24. CY 2017 Overall Program Satisfaction

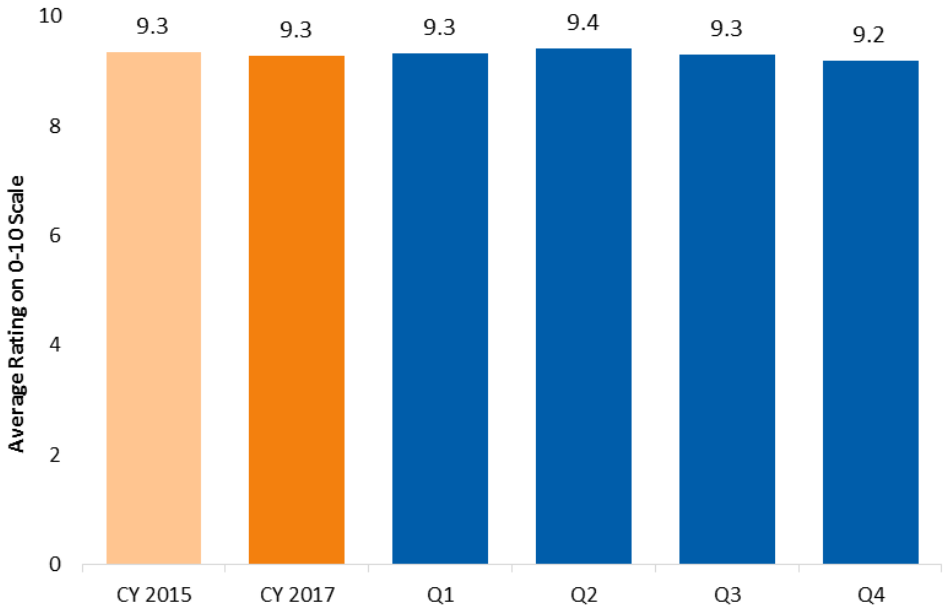


Source: Appliance Recycling Program Customer Satisfaction Survey Question: "Overall, how satisfied are you with the program?" (CY 2015 n=420, CY 2017 n=2,016, Q1 n=161, Q2 n=485, Q3 n=536, Q4 n=754)

Participants gave the Focus on Energy staff who assisted them similarly high satisfaction ratings, averaging 9.3 for CY 2017 (Figure 25). Ratings were statistically equivalent to the CY 2015 program for the first three quarters of CY 2017 and the year overall; however, Q4 ratings were significantly lower than CY 2015.[35]

[35] Q4 ratings were significantly lower than CY 2015 ($p < 0.10$) using t-test.

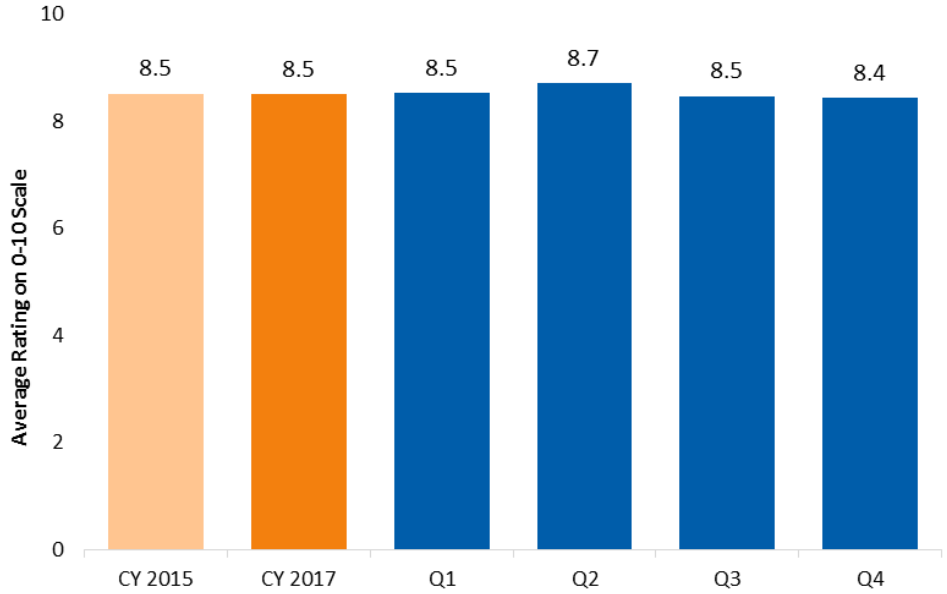
Figure 25. CY 2017 Satisfaction with Focus on Energy Staff



Source: Appliance Recycling Program Customer Satisfaction Survey Question: "How satisfied are you with the Focus on Energy staff who assisted you?" (CY 2015 n=410, CY 2017 n=1,987, Q1 n=159, Q2 n=481, Q3 n=526, Q4 n=741)

Respondents gave an average rating of 8.5 for their satisfaction with their incentive payment (Figure 26). These ratings we.re statistically equivalent to CY 2015 for every quarter and CY 2017 overall.

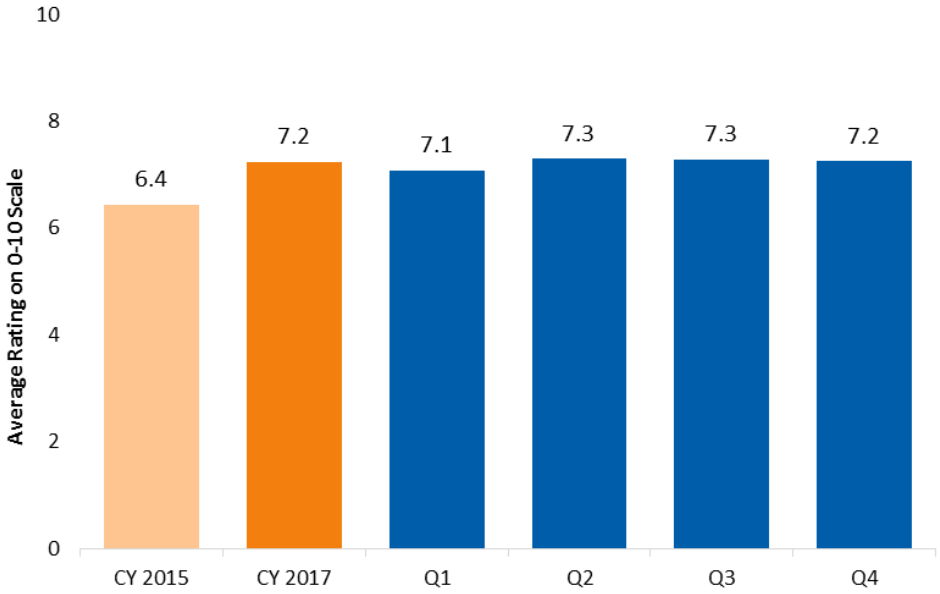
Figure 26. CY 2017 Satisfaction with Program Incentive



Source: Appliance Recycling Program Customer Satisfaction Survey Question: "How satisfied are you with the amount of the cash incentive you received?" (CY 2015 n=414, CY 2017 n=1,993, Q1 n=158, Q2 n=481, Q3 n=529, Q4 n=746)

Figure 27 shows that respondents' rating for the likelihood that they will initiate another energy efficiency project in the next 12 months averaged 7.2 (on a scale of 0 to 10, where 10 is the most likely).[36] These ratings were higher than CY 2015 during all four quarters of the year and for CY 2017 overall.[37]

Figure 27. CY 2017 Likelihood of Initiating Energy Efficiency Improvement



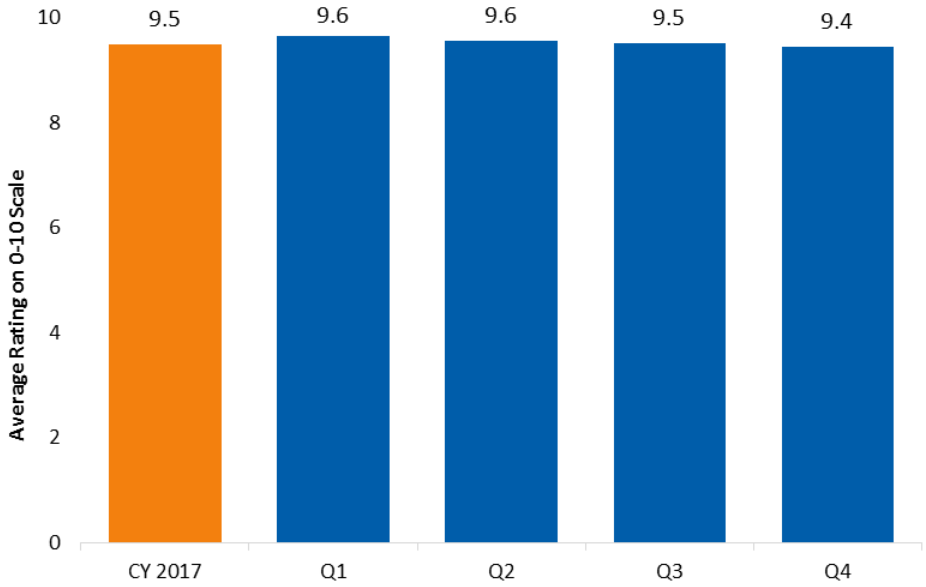
Source: Appliance Recycling Program Customer Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?"
(CY 2015 n=325, CY 2017 n=1,784, Q1 n=146, Q2 n=417, Q3 n=477, Q4 n=671)

Participants gave consistently high ratings for their likelihood to recommend the program, averaging 9.5 for the year (Figure 28). This question was not asked in the CY 2015 program survey. Using the CY 2017 survey data, the Evaluation Team calculated an NPS based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6). The NPS for all CY 2017 participants was +84 and ranged narrowly from +83 to +89 by quarter.

[36] Customers who responded that they "already have" done another energy efficiency project were counted in mean ratings as a rating of 10 (most likely).

[37] Q1 ($p < 0.05$), Q2 ($p < 0.01$), Q3 ($p=0.000$), Q4 ($p < 0.01$), and CY 2017 ($p < 0.01$) were significantly higher than CY 2015 using t-tests.

Figure 28. CY 2017 Likelihood of Recommending the Program

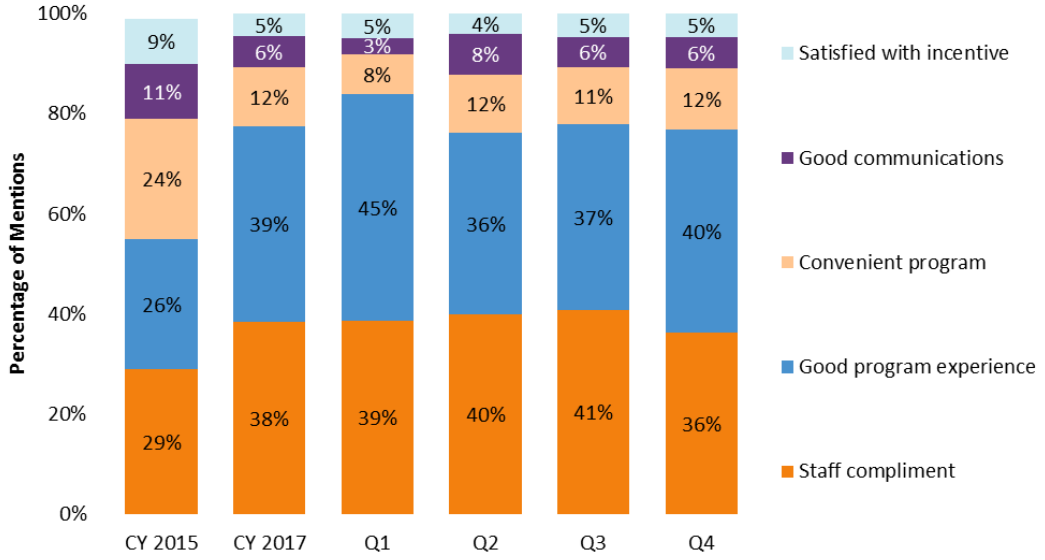


Source: Appliance Recycling Program Customer Satisfaction Survey Question: "How likely is it that you would recommend this program to a friend or colleague?" (CY 2017 n=2,008, Q1 n=160, Q2 n=485, Q3 n=535, Q4 n=749)

During the customer satisfaction surveys, the Evaluation Team also asked participants if they had any comments or suggestions for improving the program. Of the 2,025 participants who responded to the survey, 809 (or 40%) provided open-ended feedback, which the Evaluation Team coded into a total of 1,196 mentions. Of these mentions, 750 were positive or complimentary comments (63%), and 446 were suggestions for improvement (37%). The percentage of positive comments varied by quarter, ranged from a high of 76% during Q1 to a low of 57% during Q3.

The positive responses are shown in Figure 29, with 39% reflecting a generally positive experience, 38% of these complimenting the Program staff and pick-up crew, and 12% reflecting the ease and convenience of participating in the Program. In CY 2015, staff compliments (29%) and general comments about a good experience (26%) were less frequent than CY 2017, but mentions of ease and convenience (24%), good communications (11%) and satisfaction with the incentive (9%) were more common.

Figure 29. CY 2017 Positive Comments about the Program



Source: Appliance Recycling Program Customer Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions: CY 2015 n=140, CY 2017 n=750, Q1 n=62, Q2 n=198, Q3 n=194, Q4 n=275)

In CY 2017, the most frequent customer suggestions for improvement involved Program communications (31%), reducing check payment time (20%), and improving customer service (16%). Suggestions to shorten wait times for pick-up (8%) and to change program requirements (4%) were less common in CY 2017 compared to CY 2015. Suggestions to increase incentives were consistently uncommon in both years, at 4% of suggestions in CY 2015 and 6% in CY 2017.

Suggestions for improving communications tended to focus on the these:

- Cancelled or rescheduled pick-up appointments
- Pick-up crews that arrived outside the appointment window without updating the customer on their arrival time

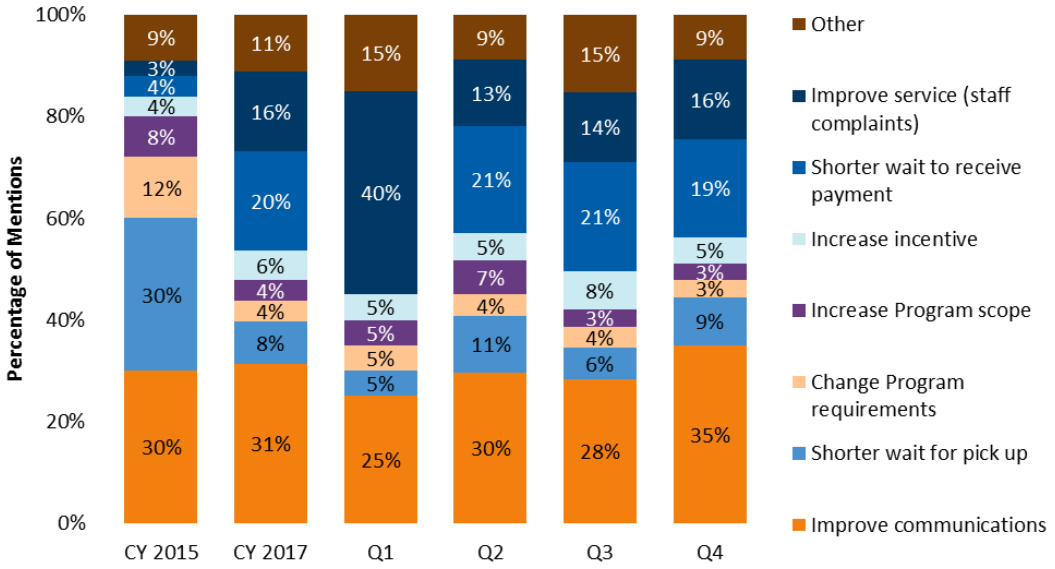
A smaller number of suggestions about communication reflected a desire for more clear and accurate information about program requirements, such as these:

- Acceptable condition of units for pick-up
- Requirement for a person over 18 to be at home during pick-up
- The amount of the rebate

Several respondents specifically suggested that they would like someone to call ahead on the day of pick-up to confirm the arrival time of the pick-up crew. Note there were also comments from respondents thanking the Program staff for calling ahead with a specific arrival time on their pick-up date. Some respondents also reported frustration reaching a person at the customer support number who could answer their questions about rebate check timing.

Suggestions for improvement are shown in Figure 30.

Figure 30. CY 2017 Suggestions for Improving the Program



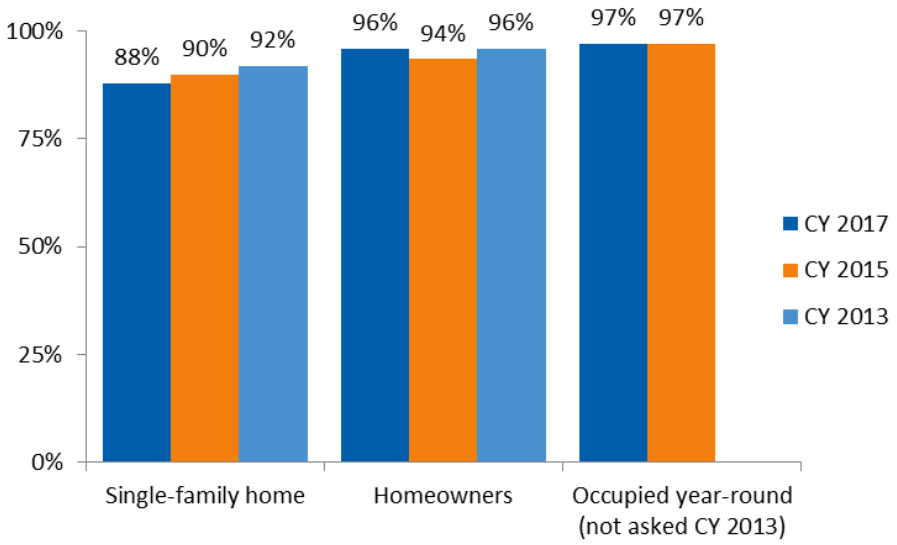
Source: Appliance Recycling Program Customer Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: CY 2015 n=74, CY 2017 n=446, Q1 n=20, Q2 n=91, Q3 n=145, Q4 n=180)

Participant Demographics

The Evaluation Team collected demographic information from each respondent of the CY 2017 participant survey and compared the results to the CY 2015 and CY 2013 evaluations.

CY 2017 survey results showed that a large majority of participants live in single-family homes, which they own and occupy year-round. There are no significant differences between CY 2017 and CY 2015 (Figure 31). Most survey respondents (82%, n=157) said they live in a house between 1,000 and 2,500 square feet. The Evaluation Team calculated the average respondent home to be 1,927 square feet. Nearly half (49%, n=167) of surveyed participants live in homes built before 1970, and 24% live in homes built since 1995.

Figure 31. Participant Reported Home Type, Ownership Status, and Occupancy



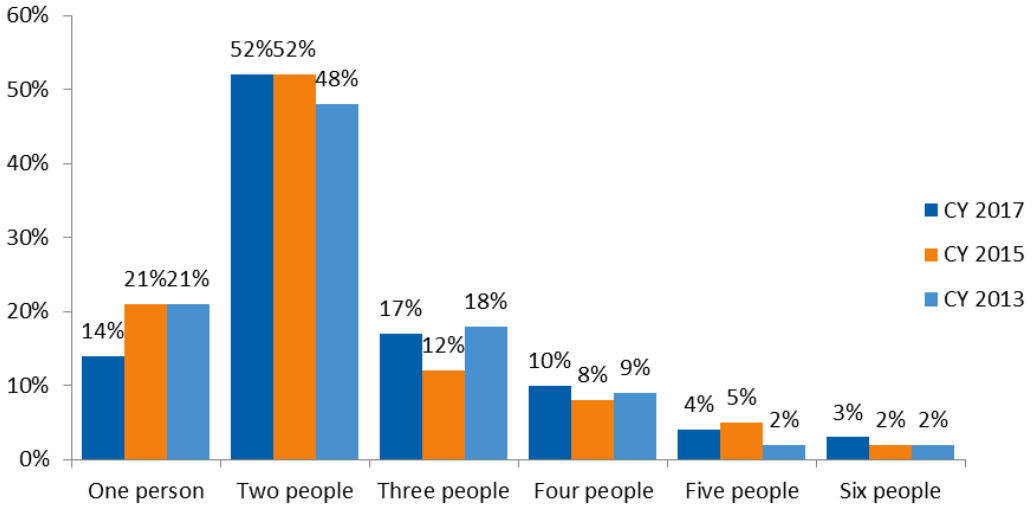
Source: 2017 Residential Appliance Recycling Program Participant Survey. Question F3 "What type of home do you live in?" Question F4 "Do you or members of your household own this home or do you rent?" Question F5 "Is your home occupied year-round or on a seasonal basis as a vacation home?" (n=171); Identical Questions H1, H2 and H3 from 2013 Residential Appliance Recycling Program Participant Survey (n=170), and I1 and I2 from 2013 Residential Appliance Recycling Program Participant Survey (n=131).

Half of the respondents (52%, n=167) said there were two people living in their home, which was also the pattern in CY 2015 and CY 2013. The Evaluation Team calculated an average of 2.5 residents per home for CY 2017 survey respondents.

Twenty-five percent of surveyed participants (n=171) reported having children under the age of 18 living in their household, which was a significant increase from 17% in CY 2015.[38] These households have an average of 2.0 children per household, and children under age 18 accounted for 0.5 of the 2.5 occupants in the average participant household.

[38] p=0.086 using binomial t-test.

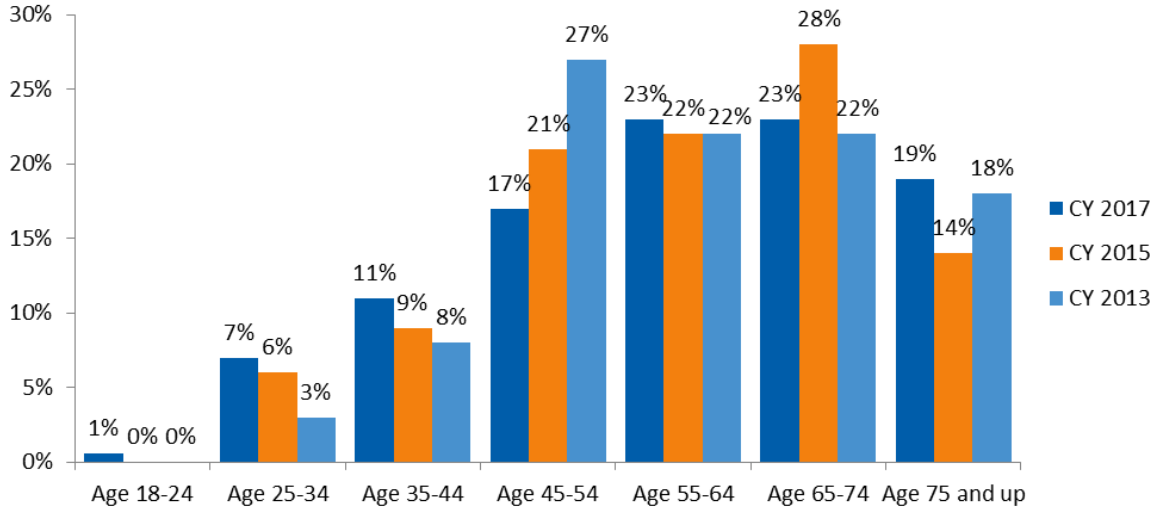
Figure 32. Participant Reported Occupancy Numbers



Source: 2017 Residential Appliance Recycling Program Participant Survey. Question F9: "Including yourself, how many people currently live in this household on a full time basis?" (n=167); Identical Question G9 in 2015 Residential Appliance Recycling Program Participant Survey (n=170), and I8 in 2013 Residential Appliance Recycling Program Participant Survey (n=131).

The average and median age of surveyed participants was about 60 years old, and only 18% of participants surveyed in CY 2017 were under 45 years old (Figure 33).

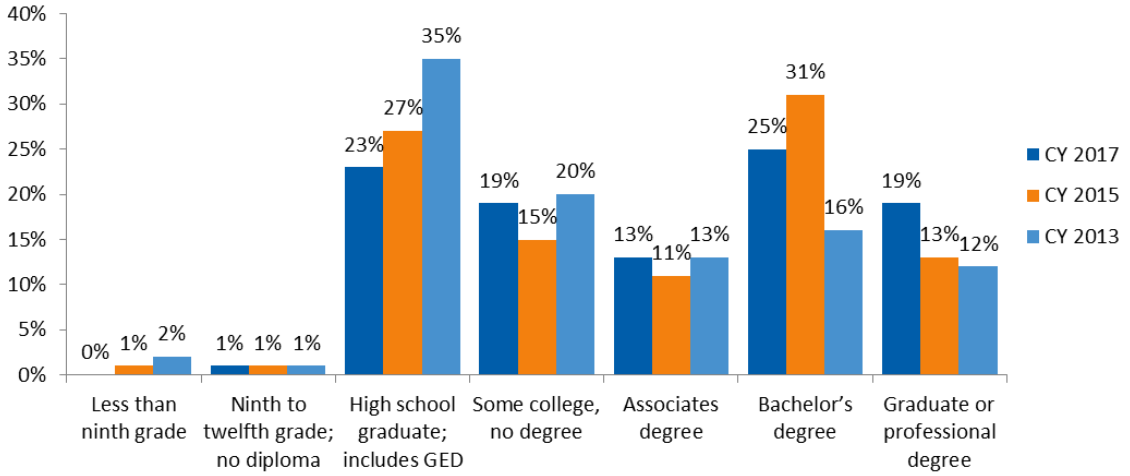
Figure 33. Participant Reported Age



Source: 2017 Residential Appliance Recycling Program Participant Survey. Question F12: "Which of the following categories best represents your age?" (n=168); Identical Question G12 from 2015 Residential Appliance Recycling Program Participant Survey (n=166), and I11 from 2013 Residential Appliance Recycling Program Participant Survey (n=130).

Ninety-nine percent of households surveyed in CY 2017 included at least one adult who graduated from high school, and 44% included at least one college graduate, as shown in Figure 34. Significantly more households with college graduates participated in CY 2017 and CY 2015 compared to CY 2013.[39]

Figure 34. Participant Reported Education Level



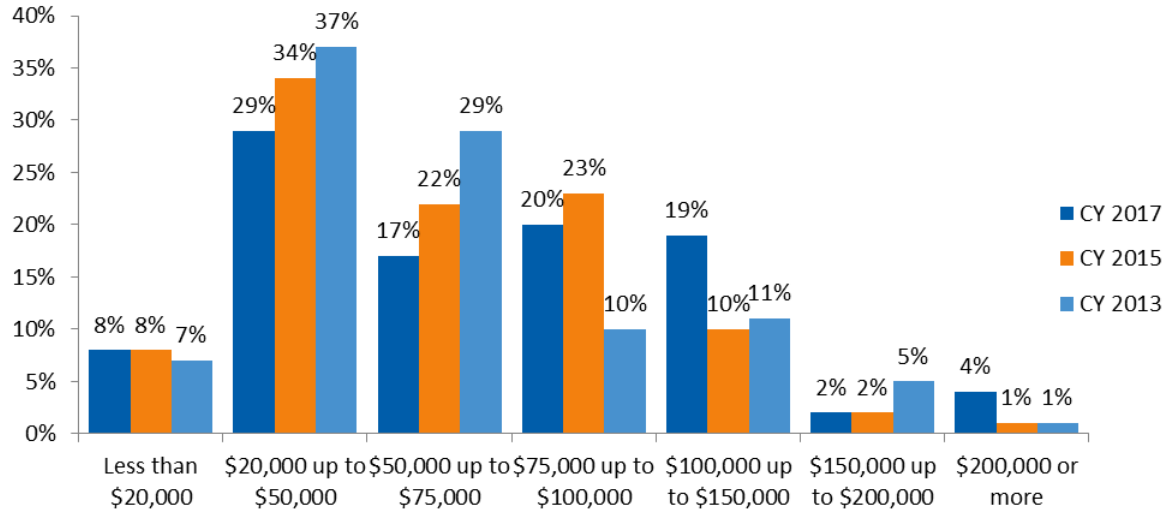
Source: Residential Appliance Recycling Program Participant Survey. Question F11: "What is the highest level of school that someone in your home has completed?" (n=167); Identical Question G11 from 2013 Residential Appliance Recycling Program Participant Survey (n=166), and I10 from 2013 Residential Appliance Recycling Program Participant Survey (n=130).

The median household income reported by surveyed participants in CY 2017 was between $50,000 and $75,000, with only 8% earning less than $20,000 and 6% earning more than $150,000, as shown in Figure 35. Significantly more participants earned over $75,000 in CY 2017 (45%) compared to CY 2013 (27%), which may be related to the significant increase in the percentage of participating households with college degrees since CY 2013.[40]

[39] Results using binomial t-tests: $p < 0.01$ (compared to CY 2017), $p < 0.01$ (compared to CY 2015).

[40] $p < 0.01$ using binomial t-test.

Figure 35. Participant Reported Annual Household Income



Source: 2017 Residential Appliance Recycling Program Participant Survey Question F13: "Which category best describes your total household income in 2016 before taxes?" (n=132), 2015 Residential Appliance Recycling Program Participant Survey Question G13: "Which category best describes your total household income in 2014 before taxes?" (n=117), and 2013 Residential Appliance Recycling Program Participant Survey Question QI12: "Which category best describes your total household income in 2012 before taxes?" (n=108)

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 43 lists the incentive costs for the Appliance Recycling Program for CY 2017.

Table 43. Appliance Recycling Program Incentive Costs

	CY 2017
Incentive Costs	$446,565

The Evaluation Team found the CY 2017 Program was cost-effective (1.10). Table 44 lists the evaluated costs and benefits.

Table 44. Appliance Recycling Program Costs and Benefits

Cost and Benefit Category	CY 2017
Costs	
Administration Costs	$530,547
Delivery Costs	$1,209,883
Incremental Measure Costs	$347,262
Total Non-Incentive Costs	**$2,087,692**
Benefits	
Electric Benefits	$1,941,575
Gas Benefits	$0
Emissions Benefits	$363,509
Total TRC Benefits	**$2,305,084**
Net TRC Benefits	**$217,392**
TRC B/C Ratio	**1.10**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Appliance Recycling Program.

Outcome 1. Reducing the check payment cycle time was a common suggestion from participants. In CY 2017, speeding up rebate payments comprised 20% of suggestions for improving the program, up from just 4% in CY 2015. The average check payment cycle also increased throughout CY 2017, from 27 days in Q1 to 38 days in Q4. Conversely, suggestions to reduce the time between scheduling and pick-up fell from 30% of suggestions in CY 2015 to 8% in CY 2017, while average scheduling cycle times remained in a consistent range of 15 to 18 calendar days for each quarter of CY 2017.

Recommendation 1. Prioritize process improvements that would allow rebate checks to be mailed to participants more quickly. If possible, begin the process of approving payments for potential participants upon enrollment, rather than following confirmation of pick-up.

Outcome 2. The Appliance Recycling Program is very popular with participants, but most have not participated in other Focus on Energy programs. During CY 2017, participants gave the Program an average overall satisfaction rating of 9.3, the highest satisfaction ratings given by participants in any residential Focus on Energy program this year. Compared to 2013 and 2015, the Program also continued to see an increase in the percentage of participants who were aware of or had participated in other Focus on Energy programs. However, 65% of CY 2017 Appliance Recycling Program participants had never participated in a Focus on Energy program before.

Recommendation 2. Consider taking advantage of the popularity of the Program among past participants to solicit participation in other Focus on Energy programs. The Program Administrator can use the lists of past participants to distribute information about new program offerings via direct mail or email. Reaching out to this group could boost participation in other energy efficiency programs because it would target customers that have shown some consciousness of energy efficiency (i.e., more likely to sign up) but historically have not participated in other programs.

Home Performance with ENERGY STAR Program

The Home Performance with ENERGY STAR Program encourages comprehensive energy efficiency retrofits in single-family homes with three or fewer units. Focus on Energy designed the Program to address customers' uncertainty about home improvements, their possible costs, and the potential for energy savings by providing information and recommendations specific to each customer's home. The Program offers three paths for participation:

- A whole home path for building shell improvements
- An HVAC path for heating and cooling improvements
- A renewable rewards path, which is also available to small business customers

The whole home and HVAC components offer these two tiers of incentives for energy efficiency improvements:

- Tier 1, the standard track, offers incentives available to all homeowners
- Tier 2, the income-qualified track (IQT), offers enhanced incentives to homeowners with a household income at or below 80% of the state median income

In 2016, the PSC identified that rural customers had been historically underserved by Focus on Energy programs, and allocated funding to a package of programs to enhance service in 2017 and 2018. In CY 2017, Focus on Energy added a Rural Broadband offering to the whole home path as one component of this offering. The Program encouraged rural customers to make building shell improvements, distributing discounts for $300 off a home energy assessment to customers in rural ZIP codes who completed self-assessments through Focus on Energy's Direct Mail Home Energy Assessment (DHEA) Pilot.[41,42] Focus on Energy provided incentives to encourage trade allies to travel to distant rural areas to complete assessments.

The Evaluation Team did not conduct an impact evaluation for the Rural Home Performance Program in CY 2017 because of its delayed launch but this chapter provides the process findings for the Program. A complete impact evaluation of the Rural Home Performance program will be included in the CY 2018 annual evaluation report.

This chapter provides aggregated and independent findings for all Program components and incentive tiers. Table 45 lists the Program's actual spending, savings, participation, and cost-effectiveness for whole home and HVAC projects.

[41] Each home energy assessment included the Home Energy Score, as described in the *Program Design* section.

[42] Focus on Energy designated rural ZIP codes according to U.S. Census Bureau data. See Appendix K for a complete list of designated rural ZIP codes.

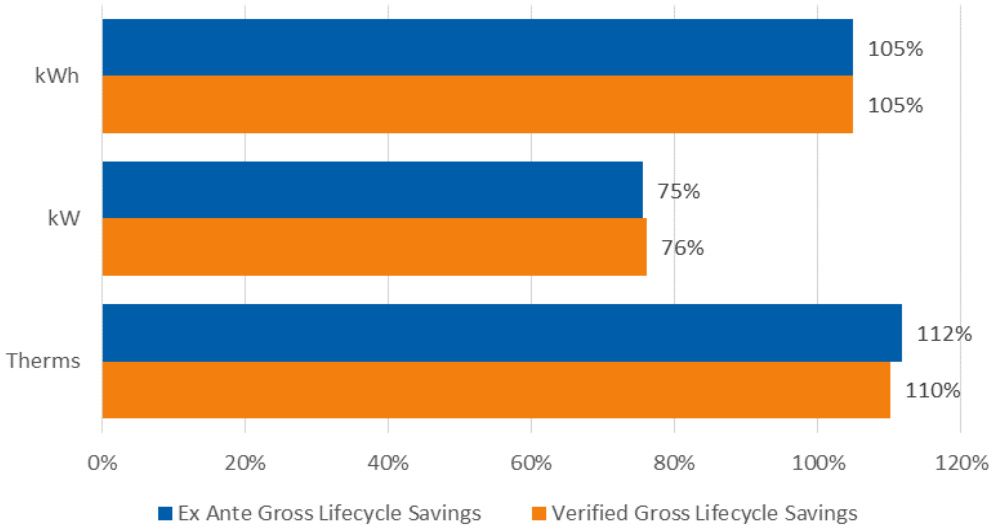
Table 45. Home Performance with ENERGY STAR Program Whole Home and HVAC Paths Summary

Item	Units	CY 2017	CY 2016
Incentive Spending	$	$6,165,544	$5,416,782
Participation	Number of Participants	21,678	20,013
Verified Gross Lifecycle Savings	kWh	238,305,868	205,095,725
	kW	2,807	2,908
	therms	29,758,586	28,236,648
Verified Gross Lifecycle Realization Rate	% (MMBtu)	99%	100%
Net Annual Savings	kWh	9,566,078	8,432,816[1]
	kW	2,302	2,976
	therms	1,146,029	1,060,429
Annual Net-to-Gross Ratio	% (MMBtu)	78%	85%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	1.69	1.23

[1] During CY 2017 review, an error was found in CY 2016 net calculations, as discussed in the *ECMs* section below. CY 2016 net kWh savings should have been 8,965,649, with an overall Annual NTG Ratio for CY 2016 of 86%. This error will be rectified in the CY 2018 evaluation report's summary of quadrennial activities.

Figure 36 shows the percentage of gross lifecycle savings goals achieved by the whole home and HVAC paths in CY 2017. The Program met 76% of its CY 2017 goal for kW savings and exceeded its CY 2017 kWh and therms goals for both *ex ante* and verified gross savings.

Figure 36. Home Performance with ENERGY STAR Program Whole Home and HVAC Paths Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] For *ex ante* gross lifecycle savings, 100% reflects the Program Implementation contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

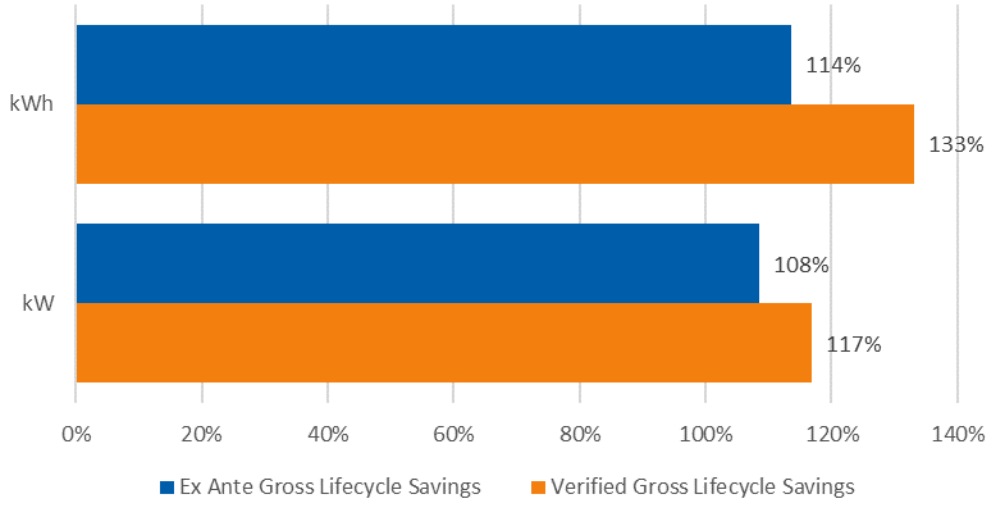
Table 46 lists the Program's actual spending, savings, participation, and cost-effectiveness for the renewable rewards path.

Table 46. Home Performance with ENERGY STAR Program Renewable Rewards Path Summary

Item	Units	CY 2017	CY 2016
Incentive Spending	$	$1,095,018	$1,158,198
Participation	Number of Participants	552	546
Verified Gross Lifecycle Savings	kWh	189,149,337	126,495,441
	kW	2,774	1,833
	therms	0	0
Verified Gross Lifecycle Realization Rate	% (MMBtu)	117%	118%
Net Annual Savings	kWh	5,455,105	3,615,302
	kW	2,013	1,302
	therms	0	0
Annual Net-to-Gross Ratio	% (MMBtu)	72%	69%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	1.11	0.89

Figure 37 shows the percentage of gross lifecycle savings goals achieved by the Program in CY 2017 for the renewable rewards path. The Program exceeded electric and demand CY 2017 goals for both *ex ante* and verified gross savings.

Figure 37. Home Performance with ENERGY STAR Program Renewable Rewards Path Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] For *ex ante* gross lifecycle savings, 100% reflects the Program Implementation contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations for the Home Performance with ENERGY STAR Program in CY 2017. The Team designed its EM&V approach to integrate multiple perspectives in assessing the Program's performance. Table 47 lists the specific data collection activities and sample sizes used in the evaluations for each Home Performance with ENERGY STAR Program path.

Table 47. CY 2017 Home Performance with ENERGY STAR Program
Data Collection Activities and Sample Sizes

Activity	Whole Home Path	HVAC Path	Renewable Rewards	Rural Broadband
Program Actor Interviews	2			
Tracking Database Review	Census			
Ongoing Participant Satisfaction Surveys	1,007	425	151	n/a
Trade Ally Online Surveys	80			
Electric Billing Analysis[1]	655	n/a	n/a	n/a
Gas Billing Analysis[1]	850	n/a	n/a	n/a

[1] Billing analysis sample sizes represent participant homes included in the billing analysis; they do not reflect the total number of homes for which the Team received billing data.

Program Actor Interviews

The Evaluation Team interviewed APTIM, the Program Administrator, and CLEAResult, the Program Implementer, to assess the status of the Program. Interview topics included program performance and goals, marketing and outreach, trade ally networks, recent changes to the Program, and upcoming changes to the Program going forward.

Tracking Database Review

The Evaluation Team's review of the census of the Program SPECTRUM tracking data included these tasks:

- Thoroughly review the data to ensure the SPECTRUM totals matched the totals reported by the Program Administrator
- Reassign adjustment measures to measure names
- Check for complete and consistent application of data fields (measure names, application of first-year savings, application of effective useful lives [EULs], etc.)

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct satisfaction surveys beginning in CY 2015 for the 2015–2018 quadrennial. The goal of these surveys was to provide an opportunity for quick and easy feedback to recent program participants, ensure timely feedback close to the participation experience, enable problem identification at any time of year, and identify energy efficiency opportunities for delivering follow-up information to interested participants.

The Program Administrator deployed online surveys through SPECTRUM to all CY 2017 participants with email addresses within two weeks of participating in the program. The Evaluation Team gathered online survey results via SPECTRUM and sent, received, and scanned mail survey responses, which were combined with the online results for quarterly and annual reporting.

In CY 2017, 1,583 Home Performance with ENERGY STAR Program participants (1,007 whole home, 425 HVAC, and 151 Renewable Rewards) responded to the customer satisfaction survey.

Trade Ally Online Survey

In October 2017, the Evaluation Team surveyed 80 Program Trade Allies who participated in whole home and HVAC components of the Home Performance with ENERGY STAR Program. The brief survey included certain core questions regarding engagement and satisfaction with the Program and Focus on Energy.

Electric and Gas Billing Analyses

The Evaluation Team conducted billing analyses to estimate the Program's net savings for electric and gas savings for each track/tier for 2016 and 2017 participants where the new Snugg Pro Software was used. In January 2018 the Evaluation Team submitted a request to participating utilities for January 2015 to January 2018 billing data for all Tier 1 and Tier 2 Home Performance with ENERGY STAR whole home participants .[43] The Team received valid billing data from 36 utilities for 1,976 customers. Focus on Energy also provided detailed tracking data from SPECTRUM for participants in all of its programs from 2016 and 2017.

The Evaluation Team's CY 2017 billing analysis of standard track (Tier 1) participants was based on billing data from a sample of 497 participant electric accounts and 641 participant gas accounts. The impact of the Program was assessed by comparing the participants' energy consumption to a nonparticipant control group of 171 electric accounts and 187 gas accounts that participated in the Program after the billing analysis period

The Evaluation Team's CY 2017 billing analysis of income-qualified (Tier 2) participants was based on billing data from a sample of 158 electric accounts and 209 gas accounts. The impact of the Program was assessed by comparing the participants' energy consumption to a nonparticipant control group of 32 electric accounts and 36 gas accounts that participated in the program after the analysis period.

Impact Evaluation

This section presents impact evaluation findings for the whole home path and HVAC path by income track, as well as the renewable rewards path. The Evaluation Team based the impact evaluations on the methods shown in Table 48.

[43] The Team submitted billing data requests to all participating utilities with customers who participated in the whole home path (Tier 1 or Tier 2) and for which the Team had contact information.

Table 48. CY 2017 Home Performance with ENERGY STAR Impact Evaluation Methods

Activity	Whole Home Path	HVAC Path	Renewable Rewards
Tracking Database Review	✓	✓	✓
Billing Analysis	✓	--	--
Participant Surveys	--	✓[1]	✓[2]
Standard Market Practice	--	✓	--

[1] The Team applied CY 2015 Residential Rewards participant survey self-report NTG results to HVAC path measures that were not included in the standard market practice analysis.

[2] The Team applied CY 2016 Renewable Rewards participant survey self-report NTG results to 2017 Renewable Rewards measures.

Evaluation of Gross Savings

The Evaluation Team assessed gross Program savings through a tracking database review.

Tracking Database Review

The Evaluation Team reviewed the census of CY 2017 Home Performance with ENERGY STAR Program data contained in SPECTRUM for appropriate and consistent application of unit-level savings and EULs in adherence with the Wisconsin TRM or other deemed savings sources.

Whole Home Path

The Evaluation Team adjusted unit therms savings for one measure and the EUL value for one measure, as shown in the Table 49, in accordance with the Wisconsin TRM. The adjustments had little effect on whole home path realization rates because of the small number of installed units for each measure.

Table 49. CY 2017 Whole Home Path Database Tracking Review Adjustments

Measure (MMID)	SPECTRUM Average Per Unit		Adjustments to SPECTRUM Per Unit	
	Therms	EUL	Therms	EUL
Heat Pump Water Heater, Residential (MMID 4108)	0	--	-23	--
Water Heater, >= 0.67 EF, Storage, NG, Claim Only (MMID 3587)	--	12	--	10

Note: Blank cells reflect values that were not adjusted.

HVAC Path

The Evaluation Team made adjustments to the unit therms savings of one furnace measure and one water heater measure to align these values with the Wisconsin TRM. The Evaluation Team also adjusted the unit kW savings for 10 furnace measures for which SPECTRUM had incorrect prescriptive values. The Team calculated the correct kilowatt savings using the algorithms and inputs approved in the TRM. Table 50 documents these adjustments.

Table 50. CY 2017 HVAC Path Database Tracking Review Adjustments

Measure (MMID)	SPECTRUM Average Per-Unit Savings			Adjustments to SPECTRUM Per-Unit Savings		
	kW	kWh	therms	kW	kWh	therms
Furnace And A/C, ECM, 95%+ AFUE, ≥ 16 SEER	--	--	25.3	--	--	21.0
LP Furnace with ECM, 90%+ AFUE (Existing)	0.0775	--	--	0.0792	--	--
NG Furnace with ECM, 95%+ AFUE (Existing)	0.0774	--	--	0.0792	--	--
NG Furnace with ECM, 96%+ AFUE	0.0776	--	--	0.0792	--	--
NG Furnace with ECM, 97%+ AFUE	0.0775	--	--	0.0792	--	--
NG Furnace with ECM, 98%+ AFUE	0.0777	--	--	0.0792	--	--
Smart Thermostat, Existing NG Furnace	0.0039	427.7	31.9	0.0000	439.0	30.0
Furnace and A/C, Tier 2, ECM, 95%+ AFUE, ≥ 16 SEER	--	--	191.0	--	--	165.0
Hot Water Boiler, Tier 2, 95%+ AFUE	--	--	158.0	--	--	151.0
LP Furnace with ECM, Tier 2, 90%+ AFUE (Existing)	0.0778	--	--	0.0792	--	--
NG Furnace with ECM, Tier 2, 95%+ AFUE (Existing)	0.0775	--	--	0.0792	--	--
NG Furnace with ECM, Tier 2, 96%+ AFUE	0.0777	--	--	0.0792	--	--
NG Furnace with ECM, Tier 2, 97%+ AFUE	0.0778	--	--	0.0792	--	--
NG Furnace with ECM, Tier 2, 98%+ AFUE	0.0776	--	--	0.0792	--	--

Note: Blank cells reflect values that were not adjusted.

Renewable Rewards Path

The Evaluation Team found no discrepancies for the renewable rewards path during the tracking database review.

Renewable Rewards Path Savings

The Evaluation Team recommended changes to both ground source heat pump (GSHP) and solar photovoltaic (PV) measures in 2016, based on desk reviews of measure applications. These changes were recommended in the 2017 deemed savings report,[44] but they were not implemented in the CY 2017 TRM because they were not finalized until the summer of 2017. Therefore, they are applied as gross adjustments, as described below.

Ground Source Heat Pumps

The Evaluation Team applied realization rates from the 2016 engineering desk review of GSHPs to the CY 2017 GSHP measures. For the CY 2016 evaluation, the Team calculated verified gross savings for 10 GSHP applications from the renewable rewards path. The Team found that installed heating and cooling capacities were higher than the deemed capacities listed in the TRM.

In addition, the Team found that coefficients of performance and energy efficiency ratings were less than their deemed values in the TRM, and that full-load installed efficiencies were conservative. Overall,

[44] Cadmus. *Focus on Energy Evaluated Deemed Savings Changes*. August 31, 2017. https://focusonenergy.com/sites/default/files/FoE_Deemed%20Savings%20Report_%20CY%2017_v1.7.pdf

the verified energy savings for GSHPs exceeded the *ex ante* values by 28%, and the verified demand reduction exceeded the *ex ante* values by 8%.

Solar Photovoltaic Systems

The Team also applied realization rates from the CY 2016 (PV) system analysis to CY 2017 PV systems. For the CY 2016 evaluation, the Evaluation Team calculated verified gross savings for 60 residential and business PV participants. The Team reviewed each application for key system characteristics such as tilt, system size, and azimuth then identified the sites in Google Earth to confirm orientation details and the accuracy of reported shading. Finally, the Evaluation Team entered the resulting parameters into PVWatts and created an hourly generation profile that produced results for annual electricity generation and peak load reduction.

The overall verified electricity generation for PV systems in the CY 2016 renewable rewards path were substantially higher than the TRM calculations indicated. This is likely because of several factors, including a different DC-to-AC derate factor and differences in shading losses. Similarly, the verified peak demand also exceeded the *ex ante* values, albeit by a smaller margin. Overall, the verified energy savings for PV exceeded the *ex ante* values by 17%, and the verified demand reduction exceeded the *ex ante* values by 9% for business applications and 6% for residential applications. The Team applied these realization rates to PV savings for the CY 2017 evaluation.

CY 2017 Verified Gross Savings Results

Overall, the Home Performance with ENERGY STAR Program achieved an evaluated annual realization rate of 101% weighted by MMBtu.[45] For the HVAC path, adjustments to the therms savings for natural gas furnaces (Table 50) account for much of the decrease in verified gross savings below *ex ante* gross savings. The Renewable Rewards realization rates were driven by overly conservative and, in some cases, outdated calculation assumptions made in the Wisconsin TRM for each measure. As noted in the Renewable Rewards section above, updates to these assumptions were not finalized early enough for inclusion in the CY 2017 TRM. However, they will be included in the CY 2018 TRM and these gross adjustments should not be necessary for that program year.

Table 51 shows realization rates by Program component, and Table 52 through Table 54 show realization rates by measure type for each Program component.

[45] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

Table 51. CY 2017 Home Performance with ENERGY STAR Program
Annual and Lifecycle Realization Rates by Program Component

Program Component	Annual Realization Rate				Lifecycle Realization Rate			
	kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
HVAC - Standard Track	100%	101%	98%	99%	100%	101%	97%	98%
HVAC - IQT	100%	102%	98%	99%	100%	102%	98%	99%
Whole Home - Standard Track	100%	100%	100%	100%	100%	100%	100%	100%
Whole Home - IQT	100%	100%	100%	100%	100%	100%	100%	100%
Renewable Rewards	117%	108%	n/a	117%	117%	108%	n/a	117%
Total	**106%**	**104%**	**99%**	**101%**	**107%**	**104%**	**99%**	**101%**

Table 52. CY 2017 Whole Home Path Annual and Lifecycle Realization Rates by Measure Type

Program Component	Measure	Annual Realization Rate				Lifecycle Realization Rate			
		kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
Whole Home - Standard Track[1]	Project Completion	100%	100%	100%	100%	100%	100%	100%	100%
	Water Heater	100%	100%	52%	78%	100%	100%	93%	97%
Whole Home - Standard Track Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Whole Home - IQT[1]	Adjustment Measure	n/a	n/a	100%	100%	n/a	n/a	100%	100%
	Project Completion	100%	100%	100%	100%	100%	100%	100%	100%
Whole Home - IQT Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Whole Home Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

[1] Tracking data included projects with air sealing, duct sealing, and insulation, but no savings were attributed to these measures.

Table 53. CY 2017 HVAC Path Annual and Lifecycle Realization Rates by Measure Type

Program Component	Measure	Annual Realization Rate				Lifecycle Realization Rate			
		kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
HVAC - Standard Track	Adjustment Measure	n/a	n/a	100%	100%	n/a	n/a	100%	100%
	Air Source Heat Pump	100%	100%	n/a	100%	100%	100%	n/a	100%
	Boiler	n/a	n/a	100%	100%	n/a	n/a	100%	100%
	Ductless Minisplit Heat Pump	100%	100%	n/a	100%	100%	100%	n/a	100%
	ECM	100%	100%	n/a	100%	100%	100%	n/a	100%
	Furnace and A/C	100%	100%	83%	90%	100%	100%	83%	90%
	Furnace with ECM	100%	102%	100%	100%	100%	102%	100%	100%
	Smart Thermostat	101%	99%	100%	100%	101%	99%	100%	100%
	Water Heater	n/a	n/a	100%	100%	n/a	n/a	100%	100%
HVAC - Standard Track Total		**100%**	**101%**	**98%**	**99%**	**100%**	**101%**	**97%**	**98%**
HVAC - IQT	Boiler	n/a	n/a	100%	100%	n/a	n/a	100%	100%
	Ductless Minisplit Heat Pump	100%	100%	n/a	100%	100%	100%	n/a	100%
	Furnace	n/a	n/a	100%	100%	n/a	n/a	100%	100%
	Furnace and A/C	100%	100%	86%	88%	100%	100%	86%	88%
	Furnace with ECM	100%	102%	100%	100%	100%	102%	100%	100%
	Water Heater	n/a	n/a	100%	100%	n/a	n/a	100%	100%
HVAC - IQT Total		**100%**	**102%**	**98%**	**99%**	**100%**	**102%**	**98%**	**99%**
HVAC Total		**100%**	**101%**	**98%**	**99%**	**100%**	**101%**	**98%**	**98%**

Table 54. CY 2017 Renewable Rewards Annual and Lifecycle Realization Rates by Measure Type

Program Component	Measure	Annual Realization Rate				Lifecycle Realization Rate			
		kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
Renewable Rewards	Ground Source Heat Pump	128%	108%	n/a	128%	128%	108%	n/a	128%
	Solar PV	117%	108%	n/a	117%	117%	108%	n/a	117%
Renewable Rewards Total		**117%**	**108%**	**n/a**	**117%**	**117%**	**108%**	**n/a**	**117%**

Table 55 lists the *ex ante* and verified annual gross savings for each Home Performance with ENERGY STAR Program component for CY 2017. Table 56 through Table 58 show verified annual gross savings by measure type for each Program component.

Table 55. CY 2017 Home Performance with ENERGY STAR Program Annual Gross Savings Summary by Program Component[1]

Program Component	*Ex Ante* Gross Annual			Verified Gross Annual		
	kWh	kW	therms	kWh	kW	therms
HVAC - Standard Track	8,881,932	2,249	801,305	8,886,793	2,271	785,893
HVAC - IQT	415,054	91	181,207	416,302	92	178,479
Whole Home - Standard Track	1,581,242	376	417,986	1,581,242	376	417,319
Whole Home - IQT	115,845	68	128,278	115,845	68	128,278
Renewable Rewards	6,446,903	2,575	0	7,555,895	2,774	0
Total Annual	**17,440,976**	**5,359**	**1,528,776**	**18,556,076**	**5,581**	**1,509,969**

[1] Differences to the Home Performance with ENERGY STAR Program were because water adjustment measures were equivalent to 4,035 annual kWh (0.04%).

Table 56. CY 2017 Whole Home Path Annual Gross Savings Summary by Measure Type

Program Component	Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
		kWh	kW	therms	kWh	kW	therms
Whole Home - Standard Track[1]	Project Completion	1,532,989	374	416,602	1,532,989	374	416,602
	Water Heater	48,253	2	1,384	48,253	2	717
Whole Home - Standard Track Total Annual		**1,581,242**	**376**	**417,986**	**1,581,242**	**376**	**417,319**
Whole Home - IQT[1]	Adjustment Measure	0	0	144	0	0	144
	Project Completion	115,845	68	128,134	115,845	68	128,134
Whole Home - IQT Total Annual		**115,845**	**68**	**128,278**	**115,845**	**68**	**128,278**
Whole Home Total Annual		**1,697,087**	**444**	**546,264**	**1,697,087**	**444**	**545,597**

[1] Tracking data included projects with air sealing, duct sealing, and insulation, but no savings were attributed to these measures.

Table 57. CY 2017 HVAC Path Annual Gross Savings Summary by Measure Type

Program Component	Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
		kWh	kW	therms	kWh	kW	therms
HVAC - Standard Track	Adjustment Measure	0	0	144	0	0	144
	Air Source Heat Pump	31,722	10	0	31,722	10	0
	Boiler	0	0	65,541	0	0	65,541
	Ductless Minisplit Heat Pump	575,688	-105	0	575,688	-105	0
	ECM	55,610	11	0	55,610	11	0
	Furnace and A/C	1,666,924	891	81,447	1,668,477	892	67,641
	Furnace with ECM	6,132,561	1,144	396,711	6,130,066	1,167	396,092
	Smart Thermostat	419,427	299	249,278	425,230	297	248,291
	Water Heater	0	0	8,184	0	0	8,184
HVAC - Standard Track Total Annual		**8,881,932**	**2,249**	**801,305**	**8,886,793**	**2,271**	**785,893**
HVAC - IQT	Boiler	0	0	8,661	0	0	8,661
	Ductless Minisplit Heat Pump	15,840	-6	0	15,840	-6	0
	Furnace	0	0	20,130	0	0	20,130
	Furnace and A/C	64,750	35	23,875	64,750	35	20,625
	Furnace with ECM	334,464	62	128,355	335,712	64	128,877
	Water Heater	0	0	186	0	0	186
HVAC - IQT Total Annual		**415,054**	**91**	**181,207**	**416,302**	**92**	**178,479**
HVAC Total Annual		**9,296,986**	**2,340**	**982,512**	**9,303,095**	**2,363**	**964,372**

Table 58. CY 2017 Renewable Rewards Annual Gross Savings Summary by Measure Type

Program Component	Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
		kWh	kW	therms	kWh	kW	therms
Renewable Rewards	Ground Source Heat Pump	115,971	27	0	148,045	29	0
Renewable Rewards	Solar PV	6,330,932	2,548	0	7,407,850	2,745	0
Renewable Rewards Total Annual		**6,446,903**	**2,575**	**0**	**7,555,895**	**2,774**	**0**

Table 59 lists the *ex ante* and verified gross lifecycle savings by Program component for the Home Performance with ENERGY STAR Program in CY 2017. Table 60 through Table 62 show verified gross lifecycle savings by measure type for each Program component.

Table 59. CY 2017 Home Performance with ENERGY STAR Program Lifecycle Gross Savings Summary by Program Component[1]

Program Component	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
HVAC - Standard Track	195,247,943	2,249	15,156,349	195,284,241	2,271	14,774,305
HVAC - IQT	9,449,568	91	4,132,742	9,478,193	92	4,069,863
Whole Home - Standard Track	31,227,128	376	8,350,074	31,227,128	376	8,348,786
Whole Home - IQT	2,316,306	68	2,565,632	2,316,306	68	2,565,632
Renewable Rewards	161,462,071	2,575	0	189,149,337	2,774	0
Total Lifecycle	**399,703,017**	**5,359**	**30,204,797**	**427,455,205**	**5,581**	**29,758,586**

Table 60. CY 2017 Whole Home Path Lifecycle Gross Savings Summary by Measure Type

Program Component	Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
		kWh	kW	therms	kWh	kW	therms
Whole Home - Standard Track[1]	Project Completion	30,599,628	374	8,332,720	30,599,628	374	8,332,720
	Water Heater	627,500	2	17,354	627,500	2	16,066
Whole Home - Standard Track Total Lifecycle		**31,227,128**	**376**	**8,350,074**	**31,227,128**	**376**	**8,348,786**
Whole Home - IQT[1]	Adjustment Measure	0	0	3,312	0	0	3,312
	Project Completion	2,316,306	68	2,562,320	2,316,306	68	2,562,320
Whole Home - IQT Total Lifecycle		**2,316,306**	**68**	**2,565,632**	**2,316,306**	**68**	**2,565,632**
Whole Home Total Lifecycle		**33,543,434**	**444**	**10,915,706**	**33,543,434**	**444**	**10,914,418**

[1] Tracking data included projects with air sealing, duct sealing, and insulation, but no savings were attributed to these measures.

Table 61. CY 2017 HVAC Path Lifecycle Gross Savings Summary by Measure Type

Program Component	Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
		kWh	kW	therms	kWh	kW	therms
HVAC - Standard Track	Adjustment Measure	0	0	3,312	0	0	3,312
	Air Source Heat Pump	570,996	10	0	570,996	10	0
	Boiler	0	0	1,310,820	0	0	1,310,820
	Ductless Minisplit Heat Pump	10,362,384	-105	0	10,362,384	-105	0
	ECM	1,000,980	11	0	1,000,980	11	0
	Furnace and A/C	38,211,463	891	2,111,646	38,247,053	892	1,753,706
	Furnace with ECM	140,907,849	1,144	9,115,029	140,850,530	1,167	9,100,799
	Smart Thermostat	4,194,271	299	2,492,782	4,252,299	297	2,482,908
	Water Heater	0	0	122,760	0	0	122,760
HVAC - Standard Track Total Lifecycle		**195,247,943**	**2,249**	**15,156,349**	**195,284,241**	**2,271**	**14,774,305**
HVAC - IQT	Boiler	0	0	173,220	0	0	173,220
	Ductless Minisplit Heat Pump	285,120	-6	0	285,120	-6	0
	Furnace	0	0	461,505	0	0	461,505
	Furnace and A/C	1,488,000	35	549,875	1,488,000	35	475,023
	Furnace with ECM	7,676,448	62	2,945,352	7,705,073	64	2,957,325
	Water Heater	0	0	2,790	0	0	2,790
HVAC - IQT Total Lifecycle		**9,449,568**	**91**	**4,132,742**	**9,478,193**	**92**	**4,069,863**
HVAC Total Lifecycle		**204,697,511**	**2,340**	**19,289,091**	**204,762,434**	**2,363**	**18,844,168**

Table 62. CY 2017 Renewable Rewards Lifecycle Gross Savings Summary by Measure Type

Program Component	Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
		kWh	kW	therms	kWh	kW	therms
Renewable Rewards	Ground Source Heat Pump	2,087,478	27	0	2,664,805	29	0
Renewable Rewards	Solar PV	159,374,593	2,548	0	186,484,532	2,745	0
Renewable Rewards Total Lifecycle		**161,462,071**	**2,575**	**0**	**189,149,337**	**2,774**	**0**

Evaluation of Net Savings

This section details the Evaluation Team's methods to estimate verified net savings, which included billing analysis, modeling software calibration, standard market practice, and participant surveys.

Billing Analysis – Whole Home Path

In CY 2017, the Evaluation Team used the Snugg Pro modeling software to determine verified savings from the whole home path.

For the billing analysis, the Team used weather normalized regression models to measure the impact of energy efficiency measures on consumption for participants where the Snugg Pro software was used in CY 2016 and CY 2017. By evaluating the pre- and post-installation energy consumption, and accounting for variables such as weather, the Evaluation Team measured impacts for Program-related installations. The CY 2017 analysis included a control group of nonparticipants, which allowed the billing analysis to provide an estimate of net savings. The Evaluation Team compared the change in energy consumption for participants to the results of a similar analysis conducted for nonparticipants to estimate total verified net savings from the Program. The nonparticipant group was identified by sampling future program participants—that is, customers who participated *after* the analysis period. This treatment group helped account for exogenous factors that may have occurred simultaneous to Program activity.

The Evaluation Team conducted four separate billing analyses to evaluate verified net savings for the Home Performance with ENERGY STAR Program. Table 63 lists NTG rates and precision achieved for each analysis in CY 2017. These results were applied to CY 2017 Snugg Pro projects.

Table 63. CY 2017 Whole Home Path Billing Analysis Results Applied to CY 2017 Snugg Pro Projects

Track	Savings Type	NTG	Precision at 90% Confidence
Standard Track (Tier 1)	Electricity	105%	±16%
	Natural Gas	39%	±9%
Income-Qualified Track (Tier 2)	Electricity	153%	±28%
	Natural Gas	43%	±15%
Overall	**MMBtu**	**46%**	**n/a**

Billing Analysis for Electric Savings

The Evaluation Team used PRInceton Scorekeeping Method models to estimate NTG rates and the standard errors around the savings estimates for each program. Table 64 shows the *ex ante* and verified electric net energy savings as well as the NTG rates for each Program track. The PRENAC variable in the table represents the pre-installation weather-normalized usage.

Table 64. Whole Home Path Verified Electric Net Energy Savings from Billing Analysis

Program Track	*Ex Ante* Savings per Participant (kWh)	Verified Net Model Savings (kWh)	NTG	PRENAC	*Ex Ante* Savings Per Customer	Verified Savings Per Customer
Standard Track (Tier 1)	704	737	105%	9,858	7.1%	7.5%
Income-Qualified Track (Tier 2)	563	861	153%	8,966	6.3%	9.6%

On average, standard track (Tier 1) participants saved 737 kWh. Compared to the *ex ante* savings estimate of 704 kWh, this represents a NTG of 105%. With an average pre-installation period usage of 9,858 kWh, the savings represent a 7.5% reduction in usage.

Table 65 shows a comparison of CY 2013, CY 2015, and CY 2017 standard track (Tier 1) Home Performance with ENERGY STAR participants' *ex ante* and verified net electric savings as a percentage of total household electric consumption with billing analysis results from similar programs. The CY 2017 *ex ante* electric savings of 7% of total household consumption is on the lower range of comparable program estimates, while the verified net savings of 8% is more in the middle of the comparable ranges.

Table 65. Comparison of Standard Track (Tier 1) Whole Home Path Electric *Ex Ante* and Verified Net Savings Per Customer

Program	Electric Savings as Percentage of Total Household Consumption		Modeling Software
	Ex Ante	Verified Net	
WI FOE Standard Track HPwES (CY 2013)	6%	8%	emHome
Midwest 1 Home Performance with ENERGY STAR (HES; 2012)	6%	12%	beacon-PST
WI FOE Standard Track (Tier 1) HPwES (CY 2017)	**7%**	**8%**	**Snugg Pro**
WI FOE Standard Track HPwES (CY 2015)	7%	9%	emHome
Northwest 1 (2015-2016)	7%	11%	Deemed per unit
Mid Atlantic 1 HPwES (2013)	9%	7%	beacon-PST
Northwest 1 (2013-2014)	9%	9%	Deemed per unit
Mid Atlantic 1 HPwES (2012)	10%	9%	beacon-PST
Mid Atlantic 1 HPwES (2014)	10%	9%	beacon-PST
Mid Atlantic 1 HPwES (2015)	10%	10%	beacon-PST
Mid Atlantic 1 HPwES (2017)	10%	11%	beacon-PST
Southwest 1 HPwES (2011)	11%	9%	Real Home Analyzer
Southeast 1 HPwES (2011-2012)	14%	8%	Deemed per unit
Northeast 1 HES (2011)	18%	14%	Deemed per unit

On average, income-qualified track (Tier 2) participants saved 861 kWh. Compared to the *ex ante* savings estimate of 563 kWh, this represents a NTG of 153%. With an average pre-installation period usage of 8,966 kWh, the savings represent approximately a 10% reduction in usage.

Table 66 shows a comparison of CY 2017 income-qualified track (Tier 2) Home Performance with ENERGY STAR participants *ex ante* and verified net electric savings as a percentage of total household electric consumption with billing analysis results from other similar programs. The CY 2017 *ex ante* savings per household of 6% is the lowest of all programs in the comparison. The verified net electric savings of 10% of household consumption is in the middle range of other comparable program

estimates. The difference between the ranking for *ex ante* and evaluated savings suggests that Snugg Pro modeling software significantly underestimates electric savings for Tier 2 participants.[46]

Table 66. Comparison of Income-Qualified Track (Tier 2) HPwES Electric *Ex Ante* and Verified Net Savings

Program	Electric Savings as Percentage of Total Household Consumption		Modeling Software
	Ex Ante	Verified Net	
WI Income Qualified Track (Tier 2) HPwES (CY 2017)	**6%**	**10%**	**Snugg Pro**
Mid Atlantic 2 Low-Income Usage Reduction Program (LIURP; 2011)	7%	7%	Deemed per unit
Northwest 1 (2009–2011)	7%	7%	Deemed per unit
Northwest 1 (2007–2009)	7%	7%	Deemed per unit
WI FOE Income Qualified Track HPwES (CY 2015)	8%	11%	emHome
Mid Atlantic 2 LIURP (2010)	9%	9%	Deemed per unit
Mid Atlantic 2 LIURP (2012)	10%	10%	Deemed per unit
Mid Atlantic 2 LIURP (2013)	10%	10%	Deemed per unit
Mid Atlantic 2 LIURP (2015)	11%	11%	Deemed per unit
Northwest 2 (2009-2010)	12%	12%	TREAT (WA) and EA4 (ID)
Mid Atlantic 2 LIURP (2014)	12%	12%	Deemed per unit
Northwest 1 (2003–2005)	12%	12%	Deemed per unit
Northeast 2 Low Income (2010)	14%	14%	Deemed
Mid Atlantic 1 Low-Income Energy Efficiency Program (LIEEP; 2015)	15%	15%	Proprietary software
Midwest 2 Low Income (2016)	17%	15%	Deemed per unit
Northeast 1 Home Energy Services -Income Qualified (2011)	18%	14%	Deemed per unit
Midwest 2 Low Income (2014-2015)	18%	18%	Deemed per unit

Billing Analysis for Gas Savings

The Evaluation Team used PRInceton Scorekeeping Method models to estimate NTG and the standard errors around the savings estimates for each Program track. Table 67 shows the *ex ante* and verified electric net energy savings as well as the NTG rates for each Program track.

[46] Cadmus examined the savings by pre-period usage quartile. The Snugg Pro model does not always under-predict savings – the model over-predicts the savings for smaller usage homes with less than 7,350 kWh (77% NTG, achieving approximately 5% vs 6% expected), however for larger usage homes over 7,350 kWh Snugg Pro under-estimates the savings (179% NTG, achieving much higher savings of 12% vs 6% expected), Thus it appears that the actual savings are greater for larger usage homes because they may have more inefficient equipment or possibly have electric heat. Appendix I contains details about the quartile level results.

Table 67. HPwES *Ex Ante* and Verified Natural Gas Net Energy Savings from Billing Analysis

Program Track	*Ex Ante* Savings per Participant (therms)	Verified Net Model Savings (therms)	NTG	PRENAC (therms)	*Ex Ante* Expected Savings Per Customer	Verified Savings Per Customer
Standard Track (Tier 1)	387	150	39%	973	39.8%	15.4%
Income-Qualified Track (Tier 2)	552	238	43%	1,120	49.3%	21.2%

On average, standard track (Tier 1) participants saved 150 therms. Compared to the *ex ante* savings estimate of 387 therms, this represents an NTG of 39%. With an average pre-installation period usage of 973 therms, the savings represent approximately 15% reduction in usage.

As with the electric savings, the Evaluation Team compared the Program results with billing analyses from other similar programs. Table 68 shows that in CY 2017, the Program predicted household *ex ante* natural gas savings of 40%, which is the highest estimate of any program in the comparison, including previous Focus on Energy Home Performance with ENERGY STAR Program evaluations. Billing analysis led to a verified 15% net household natural gas savings. The unusually high 40% *ex ante* estimate highlights the driver for the lower natural gas NTG for this Program; however, 15% of household natural gas savings is also high end compared to other programs.[47]

[47] Cadmus also reviewed savings by pre-period usage quartiles and by measure type Measure Completion 10%, 20%, 30%. The quartile models achieved savings of 14% to 17%, however, the Snugg Pro estimated percent savings ranged from 33% to 60%. Similarly for Project Completion 10%, 20%, 30%, the actual savings achieved were 12%, 16%, 19% respectively. However, the expected savings from Snugg Pro were 23%, 40%, 58% respectively. The Snugg Pro modeled savings thus were high across all summaries examined. Appendix I provides these detailed model results.

Table 68. Comparison of Standard Track (Tier 1) HPwES Natural Gas *Ex Ante* and Verified Net Savings Per Customer

Program	Natural Gas Savings as Percentage of Total Household Consumption		Modeling Software
	Ex Ante	Verified Net	
Mid Atlantic 1 HPwES (2014)	14%	13%	beacon-PST
Northeast 2 HES (2010, 2011)	15%	12%	Deemed
Mid Atlantic 1 HPwES (2015)	16%	14%	beacon-PST
Mid Atlantic 1 HPwES (2016)	18%	14%	beacon-PST
Mid Atlantic 1 HPwES (2013)	18%	13%	beacon-PST
Northeast 1 HES (2011)	18%	9%	Deemed per unit
Mid Atlantic 1 HPwES (2012)	21%	15%	beacon-PST
Midwest 1 HES (2012)	23%	15%	beacon-PST
WI FOE Standard Track HPwES (CY 2015)	32%	15%	emHome
WI FOE Standard Track HPwES (CY 2013)	35%	15%	emHome
WI FOE Standard Track (Tier 1) HPwES (CY 2017)	**40%**	**15%**	**Snugg Pro**

On average, income qualified (Tier 2) participants saved 238 therms. Compared to the *ex ante* savings of 552 therms, this represents a 43% NTG. With an average pre-installation period usage of 1,120 therms, the savings represent approximately 21% reduction in usage.

Table 69 shows a comparison of the income qualified (Tier 2) participant natural gas savings to billing analysis results of other similar programs. As with the standard track (Tier 1) participants, *ex ante* natural gas savings are on the very high end of total household consumption (49%), while the verified net NTG from the billing analysis yields savings of 21% of household consumption. The program is achieving among the highest savings compared to other studies at 21%.[48]

[48] Cadmus also reviewed savings by pre-period usage quartiles and by measure type Measure Completion 10%, 20%, 30%. The quartile models achieved savings of 15% to 26%, however, the Snugg Pro estimated percent savings ranged from 41% to 68%. Similarly for Project Completion 10%, 20%, 30%, the actual savings achieved were 13%, 19%, 25% respectively. However, the expected savings from Snugg Pro were 25%, 40%, 62% respectively. The Snugg Pro modeled savings thus were high across all summaries examined. Appendix I provides these detailed model results.

Table 69. Comparison of Income-Qualified Track (Tier 2) HPwES Natural Gas *Ex Ante* and Net Savings Per Customer

Program	Natural Gas Savings as Percentage of Total Household Consumption		Modeling Software
	Ex Ante	Verified Net	
Northwest 2 (2009-2010)	14%	14%	TREAT (WA) and EA4 (ID)
Midwest 1 Low Income	13%	13%	Deemed per unit
Midwest 2 HWAP	21%	21%	Deemed per unit
Northeast 1 HES-Income Eligible (2011)	18%	9%	Deemed per unit
Northeast 2 Low Income (2010)	22%	22%	Deemed per unit
ORNL (meta)	23%	23%	Meta evaluation
Mid Atlantic 1 LIEEP (2015)	35%	11%	Proprietary software
Mid Atlantic 2 Low Income (2012)	22%	22%	Deemed per unit
WI FOE IQ HPwES (CY 2015)	35%	22%	emHome
WI FOE IQ HPwES (CY 2017)	**49%**	**21%**	**Snugg Pro**
Mid Atlantic 1 LIEEP (2016)	52%	13%	Proprietary software

Appendix I of this report provides more detail about the results and the methodologies used in the billing analyses.

Freeridership

For the standard track HVAC path, the Evaluation Team used the standard market practice methodology to determine freeridership for furnaces, joint furnaces, air conditioners, and electronically commutated motors (ECMs). This methodology uses recent sales data to estimate a market baseline efficiency.

For the remaining standard track HVAC path measures, the Evaluation Team applied participant self-response freeridership scores from the CY 2015 Residential Rewards surveys because there were no substantial changes to the measures offered or to the delivery of the Program component to customers from CY 2015 to CY 2017. For the renewables path, the Evaluation Team applied participant self-response freeridership from the CY 2016 Renewable Rewards surveys, which targeted participants who purchased solar electric PV systems and GSHPs through the Program. For smart thermostats, the Evaluation Team applied participant self-response freeridership from the CY 2016 Smart Thermostat Pilot surveys.

Table 70 lists the freeridership methodology by measure for the standard track HVAC and renewables paths and Smart Thermostat Pilot.

Table 70. CY 2017 Freeridership Methodology by Program Component and Measure Type

Program Component	Measure	Freeridership Methodology	Freeridership
Standard Track HVAC Path	Adjustment Measure	CY 2015 Residential Rewards Participant Surveys	77%
	Air-Source Heat Pump	CY 2015 Residential Rewards Participant Surveys	77%
	Boiler	CY 2015 Residential Rewards Participant Surveys	77%
	Ductless Mini-Split Heat Pump	CY 2015 Residential Rewards Participant Surveys	77%
	ECM	Standard Market Practice[1]	Varies
	Furnace and AC	Standard Market Practice[1]	Varies
	Furnace with ECM	Standard Market Practice[1]	Varies
	Smart Thermostat, Existing HVAC System	CY 2016 Smart Thermostat Pilot Surveys	29%
	Smart Thermostat, Installed w/ HVAC Measure	CY 2016 Smart Thermostat Pilot Surveys	29%
	Water Heater	CY 2015 Residential Rewards Participant Surveys	77%
HVAC Path Total Freeridership		**Varies**	**25%**
Renewable Rewards	GSHP, Electric Backup	CY 2016 Renewable Rewards Participant Surveys	69%
	Solar PV	CY 2016 Renewable Rewards Participant Surveys	30%
Renewable Rewards Total Freeridership		**Varies**	**31%**

[1] Freeridership scores were determined using standard market practice, which varies by savings and measure type. Table 77 presents these freeridership scores by savings type.

In CY 2016, smart thermostats installed with HVAC measures received the 77% freeridership value associated with those HVAC measures, from the CY 2015 residential rewards surveys. However, the true freeridership likely falls between that value and the 29% value for standalone thermostats from the CY 2016 Smart Thermostat Pilot surveys. Therefore, for CY 2017, the Evaluation Team elected to apply that 29% value to all smart thermostats.

Like in CY 2016, the standard market practice analysis in CY 2017 heavily weighted the HVAC path's freeridership, as furnaces and ECMs contribute the majority of savings to the HVAC path. The following sections provide more detail on each of the freeridership methodologies used to evaluate the HVAC and renewables paths.

Standard Market Practice Methodology

Where adequate market data were available, the Evaluation Team calculated verified net savings using standard market practice methodology. The analysis relied on Program tracking data and data collected through the evaluation process to define the average market baseline and average energy consumption of select measures installed through the HVAC path. To determine the baseline for each HVAC measure,

the Evaluation Team used two sources of sales and installation data: D+R International data and CY 2012 to CY 2017 Home Performance with ENERGY STAR Program assessment data.[49,50]

Table 71 shows the measure and savings types assessed with standard market practice methodology. The following subsections describe the specific standard market practice method for each measure.

Table 71. Measures and Savings Type Assessed with Standard Market Practice Methodology

Measure Type	Savings Type			Baseline Data Source
	kWh	kW	therms	
Natural Gas Furnaces	--	--	✓	D+R International and HPwES Audit Data
Air Conditioners	✓	✓	--	D+R International and HPwES Audit Data
ECMs	✓	✓	--	D+R International Data

The Evaluation Team first established a market baseline by reviewing and analyzing available market data that showed existing efficiency levels of a particular equipment type sold outside of Focus on Energy. These data included a range of efficiency levels (both inefficient and efficient) and nominally represented the average efficiency of equipment installed in Wisconsin in CY 2017. The result was a baseline condition that represented a mixture of efficient and inefficient equipment and is assumed to capture freeridership.

The Evaluation Team then calculated net-of-freeridership savings as the difference between the average market baseline and the average energy consumption of measures installed through the Program, using actual Program database values for installed efficiencies. To calculate NTG, the Evaluation Team compared the net-of-freeridership savings (and applied any participant spillover adjustments) to the adjusted savings. Freeridership represents the percentage difference between the adjusted savings and the net-of-freeridership savings. The three equations for these quantities are:

$$\begin{bmatrix}\text{Net-of-freeridership}\\ \text{savings}\end{bmatrix} = \begin{bmatrix}\text{Baseline energy consumption}\\ \text{using average market efficiency}\\ \text{and average Program capacity}\end{bmatrix} - \begin{bmatrix}\text{Efficient energy consumption}\\ \text{using average Program efficiency}\\ \text{and average Program capacity}\end{bmatrix}$$

[49] The Evaluation Team contracted with D+R to purchase a report of residential HVAC measures sold in Wisconsin during CY 2014, CY 2015, and CY 2016 that used sales data reported to D+R International by HARDI members participating in the Unitary HVAC Market Report. The report contained summaries of quantities of observed sales by efficiency level and estimations of the size of each measure's total market in each year.

[50] The Program Implementer for the Home Performance with ENERGY STAR Program shared data collected from all assessments conducted since CY 2012. The Evaluation Team limited the assessment data to manufacture dates of CY 2010 to CY 2017 for all furnaces and air conditioners used in the market data analysis (to align with the prior and current quadrennium).

$$[\text{Net-to-gross}] = \frac{\begin{bmatrix}\text{Net-of-freeridership} \\ \text{savings}\end{bmatrix}}{\begin{bmatrix}\text{Adjusted } \textit{ex ante} \\ \text{savings}\end{bmatrix}} + [\text{Spillover \%}]$$

$$[\text{Freeridership}] = \frac{\begin{bmatrix}\text{Adjusted } \textit{ex ante} \\ \text{savings}\end{bmatrix} - \begin{bmatrix}\text{Net-of-freeridership} \\ \text{savings}\end{bmatrix}}{\begin{bmatrix}\text{Adjusted } \textit{ex ante} \\ \text{savings}\end{bmatrix}}$$

Although the adjustments for market baseline and actual Program efficiency can be understood to have gross savings implications, for the Home Performance with ENERGY STAR Program they are net adjustments by definition. The measures involved are prescriptive and have verified gross savings that assume deemed values for baseline and installed efficiencies, and any other adjustments to these values must be net adjustments.

Natural Gas Furnaces

The Evaluation Team calculated net-of-freeridership savings for each natural gas furnace measure by comparing the average consumption of furnaces rebated through the HVAC path to the market baseline. To accomplish this, the Evaluation Team followed several steps:

- Cleaned and combined CY 2014, CY 2015, and CY 2016 market data from D+R International and the Home Performance with ENERGY STAR Program audit data to calculate a market baseline annual fuel utilization efficiency (AFUE)
- Looked up model numbers in SPECTRUM to capture the actual AFUE and capacity for furnaces rebated through the Program in CY 2017
- Calculated consumption for market and Program furnace types (assumed all savings algorithm parameters between the market and Program furnace were equal except for market and Program furnace AFUEs)
- Subtracted the efficient consumption from the market consumption to yield the net-of-freeridership savings for each furnace

The Evaluation Team calculated a market baseline AFUE of 92.76% for natural gas furnaces. This has changed across evaluation years—the market baseline was 92.83% in CY 2015 but dropped to 92.54% in CY 2016. The current *ex ante* value is 92.80%, a rounded value based on the CY 2015 Standard Market Practice analysis. Table 72 lists the average of actual AFUE values and net-of-freeridership savings (therms) for natural gas furnaces rebated through the Program.

Table 72. Natural Gas Furnaces: CY 2017 Net-of-Freeridership Savings (therms)

Measure	Furnace Capacity (MMBtu/h)	Market or Program Average AFUE	Adjusted Per-Unit Savings (therms)	Net-of-Freeridership Per-Unit Savings (therms)	Freeridership Percentage
Furnace Market Baseline	n/a	92.76	n/a	n/a	n/a
Furnace And A/C, ECM, 95% + AFUE, >= 16 SEER	71.9	96.5	21.00	35.08	-67%
NG Furnace with ECM, 95%+ AFUE (Existing)	67.2	95.3	21.00	22.79	-9%
NG Furnace with ECM, 96%+ AFUE	70.3	96.1	30.03	30.57	-2%
NG Furnace with ECM, 97%+ AFUE	73.4	97.2	39.04	41.83	-7%
NG Furnace with ECM, 98%+ AFUE	84.4	98.0	48.00	56.18	-17%

Net-of-freeridership savings were greater than adjusted *ex ante* savings, producing negative freeridership values. Several factors influence freeridership in both directions, either strongly or weakly:

- The Program average efficient AFUE was often higher than the TRM assumed, meaning that furnaces installed as part of the Program are more efficient than previously assumed. This was especially pronounced for the Furnace and A/C, ECM, 95% + AFUE, >= 16 SEER measure, where the *ex ante* assumption was a 95% AFUE efficient furnace, but Program data revealed an average installed AFUE of 96.5%. This disparity was smaller for the other furnace measures, but overall it caused net-of-freeridership savings to increase and freeridership to decrease. The effect of this was disproportionate in that a small change in efficient AFUE had a large negative effect on freeridership.
- Furnaces rebated through the Program often had capacities larger or smaller than the TRM-assumed value of 72.0 MBh. This had a negative effect on freeridership; for instance, larger actual furnace capacities produce higher net-of-freeridership savings, resulting in lower freeridership. This effect was relatively small, roughly proportional to the difference in actual Program capacity versus deemed capacity.
- The market baseline AFUE (92.76%) was lower than the *ex ante* assumed AFUE (92.80%), meaning that less efficient furnaces are being purchased and installed outside of the Program than previously assumed (92.80% *ex ante* and 92.76% market). This caused net-of-freeridership savings to increase and freeridership to decrease. The effect of this was disproportionate—a small decrease in baseline had a larger negative effect on freeridership, on the order of 1 – 2% in this case.

As shown in Table 73, freeridership values across furnace measures in CY 2017 may be either higher or lower than in CY 2016. The largest differences are for the furnace and AC combo measure—where freeridership dropped from -30% to -67%—and for the 97% AFUE measure—where freeridership dropped from +9% to -7%.

Table 73. Natural Gas Furnace Freeridership Comparison between CY 2016 and CY 2017

Measure	CY 2016 Freeridership Percentage	CY 2017 Freeridership Percentage
Furnace and AC, ECM, 95%+ AFUE, ≥ 16 SEER	-30%	-67%
NG Furnace with ECM, 95%+ AFUE (Existing)	-18%	-9%
NG Furnace with ECM, 96%+ AFUE	-9%	-2%
NG Furnace with ECM, 97%+ AFUE	+9%	-7%
NG Furnace with ECM, 98%+ AFUE	-24%	-17%

These large decreases happened because the adjusted *ex ante* savings for these two measures also dropped, as shown in

Table 74. This change occurred because of a change in baseline AFUE (92.0% to 92.8%) for these measures from CY 2016 to CY 2017. This change was already propagated to the other furnace measures for CY 2016. For these other measures, discrepancies in freeridership are accounted for by slight changes to actual Program AFUE values and sizes from CY 2016 to CY 2017.

Table 74. Comparison of Values Used for Freeridership Calculation in CY 2016 and CY 2017

Measure	CY 2016 Savings (therms)		CY 2017 Savings (therms)	
	Adjusted *Ex Ante*	Net-of-Freeridership	Adjusted *Ex Ante*	Net-of-Freeridership
Furnace and AC, ECM, 95%+ AFUE, ≥ 16 SEER	28.95	37.49	21.00	35.08
NG Furnace with ECM, 95%+ AFUE (Existing)	28.67	33.76	21.00	22.79
NG Furnace with ECM, 96%+ AFUE	30.00	32.60	30.03	30.57
NG Furnace with ECM, 97%+ AFUE	47.00	42.89	39.04	41.83
NG Furnace with ECM, 98%+ AFUE	48.00	59.72	48.00	56.18

Appendix I provides a detailed discussion of the steps taken to combine the data sources, produce the average market AFUE, and calculate net-of-freeridership savings for these measures.

Air Conditioners

The Evaluation Team calculated net-of-freeridership electric savings for air conditioners in all applicable measures. The Team isolated the air conditioner measure from the ECM to conduct the standard market practice review, then combined the savings from both components to estimate the net-of-freeridership electric savings for the measure.

Similar to the verified savings for natural gas furnaces, the net-of-freeridership savings for electric air conditioners was calculated following several steps:

- Cleaned and combined CY 2014, CY 2015, and CY 2016 market data from D+R International and the Home Performance with ENERGY STAR Program audit data to calculate a market baseline SEER
- Looked up Air Conditioning, Heating and Refrigeration Institute (AHRI) reference numbers in SPECTRUM and compared them against the AHRI database to capture the actual SEER and cooling capacity for air conditioners rebated through the Program in CY 2017
- Calculated the consumption for market baseline and Program (efficient) air conditioners (assumed energy algorithm parameters between the market and Program air conditioners were equal except for the market baseline and actual air conditioner SEER)
- Subtracted the efficient consumption from the market consumption to yield the net-of-freeridership savings for air conditioners

The Evaluation Team calculated a market baseline for air conditioners SEER of 13.9 (compared to 13.0 used for the *ex ante* value). Table 75 lists averages of the actual SEER of Program-eligible air conditioners and net-of-freeridership electric savings. The electric savings for the air conditioner and ECM were combined into one deemed savings, so the Evaluation Team did not calculate net-of-freeridership for the air conditioner measure component. Table 76 shows the net-of-freeridership demand reduction for air conditioners as a part of the standard market practice analysis for ECMs and Table 77 contains the combined electric savings and net-of-freeridership for this measure.

Table 75. Air Conditioners: CY 2017 Net-of-Freeridership Electric Savings

Measure	SEER	Per-Unit kWh Savings[1]
AC Market Baseline	13.9	n/a
Furnace and AC, ECM, 95%+ AFUE, ≥ 16 SEER (AC Only)	16.4	127.1

[1] Net-of-freeridership savings represent only the air conditioner component and does not include savings from the ECM.

Net-of-freeridership savings for air conditioners in CY 2017 were much lower than those in CY 2016, which were 178.1 kWh. This change is largely attributable to the actual Program SEER decreasing from 17.5 SEER in CY 2016 to 16.4 SEER in CY 2017, while the market baseline remained relatively unchanged (13.8 SEER in CY 2016 compared to 13.9 SEER in CY 2017). Therefore, the measure saved less energy in CY 2017 than in CY 2016. The decrease in the Program SEER brings both SEER and net-of-freeridership savings close to those of CY 2015—16.5 SEER and 136.8 kWh, respectively. However, the decrease in SEER from CY 2016 to CY 2017 matches the decrease in furnace AFUE for these measures, which was derived from Program data, an independent source.

ECMs

Measuring net-of-freeridership savings for ECMs differs from the analysis for furnaces and air conditioners, which used an efficiency rating to determine the market baseline. Because there are no

efficiency ratings for ECMs, the Evaluation Team determined freeridership based on the percentage of market furnaces (sold outside of the Program) that had an ECM versus those that had another type of motor, such as a permanent split capacitor.

Using market data from D+R International, the Evaluation Team estimated that 18.5% of CY 2017 furnaces sold outside of the Program had ECMs. This percentage has changed very little since CY 2015 (18.2%) and CY 2016 (17.8%). The Evaluation Team then used Wisconsin TRM–listed savings of 416 kWh per motor and 345.5 kWh per air conditioners with ECMs and applied this 18.5% freeridership value to calculate net-of-freeridership savings for this measure.[51]

Table 76 lists savings per the TRM and the net-of-freeridership savings calculated by the Evaluation Team.

Table 76. ECMs: CY 2017 Net-of-Freeridership Electric Savings and Demand Reduction

Measure	Wisconsin TRM Per-Unit Savings		Freeridership	Net-of-Freeridership Per-Unit Savings	
	kWh	kW		kWh	kW
Furnace and Standalone ECM	416.0	0.079	18.5%	338.9	0.0645
Furnace and AC ECM	345.5	0.172	18.5%	281.4	0.1368[1]

[1] Net-of-freeridership demand reduction for the joint furnace and air conditioner measure includes demand reduction from both the air conditioner and the ECM.

These values have remained relatively constant across CY 2015, 2016, and 2017 because they depend only on the fraction of furnaces sold outside the Program that had an ECM. The same is true for kilowatt savings for the Furnace and Standalone ECM measure. For the Furnace and AC ECM measure, CY 2017 kilowatt savings changed significantly since CY 2015 (0.141 kW) and CY 2016 (0.188 kW). This is a result of the change in Program average SEER from 16.5 in CY 2015, to 17.5 in CY 2016, then to 16.4 in CY 2017.

Note that the total net-of-freeridership savings for the furnace and AC combo measure are the total of its AC and ECM components, or 127.1 + 281.4 = 408.5 kWh. The same was true for the CY 2016 evaluation, where the total was 284.3 + 178.1 = 462.4 kWh. However, in that year's evaluation only the ECM component (284.3) was used in net savings calculations. This was an error that caused MMBtu savings for the Home Performance program to be undercounted by 1.2%. This error will be corrected in the CY 2018 evaluation report's summary of quadrennial activities.

Standard Market Practice Summary

Table 77 provides a summary of the standard market practice results, showing per-unit net-of-freeridership savings and the corresponding percentage of freeridership for all measures, evaluated

[51] These values exclude cooling savings, which is accounted for in the air conditioner analysis. The cooling savings from the air conditioner is added to the ECM savings in the total measure of net-of-freeridership savings.

using standard market practice methodology. Overall, freeridership ranged from -67% for the Furnace and AC, ECM, 95%+ AFUE (Existing) measure's natural gas savings to 51% for the same measure's demand reduction.

Table 77. CY 2017 Summary of Net-of-Freeridership Savings by Measure

Measure	Per-Unit Net-of-Freeridership Savings			Freeridership (Percentage)		
	kWh	kW	therms	kWh	kW	therms
ECM, Furnace, New or Replacement	339	0.0645	--	18.5%	18%	n/a
Furnace and A/C, ECM, 95%+ AFUE (Existing)	409[1]	0.1368	35	21.1%	50.6%	-67.0%
NG Furnace with ECM, 95%+ AFUE (Existing)	339	0.0645	23	18.5%	18.5%	-8.5%
NG Furnace with ECM, 96%+ AFUE	339	0.0645	31	18.5%	18.5%	-1.8%
NG Furnace with ECM, 97%+ AFUE	339	0.0645	42	18.5%	18.5%	-7.1%
NG Furnace with ECM, 98%+ AFUE	339	0.0645	56	18.5%	18.5%	-17.1%
LP Furnace with ECM, 90%+ AFUE (Existing)	339	0.0645	--	18.5%	18.5%	n/a

[1] The Evaluation Team added the electric net-of-freeridership savings for the Furnace and AC, ECM, 95%+ AFUE (Existing) measure to calculate the total electric savings for this measure.

Freeridership changed from CY 2016 to CY 2017 for the Furnace and AC, ECM, 95%+ AFUE (Existing) measure. This measure's kilowatt-hour freeridership increased from 10.8% in CY 2016 to 21.1% in CY 2017. This freeridership value represents the combined results of the ECM and air conditioner cooling market baseline adjustments. The decrease in baseline SEER from 17.5 in CY 2016 to 16.4 in CY 2017 is largely responsible for the notable increase in freeridership across those years.

Self-Reported Freeridership

For standard track HVAC path measures not included in the standard market practice analysis and for all Renewable Rewards and Smart Thermostat Pilot measures,[52] the Evaluation Team estimated freeridership scores based on responses from past participant surveys. Table 78 shows the freeridership scores by Program component.

[52] CY 2015 Residential Rewards NTG results were applied to HVAC path measures not included in the standard market practice analysis because no surveys were conducted with non-standard market practice HVAC path measure participants in CY 2017.

Table 78. CY 2017 Self-Reported Freeridership Estimates by Program Component

Program Component	Self-Reported Freeridership	Freeridership Source
HVAC Path (	77%	2015 Self-Report Survey[1]
Renewable Rewards	33%	2016 Self-Report Survey[2]
Smart Thermostat Measures	29%	2016 Self-Report Survey[2]

[1] Appendix J of the *Focus on Energy CY 2015 Evaluation Report* provides more detail about the results and the methodologies used in the CY 2015 Residential Rewards freeridership analysis.

[2] Appendix I of the *Focus on Energy CY 2016 Evaluation Report* provides more detail about the results and the methodologies used in the CY 2016 Renewable Rewards freeridership analysis and the Smart Thermostat Pilot freeridership analysis.

Spillover

Spillover results when customers invest in additional efficiency measures or make additional energy-efficient behavior choices beyond those rebated through the Program. Table 79 shows that the Evaluation Team applied spillover at 6% of the Residential Reward's evaluated gross savings, 3% of the Renewable Rewards evaluated gross savings, and 1% of the Smart Thermostat Pilot evaluated gross savings based on CY 2015 and CY 2016 self-report surveys.

Table 79. CY 2017 Participant Spillover Estimate

Program Component	Participant Spillover Savings (MMBtu)	Verified Gross Savings (MMBtu)	Percentage of Participant Spillover
HVAC Path	n/a	n/a	6%[1]
Renewable Rewards	95.79	3,507.81	3%[2]
Smart Thermostat Measures	4.28	668.55	1%[2]

[1] CY 2015 Residential Rewards NTG results were applied to HVAC path measures not included in the standard market practice analysis because no surveys were conducted with non-standard market practice HVAC path measure participants in CY 2016.

[2] CY 2016 Renewable Rewards and Smart Thermostat Pilot NTG results were applied to the same measures in CY 2017 because no new surveys were conducted in CY 2017.

CY 2017 Verified Net Savings Results

To calculate the Home Performance with ENERGY STAR Program NTG ratios, the Evaluation Team weighted the results of the whole home path billing analysis, standard market practice analysis, modeling software calibration, and surveys (self-reported freeridership and spillover) by energy savings. These weightings can be seen in Table 80, which shows MMBtu-based verified gross savings fractions, spillover, freeridership, and NTG ratios split out by program components and measures. The table shows that the relatively low freeridership values for the furnace AC measures—derived from the SMP methodology—drive the overall NTG ratio for the HVAC path, with an overall NTG of 93% for that path.

This, combined with the overall 46% NTG ratio for the Whole Home path—derived via billing analysis—drives the program NTG to 77%.

Table 80. CY 2017 Verified Gross Savings, Spillover, Freeridership, and NTG Values by Measure

Program Component	Measure	% Verified Gross Program Savings (Annual MMBtu)	Spillover	Freeridership	NTG Ratio
HVAC - Standard Track	Adjustment, HVAC	0.0%	6%	77%	29%
	ASHP	0.1%	6%	77%	29%
	Boiler	3.1%	6%	77%	29%
	Ductless Mini-Split Heat Pump	0.9%	6%	77%	29%
	ECM	0.1%	6%	18%	88%
	Furnace and AC	5.8%	6%	-27%	133%
	LP Furnace with ECM	1.2%	6%	18%	88%
	NG Furnace with ECM, 95%	1.2%	6%	2%	104%
	NG Furnace with ECM, 96%	21.7%	6%	5%	101%
	NG Furnace with ECM, 97%	3.9%	6%	0%	106%
	NG Furnace with ECM, 98%	0.2%	6%	-9%	115%
	Smart Thermostat	12.3%	1%	29%	72%
	Water Heater	0.4%	6%	77%	29%
HVAC - IQT	IQT Measures	9.0%	0%	0%	100%
HVAC Path Total		**59.8%**	**4%**	**11%**	**93%**
Whole Home - Standard Track	Whole Home Measure	22.0%	n/a	n/a	47%
Whole Home - IQT	Adjustment, Whole Home	0.0%	6%	77%	29%
	Whole Home Measure	6.2%	n/a	n/a	46%
Whole Home Path Total		**28.2%**	**n/a**	**n/a**	**46%**
Renewable Rewards	Solar PV	11.8%	3%	30%	73%
	Ground Source Heat Pump	0.2%	1%	69%	32%
Renewable Rewards Total		**12.0%**	**3%**	**31%**	**72%**
Program Total					**77%**

In addition to this overall NTG ratio, Table 81 shows total net-of-freeridership savings, participant spillover savings, total net savings in MMBtu by Program component.

Table 81. CY 2017 Program Annual Net Savings and NTG Ratio

Program Component	Net-of-Freeridership Savings (MMBtu)	Participant Spillover (MMBtu)	Total Annual Net Savings (MMBtu)	Total Annual Gross Verified Savings (MMBtu)	Program NTG Ratio
HVAC - Standard Track	94,694	5,221	99,915	108,911	92%
HVAC - IQT	19,268	0	19,268	19,268	100%
Whole Home - Standard Track	n/a	n/a	21,940	47,127	47%
Whole Home - IQT	n/a	n/a	6,119	13,223	46%
Renewable Rewards	17,849	763	18,613	25,781	72%
Total	**131,812**	**5,984**	**165,855**	**214,310**	**77%**

Table 82 shows the annual net energy impacts (kWh, kW, and therms) by Program component. The Evaluation Team attributed these savings net of what would have occurred without the Program. Table 83 through Table 85 show annual net energy impacts by measure type for each Program component.

Table 82. CY 2017 Home Performance with ENERGY STAR Program Annual Net Savings by Program Component

Program Component	Annual Net		
	kWh	kW	therms
HVAC - Standard Track	7,312,229	1,711	749,656
HVAC – IQT	416,302	92	178,479
Whole Home - Standard Track	1,660,304	395	162,755
Whole Home – IQT	177,243	104	55,139
Renewable Rewards	5,455,105	2,013	0
Total Annual	**15,021,183**	**4,315**	**1,146,029**

Table 83. CY 2017 Whole Home Path Annual Net Savings by Measure Type

Program Component	Measure	Annual Net		
		kWh	kW	therms
Whole Home - Standard Track[1]	Project Completion	1,609,638	392	162,475
	Water Heater	50,666	2	280
Whole Home - Standard Track Total Annual		**1,660,304**	**395**	**162,755**
Whole Home – IQT[1]	Adjustment Measure	0	0	42
	Project Completion	177,243	104	55,098
Whole Home - IQT Total Annual		**177,243**	**104**	**55,139**
Whole Home Total Annual		**1,837,547**	**498**	**217,894**

[1] Tracking data included projects with air sealing, duct sealing, and insulation, but no savings were attributed to these measures.

Table 84. CY 2017 HVAC Path Annual Net Savings by Measure Type

Program Component	Measure	Annual Net		
		kWh	kW	therms
HVAC - Standard Track	Adjustment Measure	0	0	42
HVAC - Standard Track	Air Source Heat Pump	9,199	3	0
HVAC - Standard Track	Boiler	0	0	19,007
HVAC - Standard Track	Ductless Mini-Split Heat Pump	166,950	-31	0
HVAC - Standard Track	ECM	48,744	9	0
HVAC - Standard Track	Furnace and A/C	1,417,204	495	117,143
HVAC - Standard Track	Furnace with ECM	5,363,967	1,021	432,322
HVAC - Standard Track	Smart Thermostat	306,165	214	178,769
HVAC - Standard Track	Water Heater	0	0	2,373
HVAC - Standard Track Total Annual		**7,312,229**	**1,711**	**749,656**
HVAC - IQT	Boiler	0	0	8,661
HVAC - IQT	Furnace	15,840	-6	0
HVAC - IQT	Furnace and A/C	0	0	20,130
HVAC - IQT	Furnace with ECM	64,750	35	20,625
HVAC - IQT	Smart Thermostat	335,712	64	128,877
HVAC - IQT	Water Heater	0	0	186
HVAC - IQT Total Annual		**416,302**	**92**	**178,479**
HVAC Total Annual		**7,728,531**	**1,804**	**928,135**

Table 85. CY 2017 Renewable Rewards Annual Net Savings by Measure Type

Program Component	Measure	Annual Net		
		kWh	kW	therms
Renewable Rewards	Ground Source Heat Pump	47,374	9	0
Renewable Rewards	Solar PV	5,407,731	2,004	0
Renewable Rewards Total Annual		**5,455,105**	**2,013**	**0**

Table 86 shows the lifecycle net energy impacts (kWh, kW, and therms) by program component, and Table 87 through Table 89 show lifecycle net energy impacts by measure type for each program component.

Table 86. CY 2017 Home Performance with ENERGY STAR Program Lifecycle Net Savings by Program Component

Program Component	Lifecycle Net		
	kWh	kW	therms
HVAC - Standard Track	162,844,642	1,711	15,174,821
HVAC – IQT	9,478,193	92	4,069,863
Whole Home - Standard Track	32,788,484	395	3,256,027
Whole Home – IQT	3,543,948	104	1,102,758
Renewable Rewards	136,986,446	2,013	0
Total Lifecycle	**345,641,714**	**4,315**	**23,603,468**

Table 87. CY 2017 Whole Home Path Lifecycle Net Savings by Measure Type

Program Component	Measure	Lifecycle Net		
		kWh	kW	therms
Whole Home - Standard Track[1]	Project Completion	32,129,609	392	3,249,761
	Water Heater	658,875	2	6,266
Whole Home - Standard Track Total Lifecycle		**32,788,484**	**395**	**3,256,027**
Whole Home - IQT[1]	Adjustment Measure	0	0	960
	Project Completion	3,543,948	104	1,101,798
Whole Home - IQT Total Lifecycle		**3,543,948**	**104**	**1,102,758**
Whole Home Total Lifecycle		**36,332,432**	**498**	**4,358,785**

[1] Tracking data included projects with air sealing, duct sealing, and insulation, but no savings were attributed to these measures.

Table 88. CY 2017 HVAC Path Lifecycle Net Savings by Measure Type

Program Component	Measure	Lifecycle Net		
		kWh	kW	therms
HVAC - Standard Track	Adjustment Measure	0	0	960
HVAC - Standard Track	Air Source Heat Pump	165,589	3	0
HVAC - Standard Track	Boiler	0	0	380,138
HVAC - Standard Track	Ductless Mini-split Heat Pump	3,005,091	-31	0
HVAC - Standard Track	ECM	877,389	9	0
HVAC - Standard Track	Furnace and A/C	32,487,047	495	3,037,121
HVAC - Standard Track	Furnace with ECM	123,247,872	1,021	9,933,307
HVAC - Standard Track	Smart Thermostat	3,061,655	214	1,787,694
HVAC - Standard Track	Water Heater	0	0	35,600
HVAC - Standard Track Total Lifecycle		**162,844,642**	**1,711**	**15,174,821**
HVAC - IQT	Boiler	0	0	173,220
HVAC - IQT	Furnace	285,120	-6	0
HVAC - IQT	Furnace and A/C	0	0	461,505
HVAC - IQT	Furnace with ECM	1,488,000	35	475,023
HVAC - IQT	Smart Thermostat	7,705,073	64	2,957,325
HVAC - IQT	Water Heater	0	0	2,790
HVAC - IQT Total Lifecycle		**9,478,193**	**92**	**4,069,863**
HVAC Total Lifecycle		**172,322,835**	**1,804**	**19,244,683**

Table 89. CY 2017 Renewable Rewards Lifecycle Net Savings by Measure Type

Program Component	Measure	Lifecycle Net		
		kWh	kW	therms
Renewable Rewards	Ground Source Heat Pump	852,738	9	0
Renewable Rewards	Solar PV	136,133,708	2,004	0
Renewable Rewards Total Lifecycle		**136,986,446**	**2,013**	**0**

Process Evaluation

The Evaluation Team focused its process evaluation on these key research tasks for the Home Performance with ENERGY STAR Program:

- Document Program design and implementation
- Report Program accomplishments
- Identify opportunities for process improvements
- Assess Trade Allies' overall Program satisfaction

Program Design, Delivery, and Goals

The Evaluation Team drew from stakeholder interviews, Trade Ally and ongoing customer surveys, and Program materials to document the Program's design and implementation process in CY 2017.

Program Design

The Program consists of whole home, HVAC, and renewables paths, all of which generally remained unchanged from CY 2016 in terms of design and implementation. For CY 2017, the Program added a Rural Broadband offering to the whole home path.

Whole Home and HVAC Paths

Participants interested in building shell (whole home) improvements receive a home energy assessment from a registered Trade Ally certified by the Building Performance Institute (BPI) in building science and energy assessment. The Trade Ally then provides the customer with a written report recommending specific building shell and/or HVAC improvements based on how the participant's home uses energy. Participants who proceed with any suggested improvements are eligible for an incentive.

Participants interested in HVAC improvements but not building shell improvements can work directly with an HVAC Trade Ally to receive incentives for eligible heating and cooling equipment. They do not need a home energy assessment from a registered Trade Ally to pursue HVAC improvements.

The Program offers two tiers of participation for both whole home and HVAC measures. Tier 1 is available to all Focus on Energy customers who own residential properties with three units or less (standard track). Tier 2 offers higher incentives and a subsidized energy assessment to households with an income at or below 80% of the state median income (income-qualified track, or IQT).

Standard track participants who installed whole home and HVAC measures (dual-path project) within 90 days of each other could receive an additional $250 incentive.[53] IQT participants are eligible to receive discounted home energy assessments (as described in Table 90) and larger incentives for certain whole home and HVAC measures (Table 91). Focus on Energy required Trade Allies to check each customer's income and, for those eligible, submit completed energy assessment reports via Snugg Pro to reserve incentive funds for reimbursement of the remaining unpaid assessment cost.

[53] Excluding standalone smart thermostats.

Table 90. CY 2017 Eligibility and Incentives: Whole Home Path

Program Features	Standard Track	Income-Qualified Track
Household Income Qualification	None	80% or less of state median income
Assessment Type	Comprehensive (must include blower door and combustion safety tests)	
Assessment Cost	Market rate (average cost $200-$400)[1]	$50 copay (Trade Allies reimbursed $150 by Program)
Eligible Major Measures	Air sealing, attic insulation, exterior and interior wall insulation, sill box insulation, and HVAC equipment	
Incentives	10% to 19% reduced energy use: $850 20% to 29% reduced energy use: $1,250 30%+ reduced energy use: $2,000	10% to 19% reduced energy use: $1,000 20% to 29% reduced energy use: $1,500 30%+ reduced energy use: $2,250
	$250 bonus for installing both whole home and HVAC measures	No bonus

[1] Standard track participants residing in rural ZIP codes received coupons for $300 off the cost of an assessment.

Table 91. CY 2017 Eligibility and Incentives: HVAC Path

Eligibility	Standard Track	Income-Qualified Track
Household income qualification	None[1]	80% or less of State Median Income
Measures	**Incentive**	
Propane multistage furnace with ECM, 90%+ AFUE	$100	$300
Natural gas furnace, 95%+ AFUE	n/a	$350[2]
Natural gas multistage furnace with ECM, 95%+ AFUE	$125[2]	$525[2]
Natural gas multistage furnace with ECM, 95%+ AFUE installed with a 16+ SEER air conditioner	$250[2]	$750[2]
Air source heat pump 16+ SEER and 8.4+ HSPF (propane, oil or electric furnace only; cannot be a mini-split or ductless system)	$300[2]	
ECM replacement (must replace existing PSC motor)	$100	
Natural gas home heating boiler, 95%+ AFUE	$400[2]	$550[2]
Indirect water heater (installed at same time as qualified boiler)	$100	$150
Natural gas combination boiler, 95%+ AFUE	$500[2]	$675[2]
Heat pump water heater (ENERGY STAR-qualified)	$300	
Ductless/mini-split heat pump, 18+ SEER and 9.0+ HSPF (only for homes heated solely with electric resistance heat)	$500	
Smart thermostat standalone	$75	

[1] Standard track participants can earn a $250 bonus for installing HVAC and whole home measures.

[2] Natural gas furnaces, natural gas boilers, and air source heat pumps installed with smart thermostats are eligible for bonus $50 incentive in addition to the individual measure incentives.

The Program made small changes to whole home and HVAC path incentives in CY 2017, as described below in Program Changes.

Rural Broadband Offering

The Rural Broadband offering operates and is administered like the traditional Home Performance whole home path. The offering encourages participation in hard-to-reach areas by providing coupons for $300 off home energy assessments to rural customers interested in pursuing building shell improvements. Each assessment includes a Home Energy Score[54] that estimates a home's energy use (and associated costs) and provides cost-effective energy solutions to improve the home's efficiency. Only Trade Allies who have completed Home Energy Score certification training can conduct assessments discounted by the Rural Broadband offering.

The offering specifically targets customers who completed EnergySavvy self-assessments through the DHEA Pilot; leveraging the DHEA Pilot for recruitment helped reduce customer acquisition costs. Interested customers can search Focus on Energy's website for Trade Allies who honor the Rural Broadband coupons. To encourage Trade Ally participation, the offering provides up to $300 in additional incentives[55] to reimburse Trade Allies for traveling long distances to complete assessments.[56]

Renewables Path

The Program also offers incentives for geothermal systems and solar photovoltaic (PV) installations to residential and small business customers. Unlike the whole home and HVAC paths, these incentives are not stratified by income. The Program Administrator changed the incentive structure for PV systems in CY 2017, as described below in Program Changes. Table 92 provides detail on renewable energy measures.

Table 92. CY 2016 Eligibility and Incentives: Renewable Energy Path

Measure	Residential	Small Business
Geothermal Heat Pump	$650	$650
Solar Electric (PV) System	12% of total cost ($2,000 maximum)	12% of total cost ($4,000 maximum)

Program Management and Delivery Structure

The Program Administrator oversees Program performance. The Program Implementer delivers the Program, which includes managing Program-specific marketing and outreach, reviewing home energy assessment results, tracking data, processing applications, and managing the Trade Ally network. The Program Implementer also tracks key performance indicators (KPIs) through SPECTRUM, an online database managed by the Program Administrator. The Program Implementer reported no issues with data tracking processes in CY 2017.

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54 More information is available at the Home Energy Score website: https://betterbuildingssolutioncenter.energy.gov/home-energy-score/

55 Eighty cents per mile after the first 20 miles.

56 Trade Allies obligated to return to a home to revise building shell improvements are not compensated for this additional travel.

Each Program path relies on Trade Allies as the primary delivery channel. Whole home and HVAC path Trade Allies are assigned to a regional manager with whom they can consult for program information. The Program structure allows each customer to choose the contractor he or she wants to complete their home energy assessments.

Per Program tracking data, roughly 1,180 Trade Allies completed projects in CY 2017: 1,026 completed HVAC projects, 107 completed whole home projects, and 91 completed Renewable Rewards projects. Furthermore, 28 completed Whole Home and HVAC projects, 17 completed HVAC and Renewable Rewards projects, three completed whole home and Renewable Rewards projects, and two completed projects in all three paths.

Program delivery varies by path, as described below.

Whole Home Path

Whole home Trade Allies must complete home energy assessments before installing any eligible whole home path measures. During the assessment, the Trade Allies enter the participants' household data into Snugg Pro software to model each home's energy consumption and identify potential energy savings. The Trade Allies report the results to the homeowners, recommend home improvements, and provide estimated incentive amounts for eligible measures based on the estimated energy savings from SnuggPro and the participant's household income. After installing eligible measures, the Trade Allies update Snugg Pro to calculate the projects' achieved energy savings and resulting incentives available to the participant. Program staff said Trade Allies did not report any issues with Snugg Pro.

Whole home Trade Allies must be certified by the BPI to complete home energy assessments through the whole home path. Program Implementation staff are certified to conduct trainings and administer tests to Trade Allies to achieve BPI certification. The Program Implementer also provided BPI certification training to Trade Allies upon their request.

Rural Broadband Offering

The Program Implementer sent letters to rural DHEA Pilot participants explaining the Rural Broadband offering and providing coupons for $300 off home energy assessments. The letters were mailed in two batches of 2,000 each:

- Batch #1: October 2, 2017, which coupons expiring November 30, 2017
- Batch #2: November 16, 2017, with coupons expiring January 31, 2018

As of December 18, 2017, the program had seen a very limited response rate (12 responses, or 0.30%), falling far short of an expected response rate of 17%.[57]

[57] Based on results seen in the DHEA Pilot.

HVAC Path

HVAC path customers can choose any contractor from the Trade Ally network, which all contractors are eligible to join, to install eligible HVAC measures. After the installation(s) are complete, the participant or the Trade Ally fills fill out and submits the application to receive rebates for the eligible measures.

Renewables Path

Customers can reserve incentive funds via an online form with documentation of a $500 down payment prior to the Trade Ally completing the installations.[58] Once a Trade Ally has installed eligible renewable technologies, the participant submits a separate application online to redeem his or her eligible incentives. Budget constraints limit incentive funding, so participants risk not having incentives available to them if they don't reserve their incentives before applying to receive them. While it is recommended that customers reserve incentives prior to installing eligible measures, it is not required to participate.

Program Changes

After significant changes were made to the Program in CY 2016, Program staff made few changes in CY 2017 to allow Trade Allies time to adjust to the Program's design and delivery approach. The changes that did occur in CY 2017 are explained below.

Whole Home Path

The whole home path did not change its incentive structure in CY 2017. However, it did add a Rural Broadband offering, as described in the *Program Design, Delivery, and Goals* section. The Program also began providing Home Energy Score results to customers on whole home projects during CY 2017. The Program Implementer trained Trade Allies to produce Home Energy Scores and intends to continue to offer Home Energy Score and BPI training as needed in CY 2018.

The Program discontinued whole home trainings for HVAC Trade Allies in CY 2017 upon the completion of the training budget. These trainings were designed to be offered for a limited time, with the exact duration dependent on when the budget was depleted.

The Program Implementer also certified its staff to train and administer tests to Trade Allies for BPI certification in CY 2017. The Implementer plans to expand its building science trainings and increase the training frequencies in the future.

HVAC Path

The Program made the following changes to the HVAC path incentive structure:

- Added $300 incentive for ENERGY STAR®-qualified heat pump water heaters
- Lowered the minimum SEER rating for eligible ductless/mini-split heat pumps from 25 to 18

[58] Whole home and HVAC path projects do not need to make a reservation because incentive funding for those paths is guaranteed by the Program.

- Ended the Smart Thermostat Pilot and incorporated smart thermostats as a standard measure in the HVAC path ($75 incentive)
- Added a $50 bonus for participants who installed smart thermostats with a qualified natural gas furnace, natural gas boiler, or air source heat pump

Renewables Path

At the direction of the PSC, the Program restructured renewables path incentives to depend on project cost rather than solar electric PV system capacity. The Program offered incentives in CY 2017 amounting to 12% of a solar electric system's total cost, up to $2,400 for residential customers and $4,000 for small business customers. The Program previously offered $600 in incentives per kW of capacity of the solar electric system installed, from $300 to $2,400 per customer in CY 2016. The Program also did not differentiate by customer type in CY 2016.

Suggested Future Changes

The Program Administrator said it was investigating ways to simplify delivery of the whole home path. The current modeling approach, which determines savings via Snugg Pro and calculates incentive amounts after the measure installations are complete, makes it difficult for customers to commit to projects without knowing how much energy they will save. The Program Administrator said it may move toward a more prescriptive whole home path that relies primarily on Home Energy Scores, which are cheaper than full home energy assessments, if the billing analysis of whole home projects demonstrates an insufficient realization of *ex ante* savings. The CY 2017 billing analysis found that Snugg Pro is accurately estimating savings for electric standard track homes, but underestimating savings for electric customers in the IQT and overestimating fuel savings for all customers (standard and income qualified track). This suggests it might be worthwhile for the Program Administer to continue investigating the benefits of transitioning to Home Energy Scores.

In October 2017, Program Administration staff said smart thermostats had not sold as successfully as it anticipated in either the RLAP or Home Performance Programs. At the time, the same staff was considering aligning the list of Program-qualified smart thermostats with the ENERGY STAR qualified products list, making it easier to administer the Program. However, in spring 2018, Program Implementation staff indicated that smart thermostats sold through the Program's Trade Ally network (approximately 3,200) significantly surpassed Program Implementer forecasts (approximately 1,300), suggesting the program design satisfactorily brought the smart thermostat measure to market.

As of December 2017, the Program had not changed the Rural Broadband offering in delivery or scope. However, the Program Implementer said it is considering other program approaches to increase participation in rural ZIP codes. Making the assessment free (as opposed to heavily discounted) was one option, but this option could make the Program costlier and increase freeridership among customers who acquire assessments without intent to pursue additional work.

Program Goals

As shown in Figure 36, the HVAC and Whole Home paths exceeded their goals for energy and therms savings, but missed their goal for demand savings.

The changes in participation from CY 2016 to CY 2017 are shown in Table 93.

Table 93. Changes in Participation by Path from CY 2016 to CY 2017

Program	CY 2016	CY 2017	Percent Change
HVAC Total	**18,579**	**19,967**	**7%**
Standard Track	17,563	18,920	8%
IQT	1,016	1,047	3%
Whole Home Total	**1,434**	**1,711**	**19%**
Standard Track	993	1,441	45%
IQT	441	270	-39%
Renewable Rewards Total	**546**	**552**	**1%**
Residential	514	498	-3%
Business	32	54	69%

Key Performance Indicators

For CY 2017, the Program Administrator required the Program Implementer to track progress against several KPIs for the Home Performance with ENERGY STAR Program, as shown in Table 94.

The Program achieved all KPIs, with the exception of nearly achieving the targeted 28 days for outstanding incentives in the HVAC path, and falling short of the two KPIs related to increasing HVAC Trade Ally participation in the whole home path. KPIs for the two-year Rural Broadband offering will be evaluated in CY 2018.

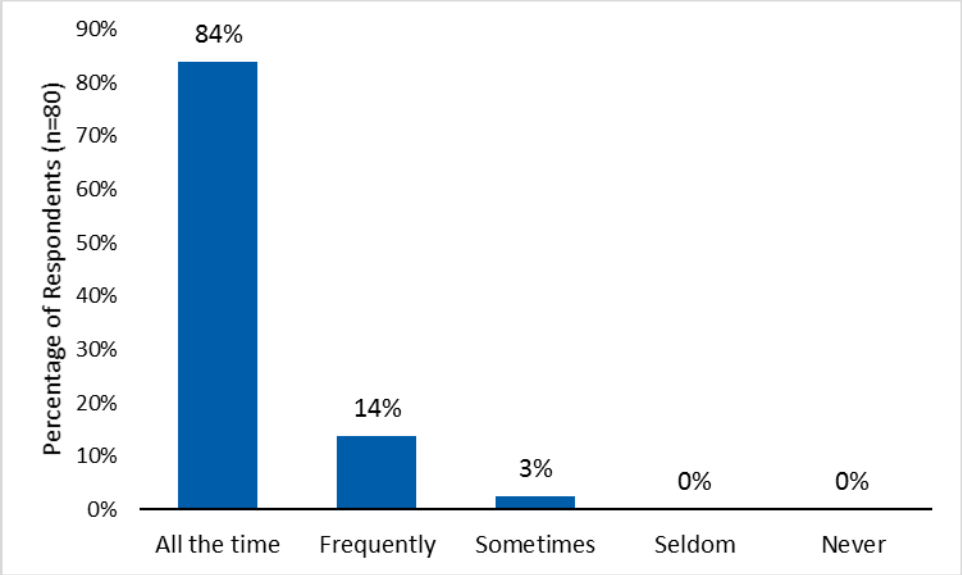
Table 94. Home Performance with ENERGY STAR CY 2017 KPIs

KPI	Measurement	Results	Source
Reduce/maintain Days Incentive Outstanding	Maintain an average of 28 days for days incentive outstanding	**Nearly Accomplished**: Whole Home: 27.16 HVAC: 28.35 Renewables: 25.43	SPECTRUM; reported by Program Implementer
Increase/maintain customer satisfaction	Meet or exceed baseline customer satisfaction score of 8.52	**Accomplished**: Whole Home: 9.0 HVAC: 9.0 Renewables: 9.2	
Increase HVAC Trade Ally participation in whole home path	Complete 100 home energy assessments performed by HVAC contractors	**Not Accomplished:** 49 by HVAC contractors (64 by all contractors)	
	Complete 10 whole home projects originating from HVAC contractors	**Not Accomplished:** 5	
Integrate Home Energy Score into whole home path	Develop tool with software vendor by August 2017	**Accomplished**: Simple Score, August 2017	
	Develop and deliver Home Energy Score trainings beginning in Q3 2017	**Accomplished**: Started September 2017	
	Include Home Energy Scores on 67% of submitted assessments	**Accomplished**: 72% (1,202 of 1,678)	
Improve customer experience	Redesign incentive application by Q3 2017	**Accomplished**: Completed July 1, 2017	
	Prepare data transfer method recommendation by July 1, 2017	**Accomplished**: Aligned eligibility with DOA income standards for transferability	
Cross-promote Focus on Energy programs	Design at least two promotions to encourage existing customers to engage with other Focus on Energy programs	**Accomplished**	
	Amend energy modeling software template by the end of Q1 2017	**Accomplished**	
Complete FHA Mortgage Pilot report	Submit final report by end of Q3 2017	**Accomplished**: Submitted 9/27/17	

Marketing and Outreach

The primary channel for Program delivery is the Trade Ally network. The CY 2017 Trade Ally online survey found that most participating Trade Allies (84%) recommended the Program to their customers *all the time*, as shown in Figure 38. The two Trade Allies who *sometimes* promote the Program said they were not confident of Program details or who was eligible, the Program was confusing to the customer, the incentives were not worth the hassle, they did not like the equipment or products Focus on Energy promoted, and they believed Focus on Energy flooded the market with under-qualified insulation contractors.

Figure 38. Trade Ally Frequency of Program Promotion to Customers



Source: Home Performance with ENERGY STAR Trade Ally Online Survey.
Question B1: "How often do you promote Focus on Energy programs to customers?"

The Program Implementer conducted Program marketing directly to customers. Most of this activity was in collaboration with utilities, which sent direct mail, bill inserts, and email blasts to their customers. The Program Implementer also used Google AdWords search displays and banner advertising to direct potential participants to the Focus on Energy website. Although the Program manual describes targeting two distinct customer profiles, or tiers—standard and income-qualified—the Program Implementer did not tailor Program marketing to specific customer segments. However, some regional nonprofit and community organizations marketed the Program to income qualified groups. The Program Implementer also continued its "reach-back" campaign, which began late in the second quarter of CY 2016 to encourage dual-path projects. Through this effort, the Program Implementer reached out to participants who completed projects through one path (e.g., HVAC path) to encourage them to complete projects through another path (e.g., whole home path).

The Rural Broadband offering targeted customers who completed self-audits and lived in rural ZIP codes with direct mail that included a nontransferable voucher for $300 off a home energy assessment. Because the assessment discount was offered exclusively to eligible rural customers, neither the Program Implementer nor Trade Allies were permitted to advertise its availability publicly. Instead, Trade Allies relied on rural customers approaching them to complete home energy assessments.

The Program Administrator and Implementer together designed two versions of the Rural Broadband outreach letter to test the effectiveness of different communication styles. As of December 2017, the Program Implementer could not report statistically significant differences in effects on Program participation between the two letters.

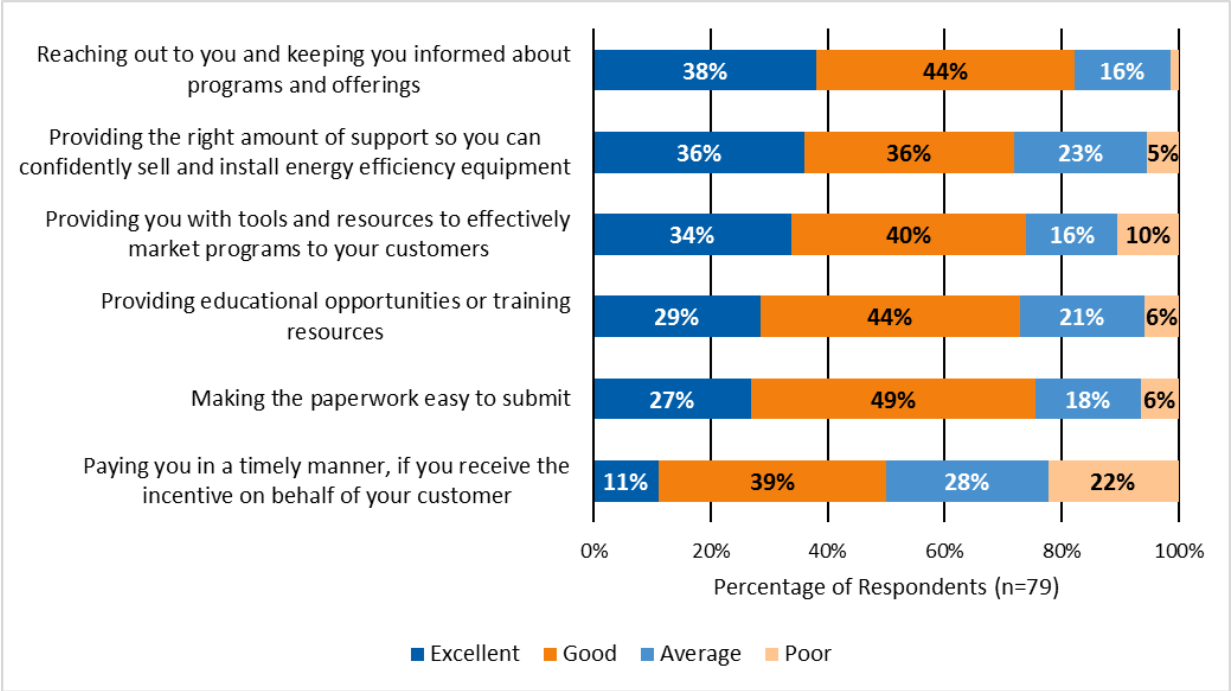
Trade Ally Experience

The Evaluation Team administered an online survey to Trade Allies to understand the Trade Ally experience as it relates to the Home Performance with ENERGY STAR Program.

Relationship with Program Staff

In the Trade Ally survey, the Team asked Trade Allies how well Focus on Energy performs on several factors, the results of which are shown in Figure 39.

Figure 39. Trade Ally Ratings of Focus on Energy Program Performance

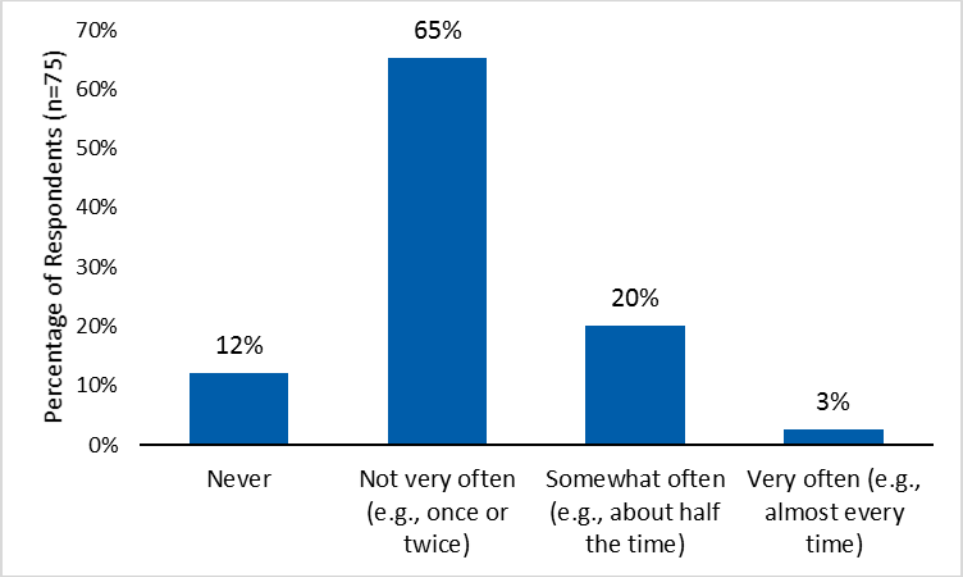


Source: Home Performance with ENERGY STAR Trade Ally Online Survey.
Question C1: "How is Focus on Energy doing when it comes to the following:"

Survey respondents most frequently rated Focus on Energy reaching out to Trade Allies and keeping them informed about programs (82%) and making paperwork easy to submit (78%) as excellent or good. In general, at least 72% of respondents said Focus on Energy did an excellent or good job with most statements about the program. CY 2017 Trade Ally survey results were generally similar to those in CY 2016. CY 2017 Trade Allies were slightly more satisfied with the marketing support and the timeliness of incentive payments, but slightly less satisfied with training and information provided to them.

The CY 2017 Program rated lowest in paying Trade Allies in a timely manner (50% excellent or good) but still rated at least average among 78% of respondents. Most respondents experienced few or no challenges with the incentive application process, as shown in Figure 40.

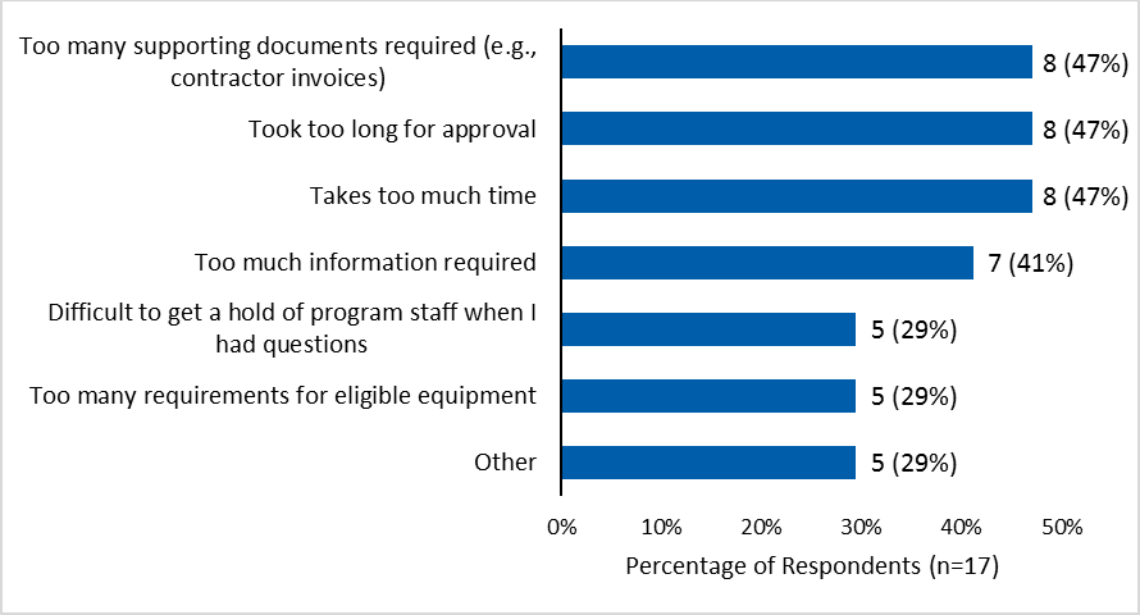
Figure 40. Frequency of Challenges Encountered During Incentive Application Process



Source: Home Performance with ENERGY STAR Trade Ally Online Survey.
Question B1: "How frequently do you run into challenges with the incentive application process?"

The 17 Trade Allies (23%) who reported challenges during the application process most commonly said Focus on Energy required too many supporting documents, took too long for approval, and took too much time (Figure 41). "Other" challenges included incentive applications requiring too much information, Trade Allies not receiving feedback from Focus on Energy after submitting their applications, and Program rules changing too often. The percentage of respondents who regularly encountered challenges during the application process increased over last year: 49% of CY 2016 Trade Ally survey respondents never encountered challenges, compared to 12% of CY 2017 respondents.

Figure 41. Trade Ally Challenges with Incentive Application Process

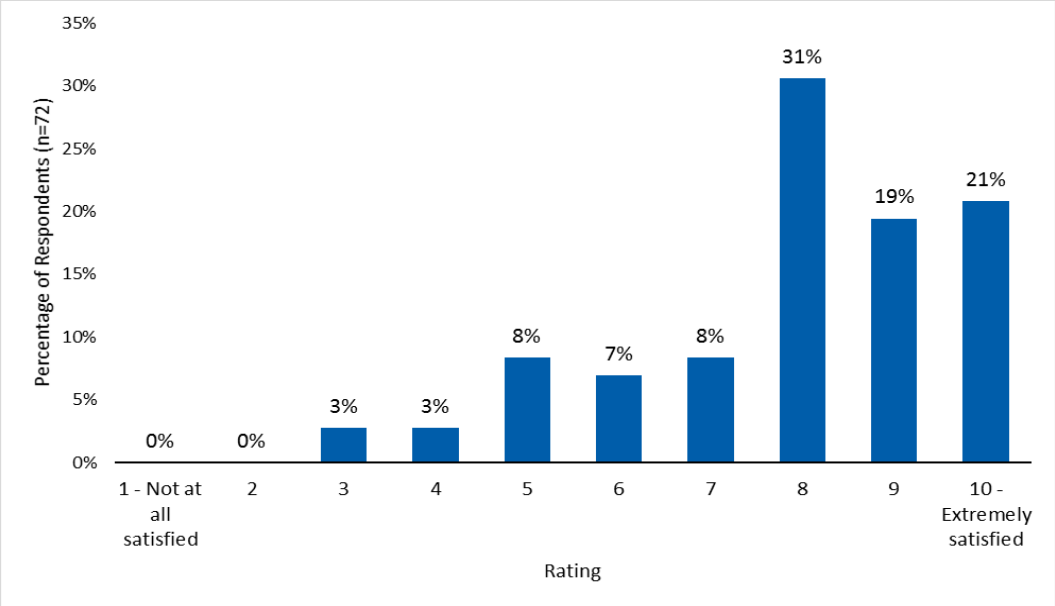


Source: Home Performance with ENERGY STAR Trade Ally Online Survey. Question C3: "What are your most frequent challenges with the incentive application process?" Multiple response; percentages sum to more than 100%.

Satisfaction

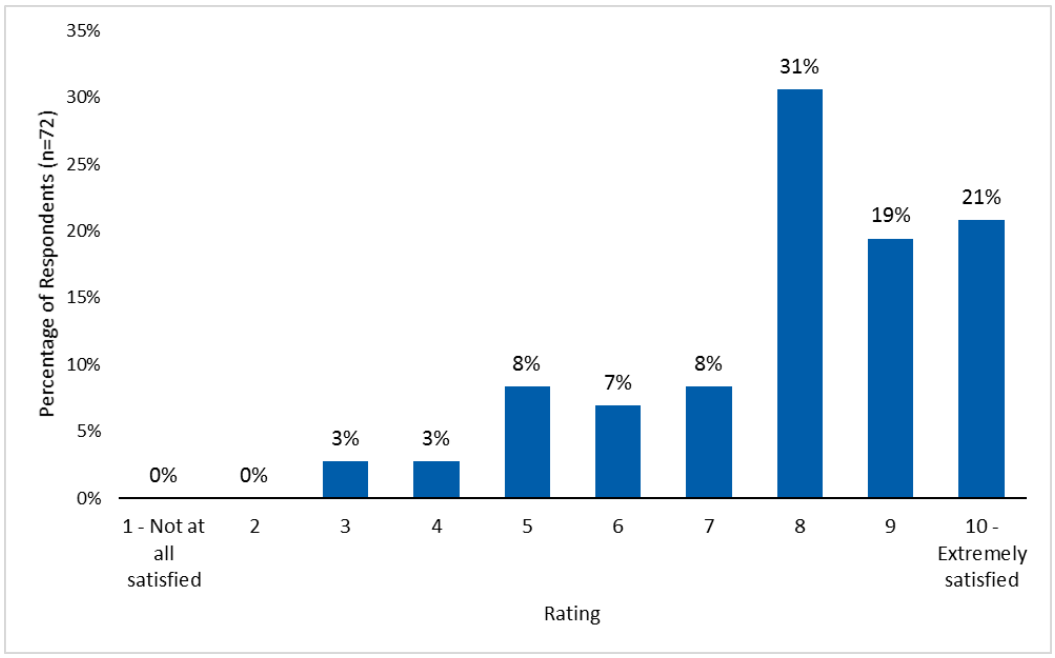
The Team asked Trade Allies to rate their satisfaction with the Home Performance with ENERGY STAR Program (Figure 42) and with Focus on Energy overall (Figure 43). Trade Allies reported an average satisfaction rating of 7.9 with the Program and 8.1 with Focus on Energy overall. Seventy-one percent of respondents rated their satisfaction with the Program an 8 or higher, up from 64% in CY 2016.

Figure 42. Trade Ally Satisfaction Ratings – Home Performance with ENERGY STAR



Source: Home Performance with ENERGY STAR Trade Ally Online Survey. Question C4: "On a 10-point scale, where 0 means *not at all satisfied* and 10 means *extremely satisfied*, how satisfied are you with Focus on Energy's Home Performance with ENERGY STAR Program?"

Figure 43. Trade Ally Satisfaction Ratings – Focus on Energy



Source: Home Performance with ENERGY STAR Trade Ally Online Survey. Question C6: "On a 10-point scale, where 0 means *not at all satisfied* and 10 means *extremely satisfied*, how satisfied are you with Focus on Energy overall?"

The Team asked respondents who rated their Program satisfaction a 6 or lower how Focus on Energy could improve the program to increase Trade Ally satisfaction (n=11). Feedback included more Program

marketing/advertising ("you need to market this program aggressively!"), fewer Program changes ("too hard to keep up with all the changes"), and better project and incentive tracking ("I would like to see […] what projects have been submitted, what is scheduled to be paid").

Barriers to Participation

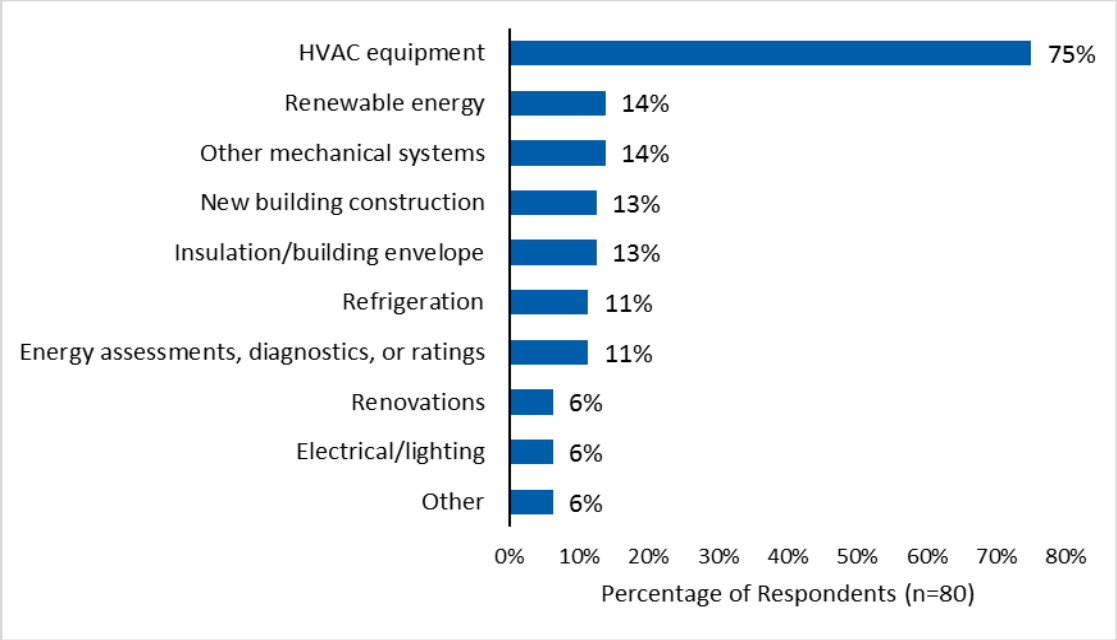
To support customers who may face financial barriers to installing Program measures, the Program promoted Federal Housing Authority (FHA) loans that included a free home energy assessment with each mortgage. However, no customers took advantage of the offer, which the Program Implementer attributed to "fairly intense competition from the booming housing market" such that it was not a priority for lenders with "easier money to be made." Program staff said the Program had income-qualified components in its marketing but did not conduct significant outreach directly to low-income customers because the income qualified track is not large or cost-effective portion of the program.

The Program Implementer did not receive any feedback about the Rural Broadband offering's travel incentive and did not receive any feedback from Rural Broadband participants indicating that any Trade Allies declined to conduct a home energy assessment in a rural household.

Firmographics

Most Trade Ally respondents work for HVAC equipment companies, as shown in Figure 44.

Figure 44. Trade Ally Company Specializations



Source: Home Performance with ENERGY STAR Trade Ally Online Survey. Question A2: "What does your company specialize in?" Multiple response; percentages sum to more than 100%.

The results align with the Trade Ally composition reported by Program staff and discussed in *Program Management and Delivery Structure*: most Trade Allies belong to the HVAC path followed by the renewables and whole home paths.

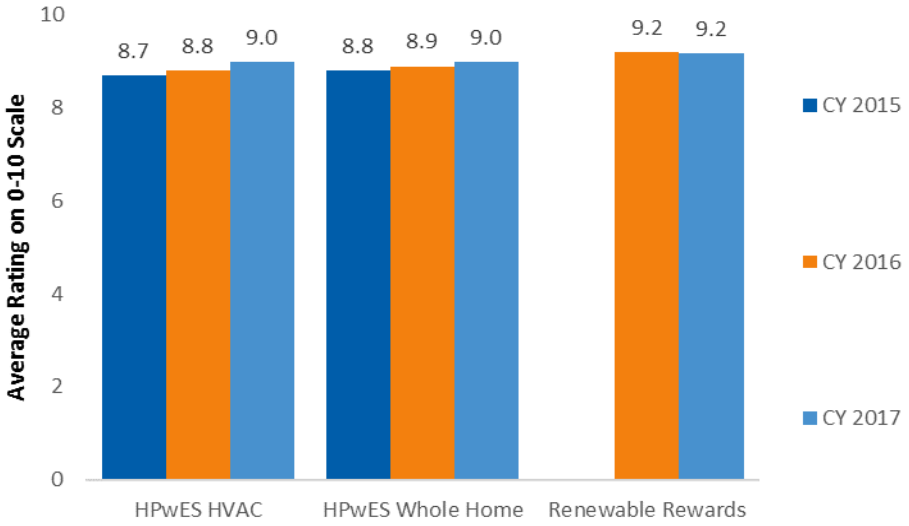
Customer Experience

Annual Results from Ongoing Customer Satisfaction Survey

Throughout CY 2017, the Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Home Performance with ENERGY STAR Program.[59] Respondents answered questions related to satisfaction and likelihood on a scale of 0 to 10, where 10 indicated the highest satisfaction or likelihood and 0 the lowest.

Figure 45 shows the overall satisfaction ratings for the CY 2017 and CY 2016 components, and comparable CY 2015 Programs. Both of the CY 2017 Home Performance with ENERGY STAR Program components received higher ratings from participants than the CY 2016 or CY 2015 versions of this Program. The rating for Renewable Rewards stayed the same in CY 2017 as the CY 2016 Program.

Figure 45. CY 2017 Overall Satisfaction with Home Performance with ENERGY STAR



Source: Home Performance with ENERGY STAR HVAC Program, Home Performance with ENERGY STAR Whole Home Program, and Renewable Rewards Participant Satisfaction Surveys Question: "Overall, how satisfied are you with the program?" (Residential/Enhanced Rewards CY 2015 n=542, Home Performance with ENERGY STAR HVAC CY 2016 n=597, Home Performance with ENERGY STAR HVAC CY 2017 n=412, Home Performance with ENERGY STAR CY 2015 n=352, Home Performance with ENERGY STAR Whole Home CY 2016 n=471, Home Performance with ENERGY STAR Whole Home CY 2017 n=970, Renewable Rewards CY 2016 n=148, and Renewable Rewards CY 2017 n=148)

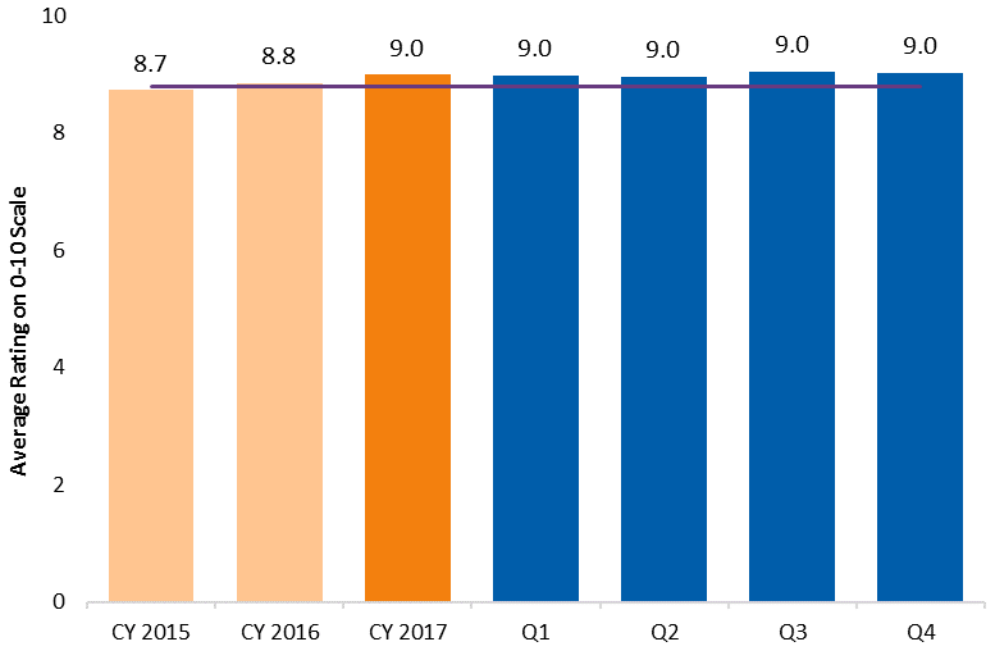
[59] The Evaluation Team found that some surveys did not include identifying information to allow it to match survey responses to program participation dates. Survey responses without participation dates were included in the year-end total, but not the quarterly breakdown.

The subsections that follow detail the complete results of these three customer satisfaction surveys by quarter for CY 2017, and compared to previous year's CY 2016 and CY 2015 Programs.

Home Performance with ENERGY STAR—HVAC

Figure 46 shows CY 2017 HVAC participants gave the Home Performance with ENERGY STAR Program an overall satisfaction rating of 9.0, which was statistically significantly higher than the portfolio baseline of 8.8 (indicated by the purple line) for the year. [60,61]

Figure 46. CY 2017 Overall Satisfaction with the Program—HVAC Component



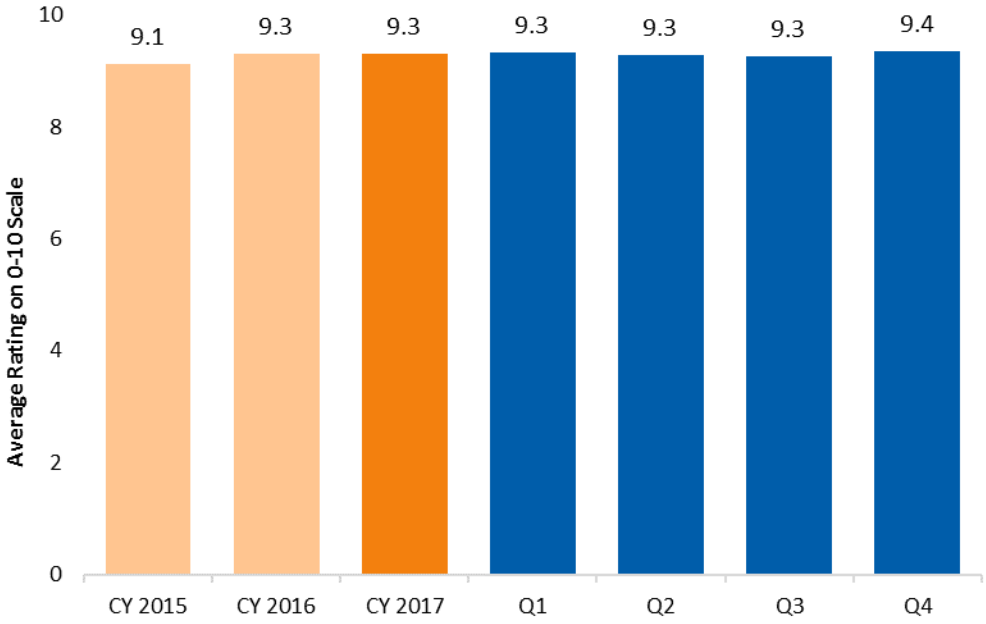
Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "Overall, how satisfied are you with the program?" (Residential/Enhanced Rewards CY 2015 n=542, CY 2016 n=597, CY 2017 n=412, Q1 n=127, Q2 n=90, Q3 n=93, Q4 n=89). The portfolio baseline (8.8) is indicated by a purple line.

As shown in Figure 47, the average rating for Program participant satisfaction with the upgrades was 9.3 in CY 2017 just as it was in CY 2016.

[60] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015–2018 quadrennium).

[61] $p < 0.05$ using binomial t-test.

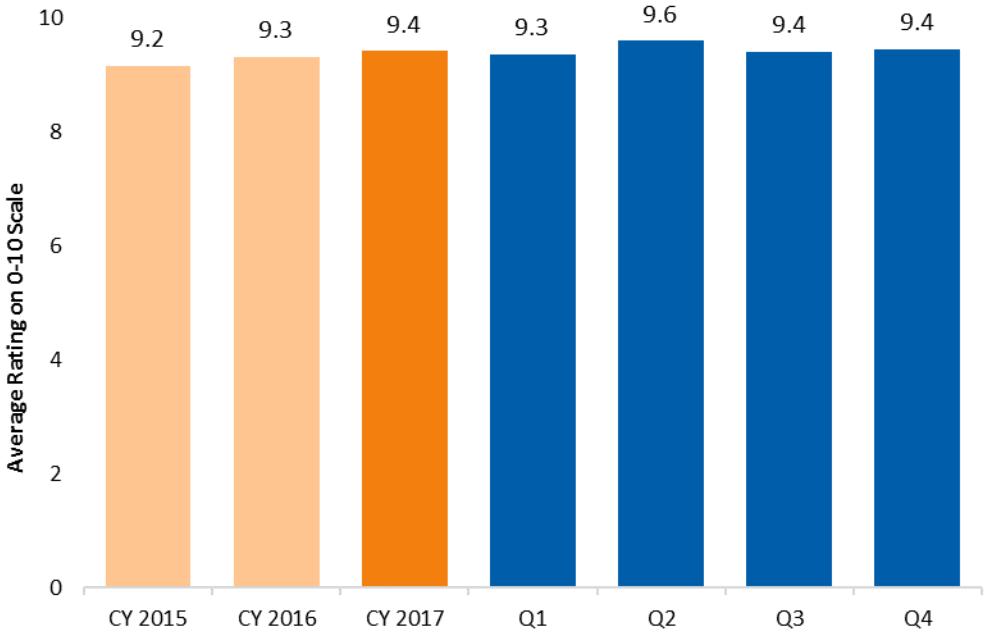
Figure 47. CY 2017 Satisfaction with Program Upgrades—HVAC Component



Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient improvement(s) that were completed?" (Residential/Enhanced Rewards CY 2015 n=521, CY 2016 n=580, CY 2017 n=401, Q1 n=127, Q2 n=83, Q3 n=89, Q4 n=92)

Participants gave their contractors high satisfaction ratings, averaging 9.4 for the CY 2017 Program (Figure 48), which was a slight but not statistically significant increase from the CY 2016 Program; although, ratings for Q2 in CY 2017 show a statistically significant increase from the CY 2016 Program.

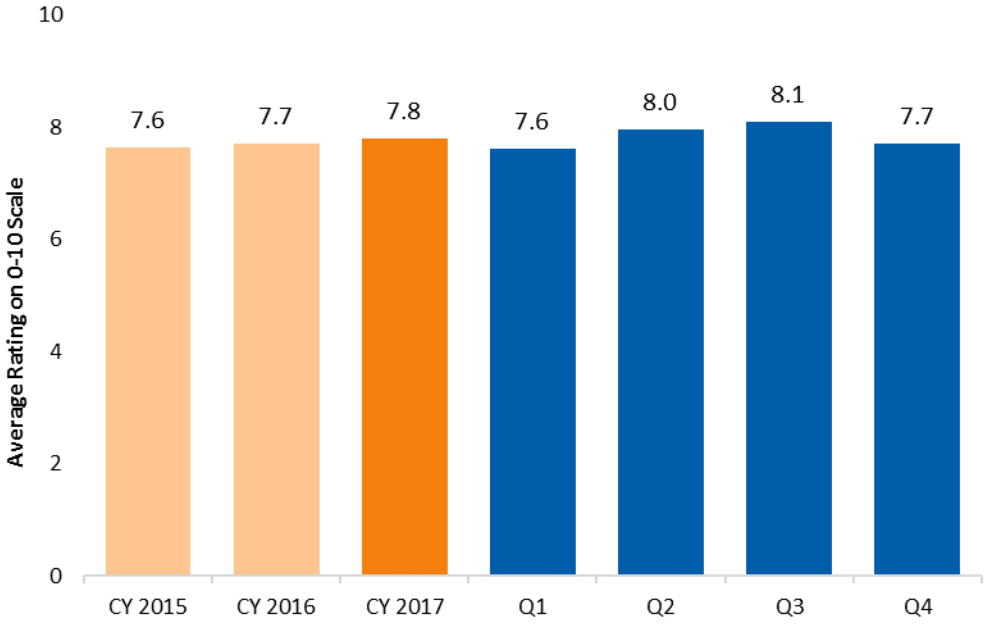
Figure 48. CY 2017 Satisfaction with Program Contractors—HVAC Component



Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "How satisfied are you with the contractor (Trade Ally) that performed the energy efficient improvement(s)?" (Residential/Enhanced Rewards CY 2015 n=524, CY 2016 n=594, CY 2017 n=399, Q1 n=123, Q2 n=82, Q3 n=92, Q4 n=89)

Respondents gave an average rating of 7.8 for their satisfaction with the amount of incentive they received (Figure 49), which was a slight increase over the CY 2016 Program. This aspect of the Program received the lowest average satisfaction rating overall.

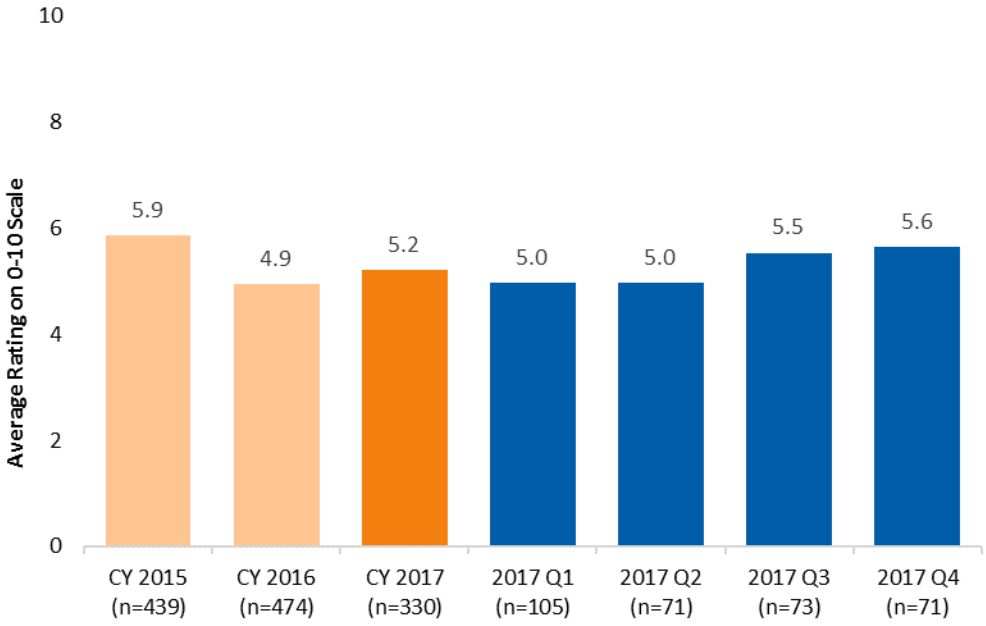
Figure 49. CY 2017 Satisfaction with Program Incentive—HVAC Component



Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "How satisfied are you with the amount of incentive you received?" (Residential/Enhanced Rewards CY 2015 n=537, CY 2016 n=605, CY 2017 n=417, Q1 n=128, Q2 n=89, Q3 n=95, Q4 n=92)

Figure 50 shows the average rating for the likelihood that respondents will initiate another energy efficiency project in the next 12 months was 5.2 in CY 2017.

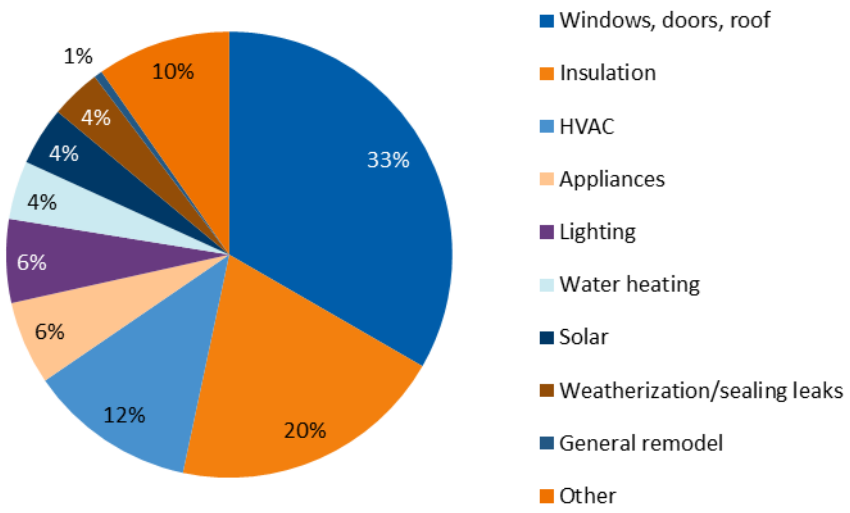
Figure 50. CY 2017 Likelihood of Initiating Energy Efficiency Improvements—HVAC Component



Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (Residential/Enhanced Rewards CY 2015 n=439, CY 2016 n=474, CY 2017 n=330, Q1 n=105, Q2 n=71, Q3 n=73, Q4 n=71)

The Evaluation Team also asked participants what improvements they were considering. Of the 425 participants who responded to the survey, 133 (31%) provided specific examples, which the Evaluation Team coded into a total of 165 mentions shown in Figure 51. Over one-third of the projects mentioned involve windows and doors and roofs (33%), followed by insulation (20%), and HVAC (12%). The most common appliances mentioned were clothes washers and clothes dryers. Ten percent of mentions were classified "other," a category that included upgrading siding, a smart thermostat, and a generator.

Figure 51. CY 2017 Intentions for Future Improvements—HVAC Component

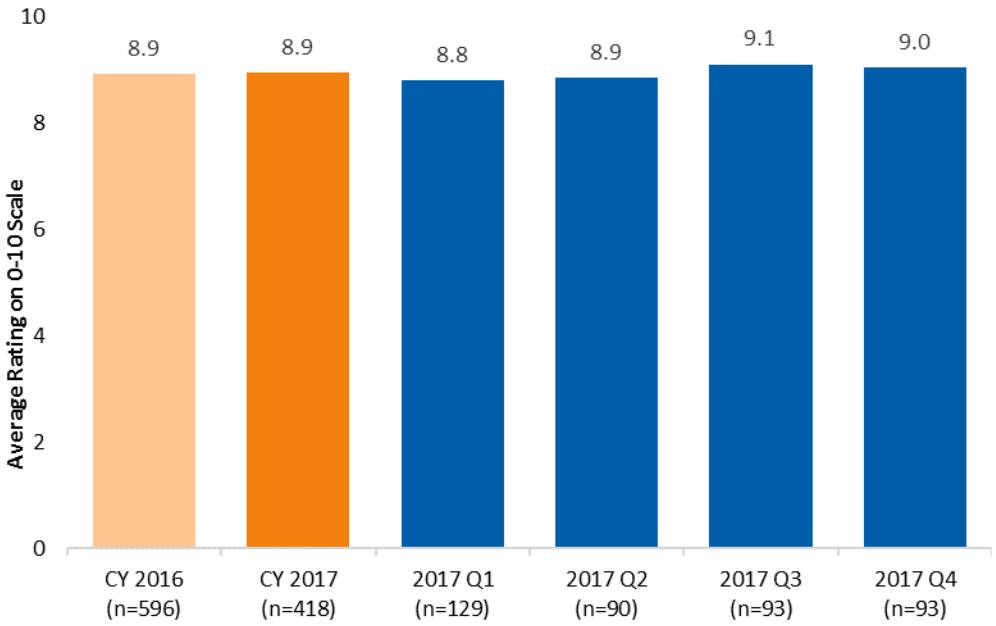


Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "What improvements do you plan to complete over the next 12 months, if applicable?" (Total mentions: n=165)

Figure 52 shows that respondents' rating for the likelihood that they would recommend this Program to other customers was 8.9; which is the same rating as in CY 2016.[62] Using these survey data, the Evaluation Team calculated a net promoter score (NPS) based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6). The HVAC component NPS is +64, based on 74% of participants identifying as promoters and 11% identifying as detractors.

[62] Customers who responded that they "already have" recommended the Program are counted in mean ratings as a rating of 10 (most likely).

Figure 52. CY 2017 Likelihood of Recommending the Program—HVAC Component

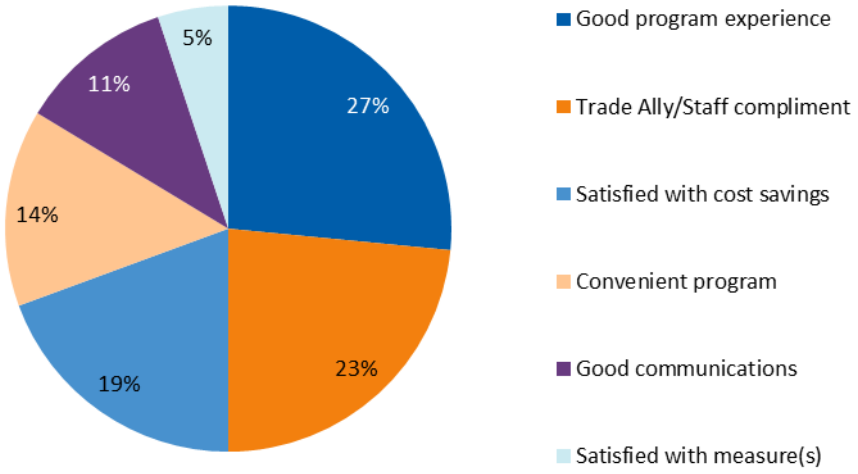


Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to others?" (CY 2016 n=596, CY 2017 n=418, Q1 n=129, Q2 n=90, Q3 n=93, Q4 n=93)

During the customer satisfaction surveys, the Evaluation Team asked participants if they had any comments or suggestions for improving the Program. Of the 425 participants who responded to the survey, 115 (27%) provided open-ended feedback, which the Evaluation Team coded into a total of 172 mentions. Of these mentions, 98 were positive or complimentary comments (57%) and 74 were suggestions for improvement (43%).

The positive responses are shown in Figure 53, with 27% reflecting a generally positive experience, 23% complimenting the contractor or Focus on Energy staff and 19% satisfied with cost savings.

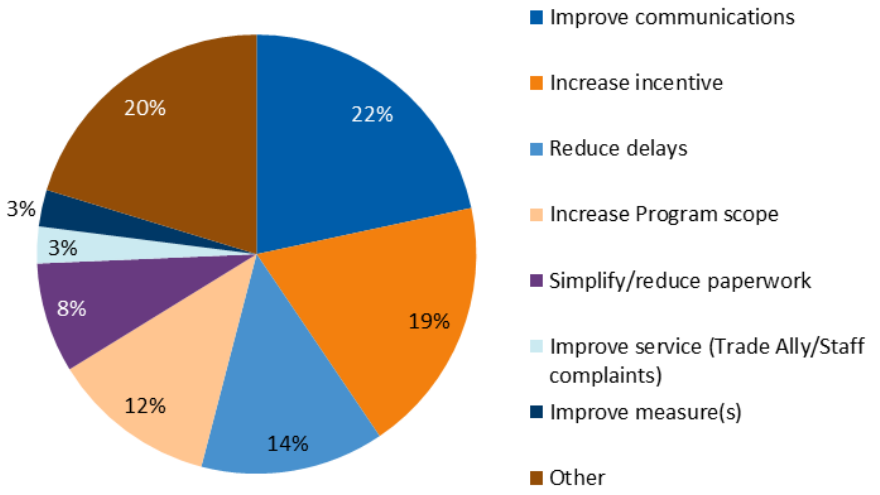
Figure 53. CY 2017 Positive Comments about the Program—HVAC Component



Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions n=98)

Suggestions for improvement are shown in Figure 54. The three most common suggestions were improving communications (22%), increasing incentives (19%), and reducing delays (14%). Suggestions about improving communications fell into two general categories: miscommunications about incentive amounts and suggestions to increase promotion for the Program.

Figure 54. CY 2017 Suggestions for Improving the Program—HVAC Component

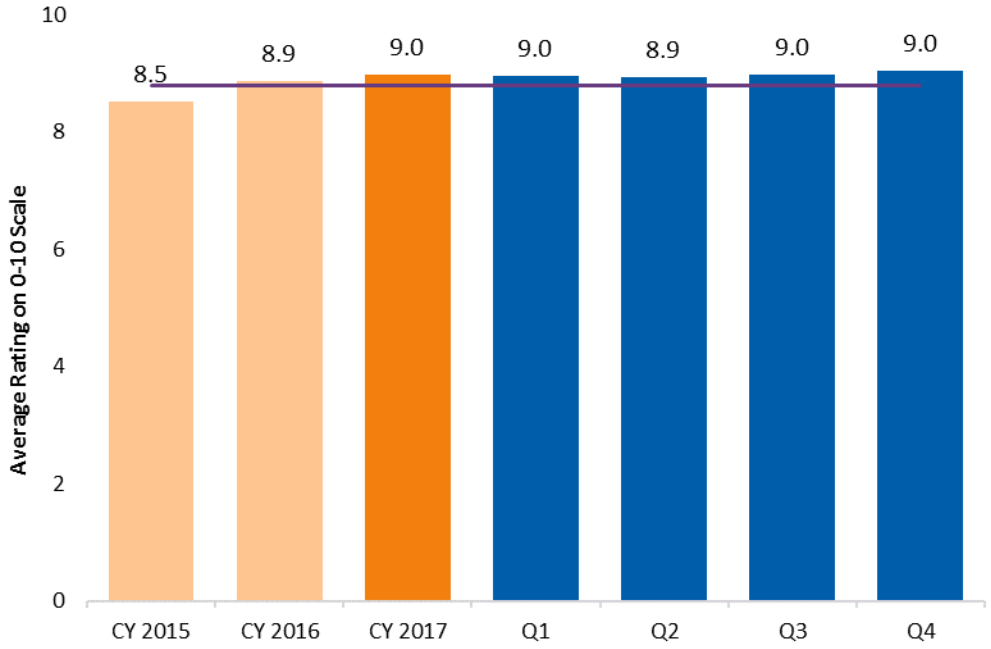


Source: Home Performance with ENERGY STAR HVAC Program Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: n=74)

Home Performance with ENERGY STAR—Whole Home

Figure 55 shows that whole home participants gave the Home Performance with ENERGY STAR Program an overall satisfaction rating of 9.0. These ratings were statistically significantly higher than the portfolio baseline of 8.8. [63]

Figure 55. CY 2017 Overall Satisfaction with the Program—Whole Home Component

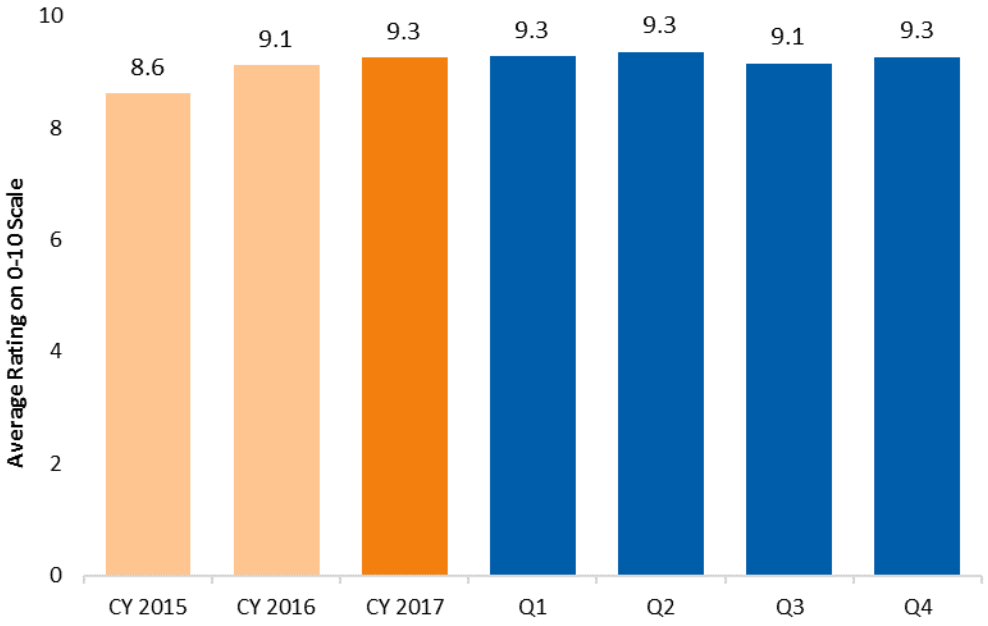


Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "Overall, how satisfied are you with the program?" (Home Performance with ENERGY STAR CY 2015 n=352, CY 2016 n=471, CY 2017 n=970, Q1 n=334, Q2 n=201, Q3 n=174, Q4 n=231). The portfolio baseline (8.8) is indicated by a purple line.

[63] $p < 0.05$ using binomial t-test.

As shown in Figure 56, Program participants gave an average rating of 9.3 for their satisfaction with the upgrades they received, a statistically significant increase from the CY 2016 Program.[64]

Figure 56. CY 2017 Satisfaction with Program Upgrades—Whole Home Component

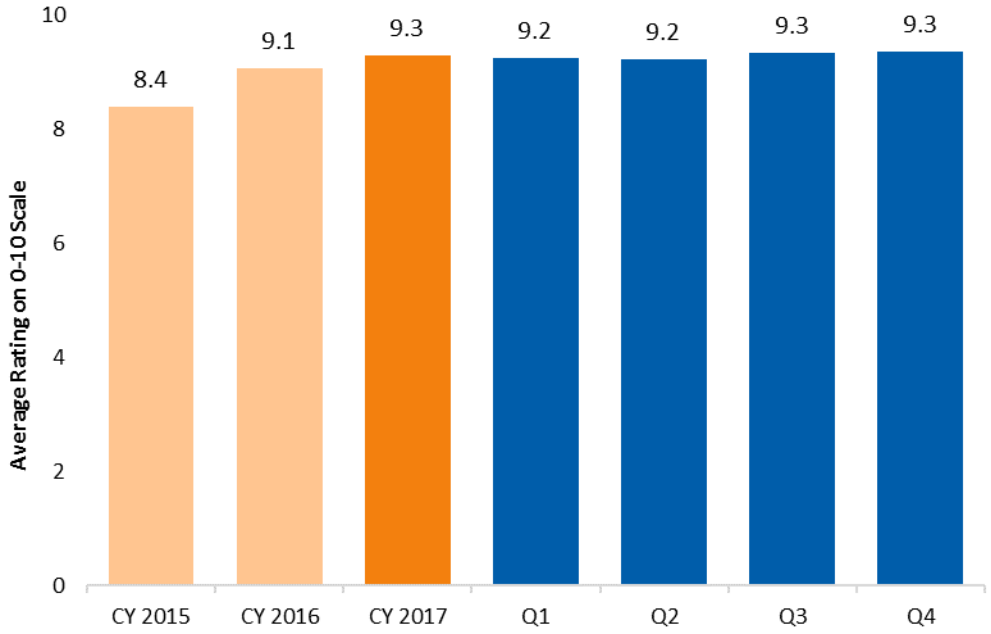


Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient improvement(s) that were completed?" (Home Performance with ENERGY STAR CY 2015 n=315, CY 2016 n=445, CY 2017 n=939, Q1 n=330, Q2 n=194, Q3 n=172, Q4 n=215)

[64] $p < 0.10$ for CY 2017 compared to CY 2016, using binomial t-tests. $p < 0.05$ for Q2 CY 2017 compared to CY 2016 using binomial t-test. Ratings from other quarters is not statistically significantly different from CY 2016.

Participants gave the contractors who provided services for them an average satisfaction rating of 9.3 for CY 2017 (Figure 57), which was a statistically significant increase over the CY 2016 Program.[65]

Figure 57. CY 2017 Satisfaction with Contractor for the Program—Whole Home Component

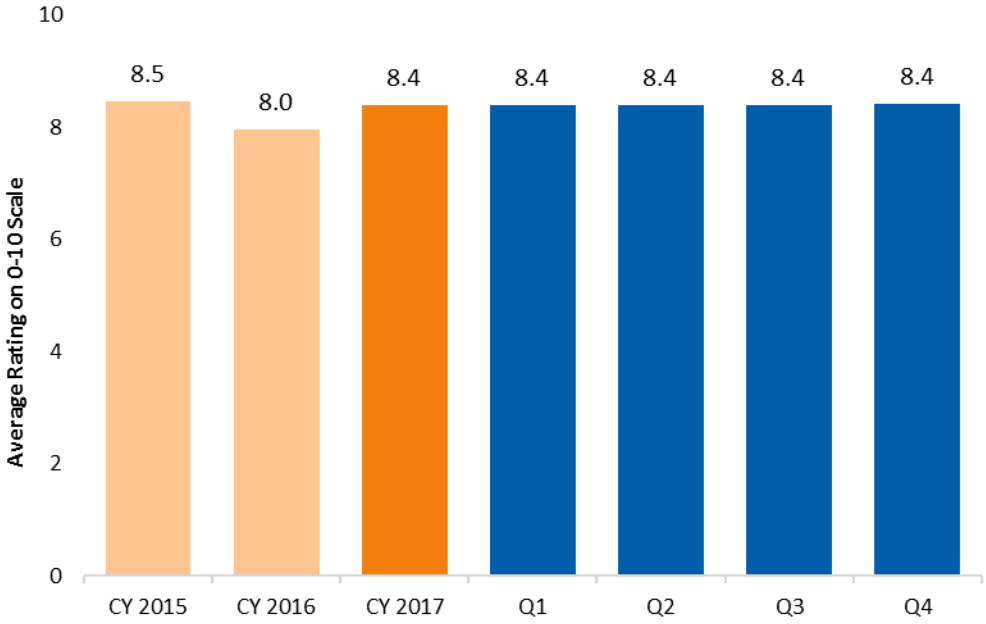


Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "How satisfied are you with the contractor (Trade Ally) that performed the energy efficient improvement(s)?" (Home Performance with ENERGY STAR CY 2015 n=350, CY 2016 n=471, CY 2017 n=957, Q1 n=333, Q2 n=196, Q3 n=175, Q4 n=223)

[65] $p < 0.05$ for CY 2017 compared to CY 2016, using binomial t-tests. Ratings for Q3 and Q4 of CY 2017 were statistically significant compared to CY 2016 using binomial t-tests ($p < 0.10$ and $p < 0.05$, respectively). Ratings from Q1 and Q2 were not statistically significantly different from CY 2016. .

Respondents gave an average rating of 8.4 for their satisfaction with the amount of incentive they received (Figure 58), a statistically significant increase from the CY 2016 Program ratings.[66] This aspect of the Program received the lowest average satisfaction rating overall.

Figure 58. CY 2017 Satisfaction with the Program Incentive—Whole Home Component

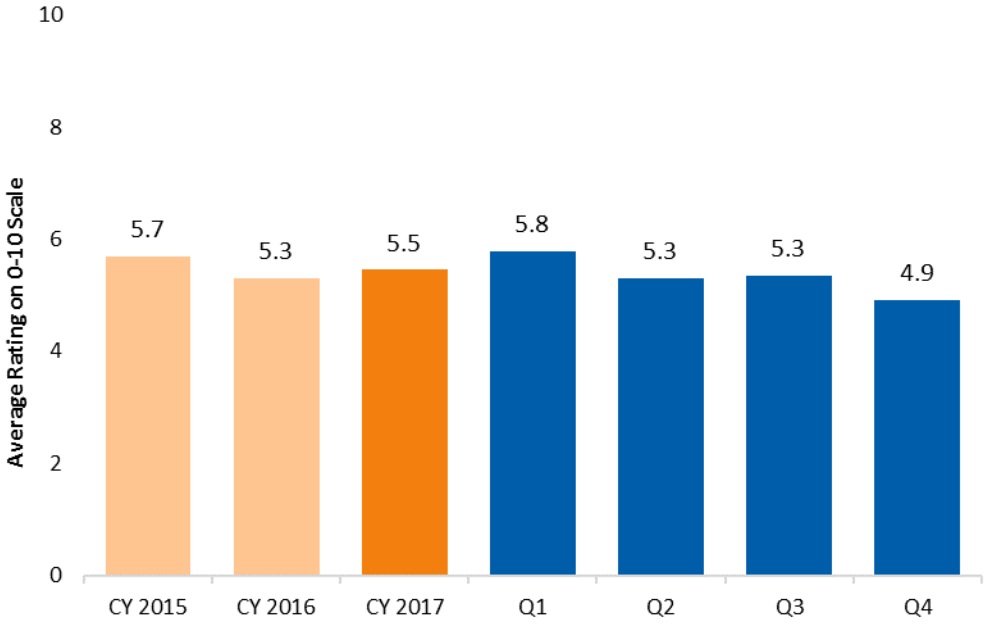


Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "How satisfied are you with the amount of incentive you received?" (Home Performance with ENERGY STAR CY 2015 n=338, CY 2016 n=467, CY 2017 n=944, Q1 n=328, Q2 n=196, Q3 n=169, Q4 n=224)

[66] $p < 0.05$ for CY 2017, using binomial t-tests. The differences for all quarters in CY 2017 were statistically significant compared to CY 2016 ($p < 0.05$).

Figure 59 shows that respondents' rating for the likelihood that they will initiate another energy efficiency project in the next 12 months averaged 5.5, which was not a statistically significant increase compared to CY 2016.[67]

Figure 59. CY 2017 Likelihood of Initiating Energy Efficiency Improvement—Whole Home Component

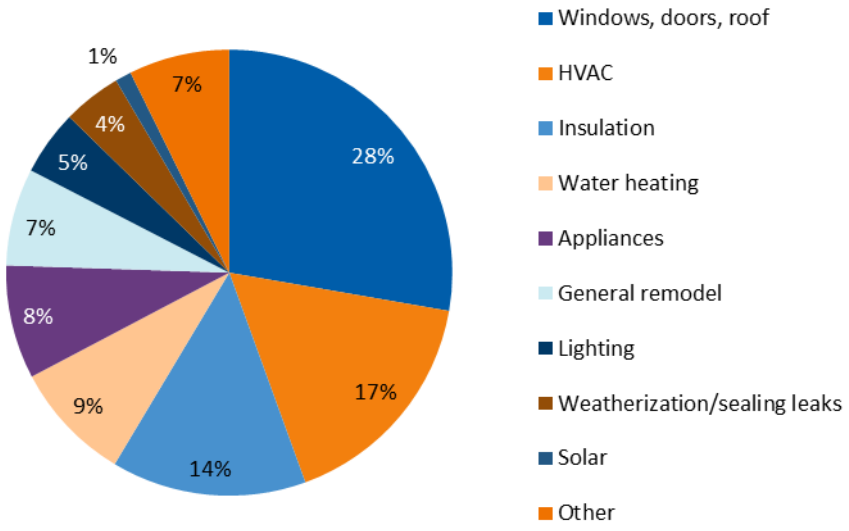


Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (Home Performance with ENERGY STAR CY 2015 n=291, CY 2016 n=385, CY 2017 n=804, Q1 n=295, Q2 n=164, Q3 n=136, Q4 n=184)

[67] $p < 0.10$ for Q1 compared to CY 2016 using binomial t-test. Ratings for all other quarters were not statistically significantly different from CY 2016.

The Evaluation Team also asked participants what improvements they were considering. Of the 1,007 participants who responded to the survey, 336 (or 30%) provided specific examples, which the Evaluation Team coded into a total of 421 mentions shown in Figure 60. Over one-quarter of the projects mentioned involve windows and doors and roofs (27%), followed by HVAC upgrades (17%) and insulation (14%). Seven percent of mentions were classified "other," a category that included new thermostat, install humidifier or dehumidifier, better ventilation with fans, and installing water heater tank wrap.

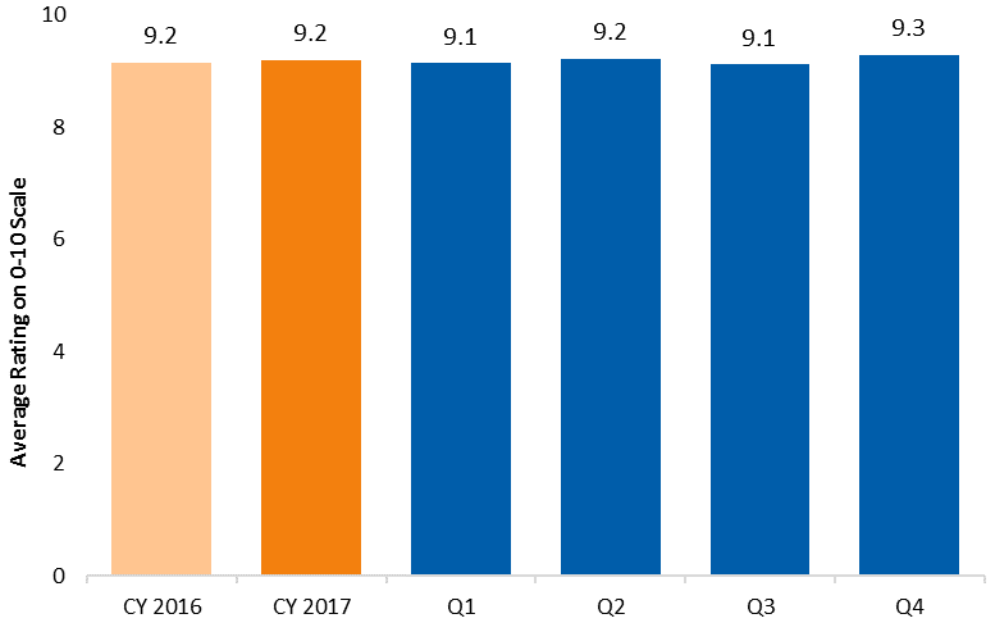
Figure 60. CY 2017 Intentions for Future Improvements—Whole Home Component



Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "What improvements do you plan to complete over the next 12 months, if applicable?" (Total mentions: n=421)

Figure 61 shows that the respondents' rating for the likelihood that they would recommend this Program to others was 9.1, a slight but not statistically significant decrease from the CY 2016 Program.[68] Using these survey data, the Evaluation Team calculated an NPS based on customers' likelihood to recommend the Program. For the whole home component of the Home Performance with ENERGY STAR Program, the NPS is +74, based on 81% of participants identifying as promoters and 6% identifying as detractors.

Figure 61. CY 2017 Likelihood of Recommending the Program—Whole Home Component



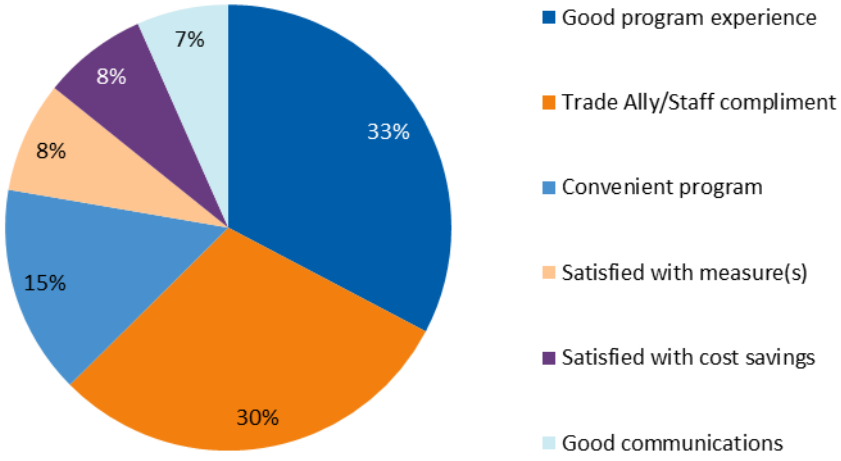
Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to others?" (CY 2016 n=476, CY 2017 n=962, Q1 n=337, Q2 n=198, Q3 n=172, Q4 n=225)

During the customer satisfaction surveys, the Evaluation Team also asked participants if they had any comments or suggestions for improving the program. Of the 1,007 participants who responded to the survey, 247 (25%) provided open-ended feedback, which the Evaluation Team coded into a total of 408 mentions. Of these mentions, 211 (52%) were positive or complimentary comments, and 197 (48) were suggestions for improvement.

[68] Customers who responded that they "already have" recommended the Program are counted in mean ratings as a rating of 10 (most likely).

The positive responses are shown in Figure 62, with most comments reflecting a generally positive experience (33%) and compliments for Focus on Energy staff and Trade Allies (30%).

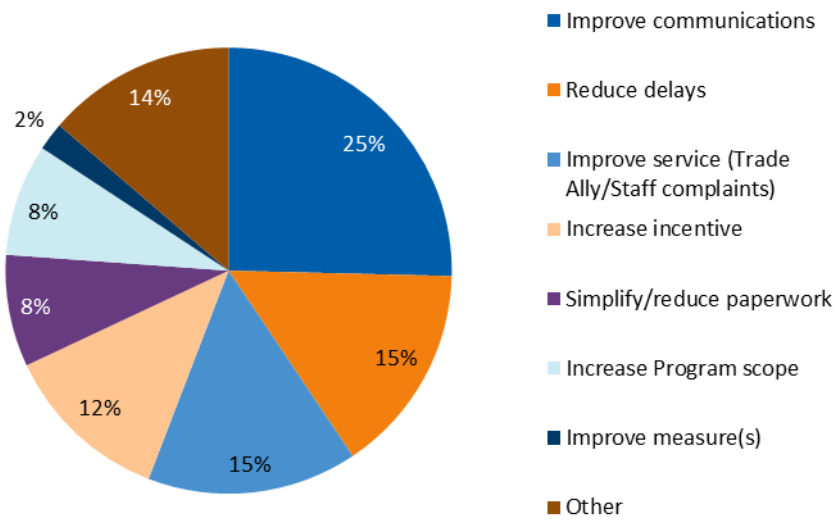
Figure 62. CY 2017 Positive Comments about the Program



Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions n=211)

Suggestions for improvement are shown in Figure 63; the most common suggestions were to improve communications (25%), reduce delays (15%), improve service (15%), and increase incentive amounts (12%) Suggestions about improving communications typically focused on confusion about changing incentive levels or increasing outreach and marketing to make customers aware of the Program, and defining on the website what Trade Ally means.

Figure 63. CY 2017 Suggestions for Improving the Program



Source: Home Performance with ENERGY STAR Whole Home Program Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: n=197)

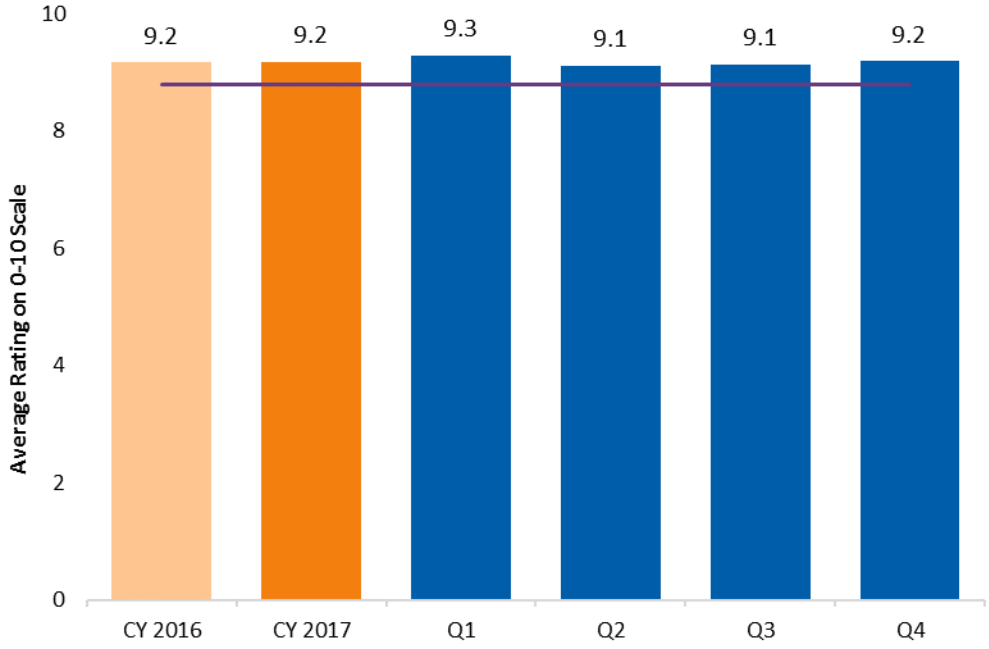
During the customer satisfaction surveys, the Evaluation Team also asked participants if they received a Home Energy Score as part of their assessment.[69] Over half (52% of 304) said they had not, 35% said they did not know if they had and 13% said they had received a Home Energy Score. Of those who had received a Home Energy Score, they said the most useful aspects were learning how improvements reduced energy use, what types of improvements could help them reduce energy use, and the impact the improvements could make on reducing their utility bill.

[69] This question was added to the survey mid-year.

Home Performance with ENERGY STAR-Renewable Rewards

Figure 64 shows that the average overall Home Performance with ENERGY STAR Program satisfaction rating among CY 2017 Renewable Rewards participants was 9.2, which was statistically significantly higher than the portfolio baseline of 8.8 (indicated by the purple line).[70]

Figure 64. CY 2017 Overall Satisfaction with the Program-Renewable Rewards

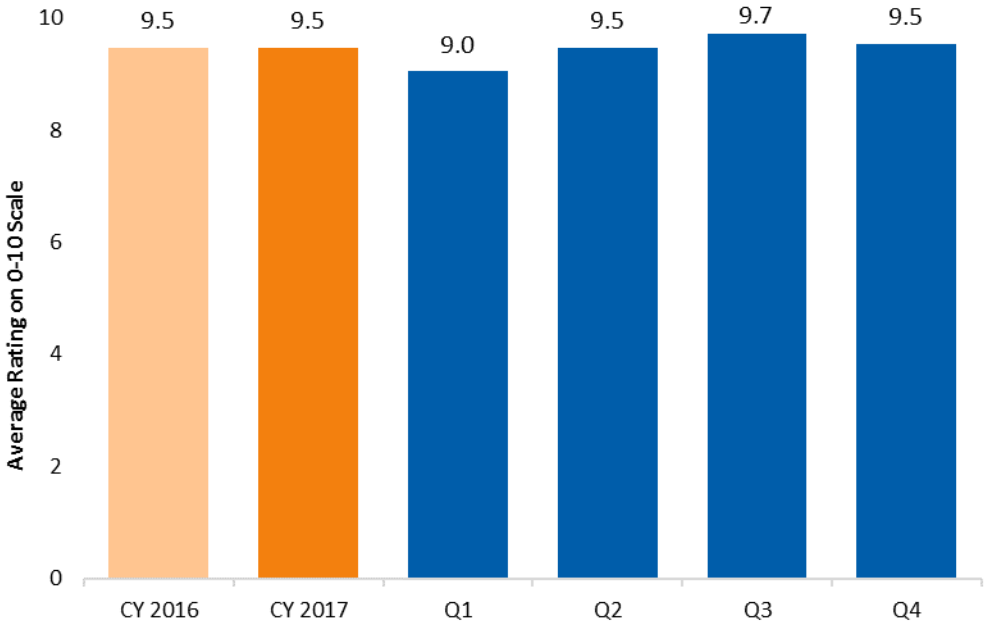


Source: Renewable Rewards Program Participant Satisfaction Survey Question. "Overall, how satisfied are you with the program?" (CY 2016 n=148, CY 2017 n=148, Q1 n=24, Q2 n=41, Q3 n=22, Q4 n=58). The portfolio baseline (8.8) is indicated by a purple line.

[70] $p < 0.05$ using binomial t-test.

As shown in Figure 65, Program participants' average rating for satisfaction with their equipment at 9.5. CY 2017 Q3 rating is statistically significantly higher when compared to the CY 2016 Program.[71]

Figure 65. CY 2016 Satisfaction with Program Upgrades-Renewable Rewards

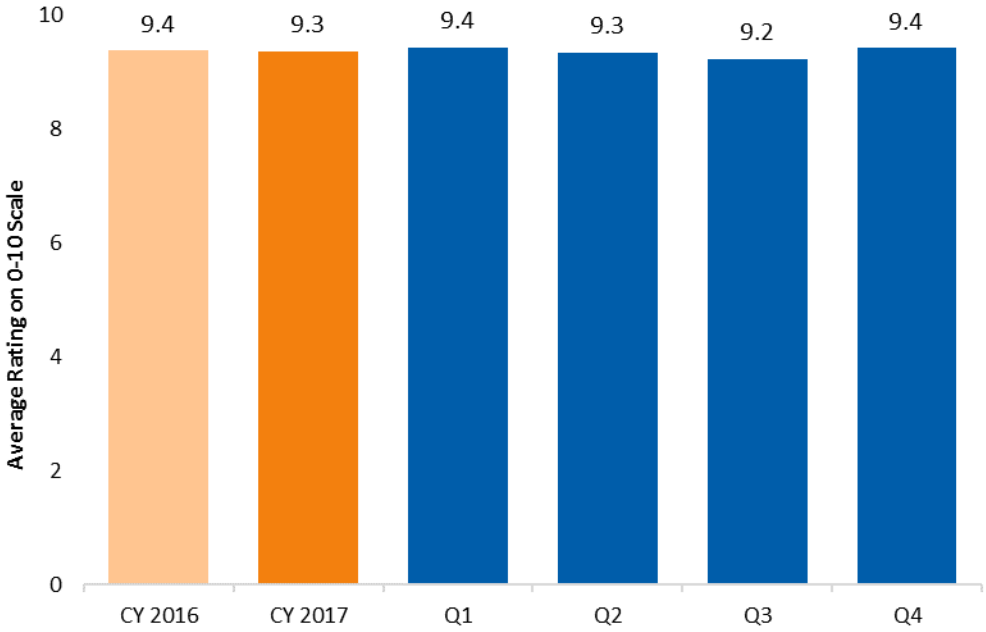


Source: Renewable Rewards Program Participant Satisfaction Survey Question. "How satisfied are you with the energy-efficient upgrades you received?" (CY 2016 n=144, CY 2017 n=143, Q1 n=22, Q2 n=40, Q3 n=22, Q4 n=56)

[71] $p < 0.10$ using binomial t-test. Ratings for all other quarters were not statistically significantly different from CY 2016.

Participants also gave their contractors high satisfaction ratings, averaging 9.3 for the CY 2017 Program (Figure 66), which is a slight but not statistically significant decrease compared to the CY 2016 Program.

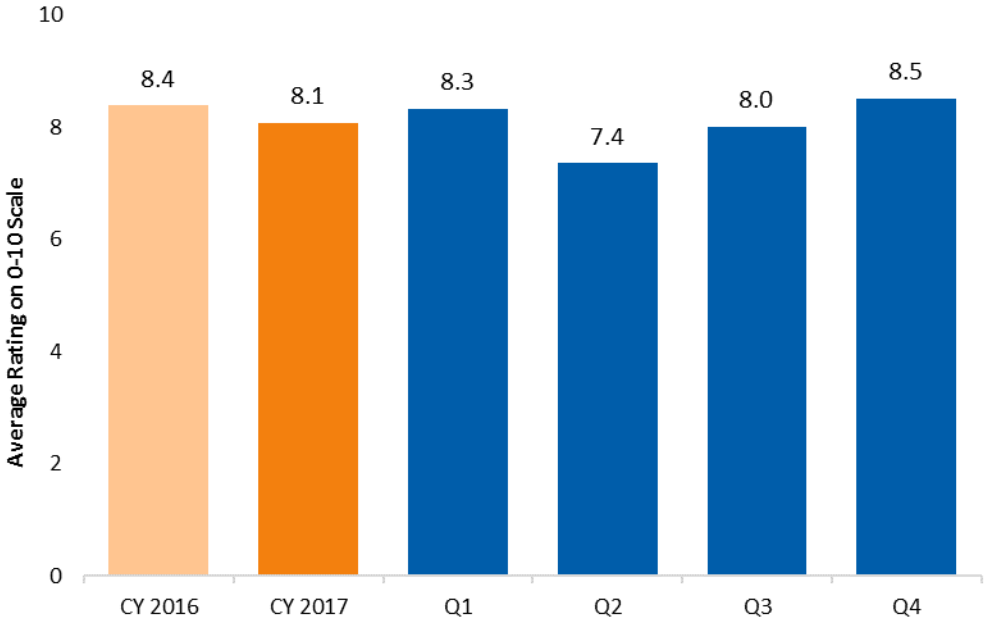
Figure 66. CY 2017 Satisfaction with Program Contractors-Renewable Rewards



Source: Renewable Rewards Program Participant Satisfaction Survey Question. "How satisfied are you with the contractor that provided the service?" (CY 2016 n=144, CY 2017 n=144, Q1 n=24, Q2 n=40, Q3 n=23, Q4 n=54)

Respondents gave an average rating of 8.1 for their satisfaction with the amount of incentive they received (Figure 67). This was a decrease from the CY 2016 Program but was not statistically significant except in Q2.[72] This aspect of the Program received the lowest average satisfaction rating overall.

Figure 67. CY 2017 Satisfaction with Program Incentive-Renewable Rewards

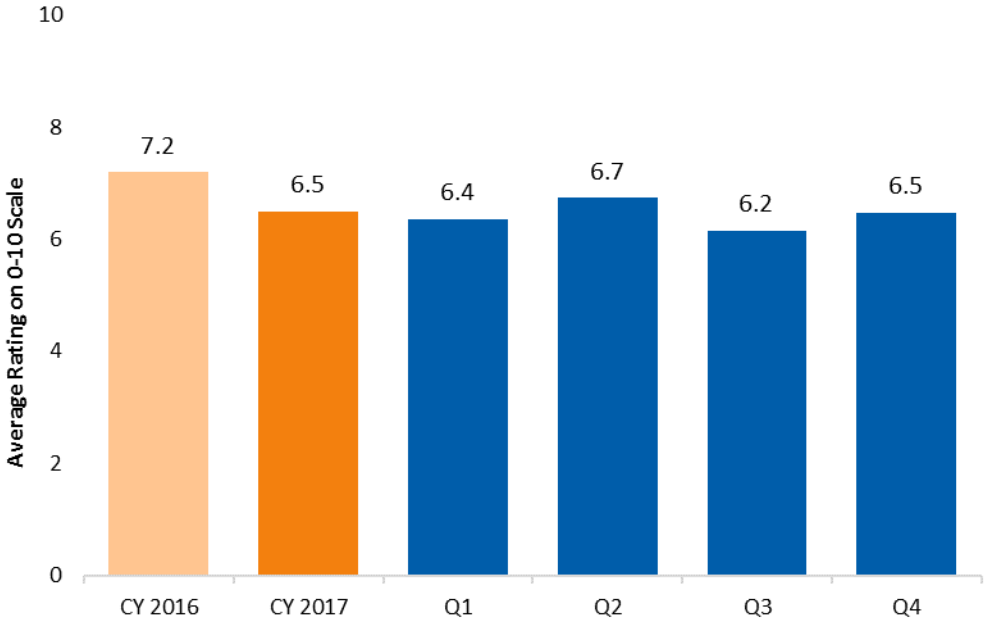


Source: Renewable Rewards Program Participant Satisfaction Survey Question. "How satisfied are you with the amount of the cash incentive you received?" (CY 2016 n=149, CY 2017 n=151, Q1 n=24, Q2 n=42, Q3 n=23, Q4 n=59)

[72] $p < 0.05$ for Q2 compared to CY 2016 using binomial t-tests. Ratings from other quarters were not statistically significantly different from CY 2016

Figure 68 shows the average rating for the likelihood that respondents will initiate another energy efficiency project in the next 12 months was 6.5 which is a statistically significant decrease compared to the CY 2016 Program.[73]

Figure 68. CY 2017 Likelihood of Initiating Energy Efficiency Improvement-Renewable Rewards

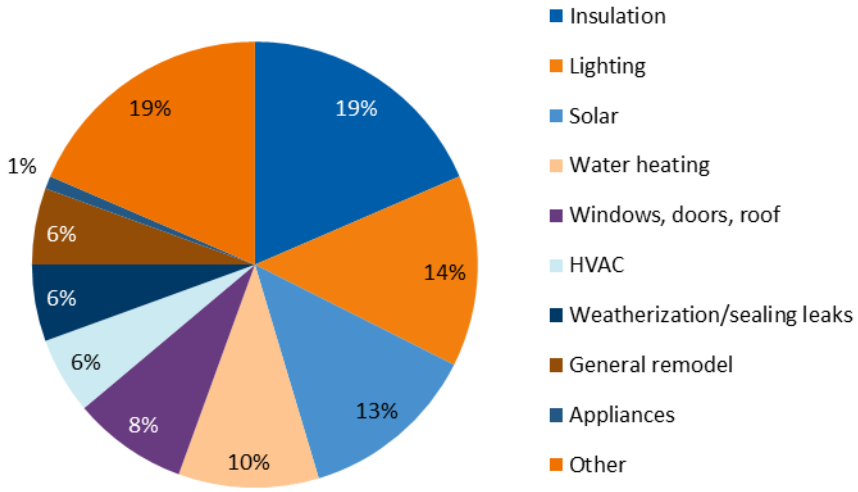


Source: Renewable Rewards Program Participant Satisfaction Survey Question. "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (CY 2016 n=134, CY 2017 n=136, Q1 n=22, Q2 n=38, Q3 n=20, Q4 n=54)

[73] $p < 0.10$ using binomial t-tests.

The Evaluation Team also asked participants what improvements they were considering. Of the 151 participants who responded to the survey, 72 (47%) provided specific examples, which the Evaluation Team coded into a total of 108 mentions shown in Figure 69. Four categories combined to account for a large majority of these mentions: insulation (19%), lighting measures (14%), solar (13%), and water heating (10%). Nineteen percent were classified "other," a category that included installing battery storage and purchasing an electric vehicle.

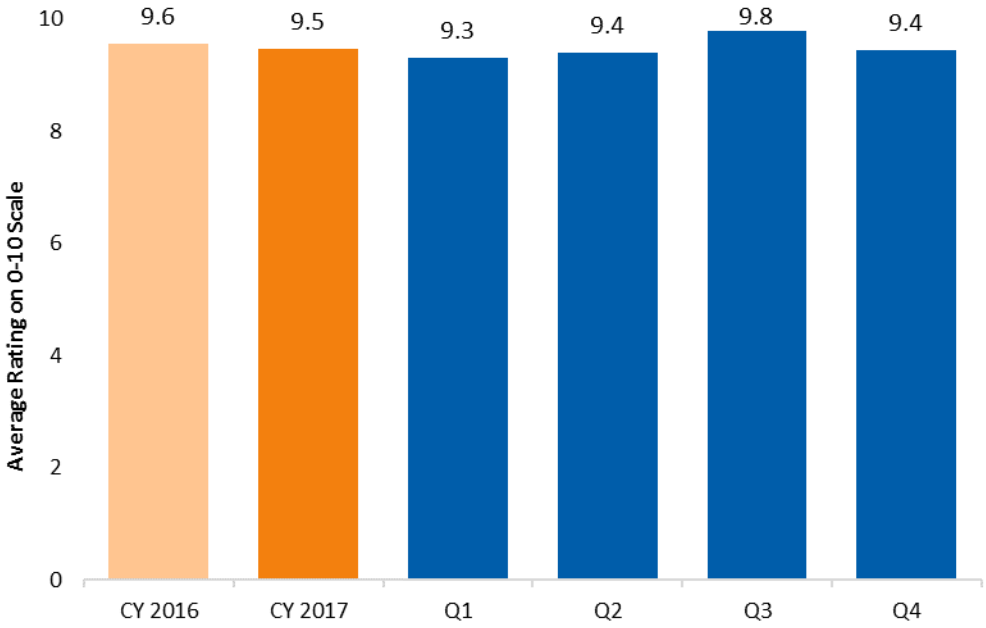
Figure 69. CY 2017 Intentions for Future Improvements-Renewable Rewards



Source: Renewable Rewards Program Participant Satisfaction Survey Question. "What improvements do you plan to complete over the next 12 months, if applicable?" (Total mentions n=108)

Figure 70 shows that business respondents gave a rating of 9.5 for the likelihood they would recommend this Program to other businesses.[74] Using these survey data, the Evaluation Team calculated an NPS based on customers' likelihood to recommend the Program. The Renewable Rewards Program's NPS was +83 and was derived from 87% of participants identifying as promoters and 3% identifying as detractors.

Figure 70. CY 2017 Likelihood of Recommending the Program-Renewable Rewards



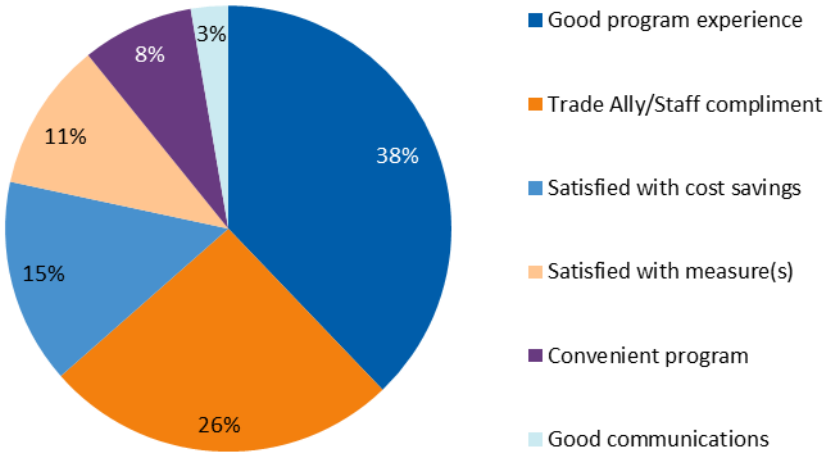
Source: Renewable Rewards Program Participant Satisfaction Survey Question. "How likely is it that you would recommend this program to other small businesses?" (CY 2016 n=150, CY 2017 n=150, Q1 n=23, Q2 n=42, Q3 n=23, Q4 n=59)

During the customer satisfaction surveys, the Evaluation Team asked participants if they had any comments or suggestions for improving the Program. Of the 151 participants who responded to the survey, 80 (44%) provided open-ended feedback, which the Evaluation Team coded into a total of 115 mentions. Of these, 74 were positive or complimentary comments (64%), and 41 were suggestions for improvement (36%). Positive comments increased from the CY 2016 Program (up from 47% to 67%).

The positive responses are shown in Figure 71, with 38% reflecting a generally positive experience, 26% complimenting Trade Allies and Program Staff, and 15% indicating satisfaction with the incentive.

[74] Customers who responded that they "already have" recommended the Program were counted in mean ratings as a rating of 10 (most likely).

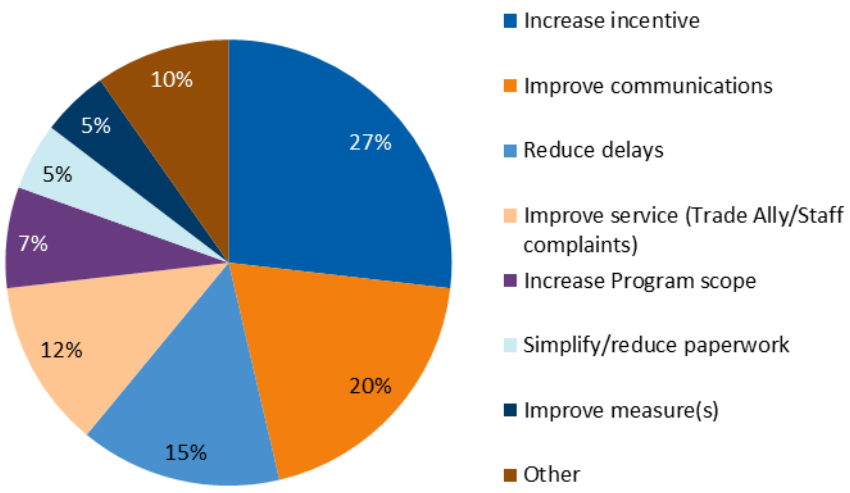
Figure 71. CY 2017 Positive Comments about the Program-Renewable Rewards



Source: Renewable Rewards Program Customer Satisfaction Survey Question. "Please tell us more about your experience and any suggestions." (Total positive mentions n=74)

Suggestions for improving the Program are shown in Figure 72. The most common suggestions involved increasing the incentive (27%), improving communications about the Program (20%), followed by reducing delays (15%), and improving service (12%).

Figure 72. CY 2017 Suggestions for Improving the Program-Renewable Rewards



Source: Renewable Rewards Program Customer Satisfaction Survey Question. "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions n=41)

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the total resource test (TRC) test. Appendix F includes a description of the TRC test.

Table 95 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Home Performance with ENERGY STAR Program whole home and HVAC paths.

Table 95. Whole Home and HVAC Path Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$6,165,794	$5,409,905	$1,667,813

The Evaluation Team found the CY 2017 whole home and HVAC paths were cost-effective (1.69). Table 96 lists the evaluated costs and benefits.

Table 96. Whole Home and HVAC Path Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$1,226,573	$1,077,241	$272,801
Delivery Costs	$2,797,134	$2,456,590	$622,109
Incremental Measure Costs	$20,602,521	$33,289,125	$3,530,955
Total Non-Incentive Costs	**$24,626,228**	**$36,822,956**	**$4,425,865**
Benefits			
Electric Benefits	$16,236,636	$15,381,498	$841,975
Gas Benefits	$21,044,655	$25,501,072	$4,292,688
Emissions Benefits	$4,219,194	$4,505,567	$585,474
Total TRC Benefits	**$41,500,485**	**$45,388,136**	**$5,720,137**
Net TRC Benefits	**$16,874,257**	**$8,565,180**	**$1,294,272**
TRC B/C Ratio	**1.69**	**1.23**	**1.29**

Table 97 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Renewable Rewards Program.

Table 97. Renewable Rewards Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$1,095,018	$1,084,624	$4,095,199

The Evaluation Team found the CY 2017 Renewable Rewards Program was cost-effective (1.11).

Table 98 lists the evaluated costs and benefits.

Table 98. Renewable Rewards Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015[75]
Costs			
Administration Costs	$196,236	$180,122	$976,181
Delivery Costs	$494,298	$410,759	$2,226,129
Incremental Measure Costs	$11,242,815	$7,612,624	$17,128,198
Total Non-Incentive Costs	**$11,933,349**	**$8,203,505**	**$20,330,509**
Benefits			
Electric Benefits	$11,844,977	$6,511,948	$16,012,637
Gas Benefits	$0	$0	$8,983,211
Emissions Benefits	$1,367,288	$807,021	$3,025,234
Total TRC Benefits	**$13,212,265**	**$7,318,969**	**$28,021,081**
Net TRC Benefits	**$1,278,916**	**($884,536)**	**$7,690,573**
TRC B/C Ratio	**1.11**	**0.89**	**1.38**

Table 99 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the overall Home Performance with ENERGY STAR Program (comprising of the whole home, HVAC, and Renewable Rewards components).

Table 99. Home Performance with ENERGY STAR Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$7,260,811	$7,065,849	$7,851,395

The Evaluation Team found the CY 2017 Home Performance with ENERGY STAR Program was cost-effective (1.50). Table 100 lists the evaluated costs and benefits.

[75] CY 2015 Results are for the Residential Rewards program and are not directly comparable to Renewable Rewards.

Table 100. Home Performance with ENERGY STAR Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$1,422,809	$1,285,139	$1,530,893
Delivery Costs	$3,291,431	$3,237,582	$3,491,119
Incremental Measure Costs	$31,845,336	$41,880,409	$25,013,024
Total Non-Incentive Costs	$36,559,577	**$46,403,130**	**$30,035,036**
Benefits			
Electric Benefits	$28,081,613	$25,781,760	$18,084,569
Gas Benefits	$21,044,655	$26,355,678	$20,412,547
Emissions Benefits	$5,586,482	$5,606,995	$4,488,641
Total TRC Benefits	**$54,712,750**	**$57,744,434**	**$42,985,756**
Net TRC Benefits	**$18,153,173**	**$11,341,304**	**$12,950,720**
TRC B/C Ratio	**1.50**	**1.24**	**1.43**

Evaluation Outcomes and Recommendations

The Evaluation Team identified several outcomes and recommendations to improve the Home Performance with ENERGY STAR Program.

Outcome 1. HVAC Trade Ally interest in whole home projects remained tepid in CY 2017.

Although the Program paid more than twice as many dual-path bonuses in CY 2017 compared to CY 2016, it fell short of its dual-path KPI in CY 2017. The Program Administrator offered limited-time BPI certification trainings to a small number of HVAC Trade Allies in CY 2016 to stimulate dual-path projects, and Program implementation staff remain a BPI resource for Trade Allies. However, it is unclear to what extent other factors present a barrier to Trade Allies participating in dual-path projects. The Program will likely continue to have limited whole home Trade Ally support and HVAC Trade Ally dual-path projects while it retains stricter requirements for becoming a whole home Trade Ally.

Recommendation 1: Investigate if other barriers are preventing Trade Allies from participating in dual-path projects, and the degree to which they deter Trade Allies. Work with Trade Allies to understand how the Program can cost-effectively help overcome these barriers.

Outcome 2. A small number of Trade Allies reported delays in incentive check processing.

Most Trade Allies reported they were satisfied with the time it took to receive their incentive checks, and the Program achieved its KPI for days incentive outstanding for all three paths. However, similar to CY 2016, a small percentage of Trade Allies said incentive processing took too long.

Recommendation 2: Sample instances in which incentive checks took much longer than the target days incentive outstanding, and follow up with the affected Trade Allies to troubleshoot issues and develop solutions to expedite incentive deliveries.

Outcome 3. Rural customers exhibited little interest in the Rural Broadband offering despite the opportunity to obtain a heavily discounted home energy assessment.

Based on the Direct Mail Home Energy Assessment Pilot participation, Program staff anticipated a much larger response rate (17%) than it achieved (less than 1%). The offering intended to leverage the Direct Mail Home Energy Assessment Pilot to increase cost-effectiveness, but it did not generate interest as strongly as anticipated. Despite limited uptake, the amount of Trade Ally support seems sufficient should the offering be expanded in CY 2018.

Recommendation 3. Consider flagging rural customers who participate in other less energy-intense programs, such as the Appliance Recycling and Simple Energy Efficiency programs, and including additional targeted collateral that promotes the Rural Broadband offering through these channels. An increase in rural customer outreach, offset by a nominal decrease in Trade Ally incentives, could help the offering reach or get closer to its goals by the end of CY 2018 while staying within budget. Also consider - promoting the Rural Broadband program at retail events held at home improvement stores in rural ZIP codes for the Residential Lighting and Appliance Program.

Outcome 4. SPECTRUM database savings for some measures did not match the savings specified in the Technical Reference Manual nor follow evaluation findings from the previous calendar year.

Although verified gross realization rates were very close to 100%, SPECTRUM recorded savings for some measures incorrectly. Table 50 shows that for many furnace projects demand savings were slightly below the TRM-deemed value of 0.0792 kW. Gas savings for furnace and air conditioning combo measures were also incorrect in SPECTRUM. This was because of a persisting offset in SPECTRUM, which stems from dropping these measures from the TRM for CY 2017 as part of a more general furnace measure update that refreshed the baseline AFUE for all furnace measures. The Team adjusted these savings for the 2017 Home Performance with ENERGY STAR Program. The Teamalso adjusted the Renewable Rewards Program savings to reflect findings from the CY 2016 evaluation.

Recommendation 4. The SPECTRUM offset in demand reduction for furnace measures should be addressed. A workpaper showcasing updated savings for the furnace and air conditioning combo measures should be written and their therm savings updated in SPECTRUM. The savings offsets for measures in the Renewable Rewards Program were explained in the 2017 Deemed Savings Report,[44] and these are already being updated in the TRM and SPECTRUM for the CY 2018 evaluation.

New Homes Construction Program

The New Homes Program provides information, implementation assistance, and incentives for builders of new single-family homes in Wisconsin that meet the Program's energy efficiency requirements. In CY 2017, the Program paired prospective homeowners with builders and energy experts to construct new homes that were between 25% and 100% more efficient than homes built according to Wisconsin's Uniform Dwelling Code (WUDC).[76]

Focus on Energy delivers the Program to eligible homeowners throughout Wisconsin through the Program Administrator (APTIM), the Program Implementer (WECC), participating Trade Allies (home builders), and Building Performance Consultants (BPCs). Home builders hire BPCs affiliated with the Program to guide them on better building techniques and to model and verify the new home's energy performance. The home builder typically receives Program incentives to help offset the costs of paying the BPC and achieving the efficiency levels required for certification as a Focus on Energy New Home.

In CY 2015, the Evaluation Team's billing analysis found that most nonparticipating builders also construct new homes that are more efficient than the WUDC's minimum requirements. Because the WUDC could no longer be used as a savings baseline, Focus on Energy commissioned the Baseline and Market Characterization Study in 2017.[77] The study was intended to establish a new baseline from which Program savings could be measured and inform a new Program design for CY 2018. To ensure Program continuity while awaiting results of the study, Focus on Energy revised the Program's eligibility requirements in CY 2017 to offer a single efficiency tier: homes that are 25% to 100% more efficient than the WUDC.

In late CY 2017, the Program Implementer began to introduce the new CY 2018 Program design to participating builders. The most significant changes include offering higher and tiered qualification and incentive thresholds, as well as the introduction of incentives for energy-neutral homes.

Table 101 lists the actual Program spending, savings, participation, and cost-effectiveness for CY 2017.

[76] Wisconsin Department of Health and Human Services. "One and Two Family (UDC) – Administrative Code." Chapter SPS 320. January 2016. Available online: https://docs.legis.wisconsin.gov/code/admin_code/sps/safety_and_buildings_and_environment/320_325/320.pdf

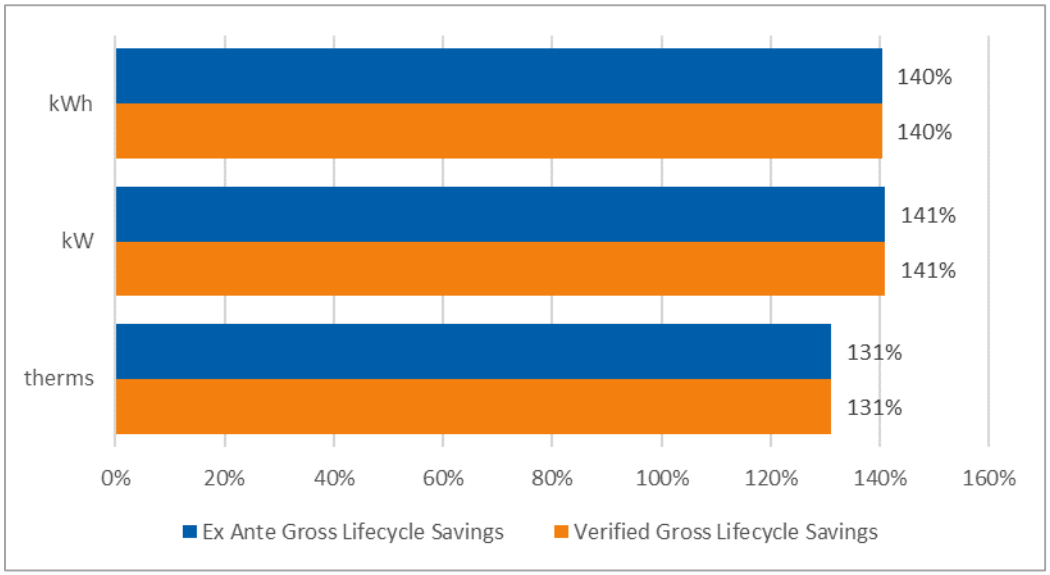
[77] Seventhwave. "New homes baseline and market characterization study." October 5, 2017.

Table 101. New Homes Program Summary

Item	Units	CY 2017	CY 2016
Incentive Spending	$	$696,950	$1,170,200
Participation	Number of Participants	2,228	2,400
Verified Gross Lifecycle Savings	kWh	130,198,800	137,381,915
	kW	1,403	1,388
	therms	29,582,010	31,370,820
Verified Gross Lifecycle Realization Rate	% (MMBtu)	100%	100%
Net Annual Savings	kWh	0	0
	kW	0	0
	therms	72,740	77,139
Annual Net-to-Gross Ratio	% (MMBtu)	6%	6%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost ratio	1.39	1.81

Figure 73 shows the percentage of gross lifecycle savings goals achieved by the New Homes Program in CY 2017. The Program met all CY 2017 goals for both *ex ante* and verified gross savings.

Figure 73. New Homes Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations for the New Homes Program in CY 2017. Table 102 lists the specific data collection activities and sample sizes used in the evaluations.

Table 102. CY 2017 New Homes Program Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Program Actor Interviews	2
Participating Builder Interviews	10
Nonparticipating Builder Interviews	3
Tracking Database Review	Census

Program Actor Interviews

The Evaluation Team interviewed the Program Administrator and Program Implementer in November 2017 to learn the status of the New Homes Program and understand its future design. Interview topics covered 2017 and 2018 Program designs, goals, marketing strategies, outreach to home builders, and market impacts on the Program.

Participating Builder Interviews

The Evaluation Team conducted interviews with 10 builders who participated in the Program in CY 2017. The Team prioritized interviews with the builders who built the highest-efficiency homes in CY 2017.The interviews focused on the effects of recent Program changes on participation, construction practices, knowledge of energy-efficient building methods, and familiarity with energy-neutral homes. In CY 2017, seven builders certified more than 10 buildings and three builders certified 10 or fewer buildings.

Tracking Database Review

The Evaluation Team review of the census of the Program SPECTRUM tracking data involved these tasks:

- Thoroughly review the data to ensure the SPECTRUM totals matched the totals reported by the Program Administrator
- Check for complete and consistent application of data fields (measure names, application of first-year savings, application of effective useful lives, etc.)

Impact Evaluation

In CY 2017, the Program certified 2,228 new homes. As discussed above, Focus on Energy simplified the Program offerings in CY 2017 while a new design was prepared for CY 2018. The Program design remained relatively unchanged. For the impact evaluation, therefore, the Team reviewed Program tracking data in SPECTRUM and applied the electric and gas billing analysis results from CY 2015 to calculate net savings.

Evaluation of Gross Savings

The Evaluation Team assessed the New Homes Program's gross savings through the tracking database review.

Tracking Database Review

The Evaluation Team reviewed the census of the CY 2017 New Homes Program data contained in SPECTRUM for appropriate and consistent application of unit-level savings.

CY 2017 Verified Gross Savings Results

Overall, the New Homes Program achieved an evaluated annual realization rate of 100% (Table 103).[78]

Table 103. CY 2017 New Homes Program Annual and Lifecycle Realization Rates by Measure Type

Measure	Annual Realization Rate				Lifecycle Realization Rate			
	kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
Certification (Electric) - 25 to 100% Better Than Code	100%	100%	n/a	100%	100%	100%	n/a	100%
Certification (Electric) - 25 to 100% Better Than Code, Claim Only	100%	100%	n/a	100%	100%	100%	n/a	100%
Certification (Gas) - 25 to 100% Better Than Code	100%	100%	100%	100%	100%	100%	100%	100%
Certification (Gas) - 25 to 100% Better Than Code, Claim Only	100%	100%	100%	100%	100%	100%	100%	100%
Total Annual	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 104 lists the *ex ante* and verified annual gross savings for the New Homes Program in CY 2017.

Table 104. CY 2017 New Homes Program Annual Gross Savings Summary by Measure Type

Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
	kWh	kW	therms	kWh	kW	therms
Certification (Electric) - 25 to 100% Better Than Code	157,523	47	0	157,523	47	0
Certification (Electric) - 25 to 100% Better Than Code, Claim Only	28,003	7	0	28,003	7	0
Certification (Gas) - 25 to 100% Better Than Code	3,309,670	1,077	796,177	3,309,670	1,077	796,177
Certification (Gas) - 25 to 100% Better Than Code, Claim Only	844,764	273	189,890	844,764	273	189,890
Total Annual	**4,339,960**	**1,403**	**986,067**	**4,339,960**	**1,403**	**986,067**

Table 105 lists the *ex ante* and verified gross lifecycle savings by measure type for the New Homes Program in CY 2017.

[78] The Evaluation Team calculated realization rates by dividing verified gross savings by *ex ante* savings.

Table 105. CY 2017 New Homes Program Lifecycle Gross Savings Summary by Measure Type

Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
Certification (Electric) - 25 to 100% Better Than Code	4,725,690	47	0	4,725,690	47	0
Certification (Electric) - 25 to 100% Better Than Code, Claim Only	840,090	7	0	840,090	7	0
Certification (Gas) - 25 to 100% Better Than Code	99,290,100	1,077	23,885,310	99,290,100	1,077	23,885,310
Certification (Gas) - 25 to 100% Better Than Code, Claim Only	25,342,920	273	5,696,700	25,342,920	273	5,696,700
Total Lifecycle	**130,198,800**	**1,403**	**29,582,010**	**130,198,800**	**1,403**	**29,582,010**

Evaluation of Net Savings

The Evaluation Team calculated net savings by applying NTG results from the CY 2015 billing analysis to the CY 2017 Program savings. These NTG ratios for electricity and gas are listed in Table 106. Appendix J of the *Focus on Energy CY 2015 Evaluation Report* contains additional details on the methodology, attrition, and results for these analyses.

Table 106. CY 2017 NTG Ratios by Savings Type

Savings Type	NTG Ratio
Electricity	0%
Gas	7%

CY 2017 Verified Net Savings Results

Applying NTG rates from the CY 2015 billing analysis to the CY 2017 gross savings yielded an estimated overall (MMBtu weighted) NTG ratio of 6%. Table 107 shows the annual net energy impacts (kWh, kW, and therms) by measure type for the Program.

Table 107. CY 2017 New Homes Program Annual Net Savings by Measure Type

Measure	Annual Net		
	kWh	kW	therms
Certification (Electric) - 25 to 100% Better Than Code	0	0	0
Certification (Electric) - 25 to 100% Better Than Code, Claim Only	0	0	0
Certification (Gas) - 25 to 100% Better Than Code	0	0	58,732
Certification (Gas) - 25 to 100% Better Than Code, Claim Only	0	0	14,008
Total Annual	**0**	**0**	**72,740**

Table 108 shows the lifecycle net energy impacts (kWh, kW, and therms) by measure type for the Program.

Table 108. CY 2017 New Homes Program Lifecycle Net Savings by Measure Type

Measure	Lifecycle Net		
	kWh	kW	therms
Certification (Electric) - 25 to 100% Better Than Code	0	0	0
Certification (Electric) - 25 to 100% Better Than Code, Claim Only	0	0	0
Certification (Gas) - 25 to 100% Better Than Code	0	0	1,761,973
Certification (Gas) - 25 to 100% Better Than Code, Claim Only	0	0	420,235
Total Lifecycle	**0**	**0**	**2,182,208**

Process Evaluation

In CY 2017, as part of the process evaluation activities, the Evaluation Team interviewed two stakeholders, the Program Administrator, the Program Implementer, and 10 participating builders. The process evaluation of the New Homes Program focused on these key topics:

- Program transition in CY 2017 and its effects on Program participation
- Results of the Baseline and Market Characterization Study completed in October 2017
- Program transition to the CY 2018 Program and its possible effects on the new homes market
- Participating builder reactions to planned Program changes
- Potential impacts of the Program on new homes not certified by the Program
- Participating and nonparticipating builder construction practices and knowledge of advanced building practices, including net zero energy homes
- Program goals and KPIs
- Program tracking processes and coordination among the Program Administrator, Program Implementer, and Trade Allies

Program Design, Delivery, and Goals

The CY 2017 New Homes Program offered participating builders incentives for constructing homes that are at least 25% more efficient than the minimum requirements of the WUDC. Builders received an incentive of $400 for gas and electric homes and $150 for electric-only homes with no gas heat. To receive incentives, builders were required to work with an accredited BCP.[79]

Program Management and Delivery Structure

Focus on Energy delivers the Program to eligible homeowners throughout Wisconsin through the Program Administrator, the Program Implementer, BPCs, and participating home builders.

Home builders hire a BPC-affiliated with the Program to conduct at least two site visits during home construction to inspect construction and verify the home's energy performance. The first site visit is

[79] BCPs must possess Residential Energy Services Network (RESNET) certification, or possess an equivalent and approved certification.

conducted at the framing stage and includes checking the insulation. The final site visit is when the home is 100% complete, at which time the BCP conducts a blower door test, ventilation capacity testing, and other verification of Program standards.

After each site visit, the BPC submits a report of the findings to the home builder. The BPC may recommend corrections that the builder needs to make prior to submitting final paperwork to the Program Implementer. After the Program Implementer completes its review, the paperwork is forwarded to the Program Administrator for final approval and payment of the incentive to the builder.

Program Goals

The Program Implementer tracked three KPIs in CY 2017. Table 109 shows the KPI goal, the results, and the source of the results for all indicators. The Program Implementer met its KPI goal of processing incentives within 28 days but did not meet its KPI goal of maintaining at least 200 active builders and 30 active BCPs. The Program Implementer said the number of participating builders probably declined because of the expiry of the $2,000 federal Energy-Efficient New Homes Tax credit and the lowering of Program incentives in CY 2017. The Program Implementer also noted that three BCPs retired in CY 2017 and other BCPs may not have participated because builders certified fewer homes.

Table 109. CY 2017 New Homes Program Key Performance Indicators

KPI	CY 2017 Goal	CY 2017 Result	CY 2017 Result Source
Active Participating Builders	200	177	Reported by Program Implementer
Active Building Performance Consultants	30	24	
Average Days Incentive Outstanding	28 days	21 days	

Data Management and Reporting

The Program Administrator and the Program Implementer reported that SPECTRUM, the data tracking system, was functional and running smoothly in CY 2017 and that no changes were planned.

Marketing and Outreach

Focus on Energy has typically marketed the New Homes Program primarily through the BPCs and home builders. However, in CY 2017 the Program conducted additional marketing, which included setting up information placards and tear-pads at the Parade of Homes, an event at which prospective homebuyers visit new homes constructed in Wisconsin.

Program Changes

Efficiency and Incentive Levels

In CY 2016, the Program offered four incentive levels for homes that received electric service and four for homes that received electric and gas service from a participating utility. In CY 2017, Focus on Energy redesigned the Program to offer a single tier for customers who received gas and/or electric service from a participating utility. This change removed the lowest incentive tier (Level 1 was $150 for homes

built 15% to 24.99% more efficiently than WUDC) and combined the other three tiers. Table 110 lists the CY 2016 ad CY 2017 certification levels and incentives.

Table 110. CY 2017 and CY 2016 Incentive Levels

Certification Level	Incentive
CY 2017 Electric and Gas Homes	
Level 1: 25% – 100% more efficient than code	$400
Level 1: 25% – 100% more efficient than code (no gas heat)	$150
CY 2016 Electric and Gas Homes	
Level 1: 15.0% – 24.9% more efficient than code	$100
Level 2: 25.0% – 34.9% more efficient than code	$425
Level 3: 35.0% – 44.9% more efficient than code	$1,100
Level 4: 45.0% – 100% more efficient than code	$1,600

Market Characterization Study

In CY 2017, Focus on Energy commissioned a Baseline and Market Characterization Study in response to Cadmus' finding in its CY 2015 billing analysis that most builders in Wisconsin are now constructing new homes to efficiency levels above the WUDC. The study, conducted by Seventhwave and published in October 2017,[80] obtained data on the efficiency levels of homes built outside of the Program and established a market baseline. The study also informed the redesign and relaunch of the New Homes Program for CY 2018.

Seventhwave visited 50 homes constructed by nonparticipating builders in 2015 and 2016. The study found that non-Program homes in Wisconsin are "generally well-insulated, tightly-constructed and have efficient appliances." The study also found that non-Program homes achieved Home Energy Rating System (HERS) scores that were on average six points higher than those of Program homes,[81] indicating that the Program "is achieving some level of differentiation from baseline practices." The study recommended quantifying the spillover effect of the Program on nonparticipant home construction practices and provided a set of reference values for the market baseline from which to measure Program savings.

[80] Seventhwave. *New Homes Baseline and Market Characterization Study.* October 5, 2017.

[81] A lower HERS score indicates that a home is more energy-efficient.

CY 2018 Program Design

Focus on Energy introduced the CY 2018 Program design to participating builders and BCPs in late 2017. The new Program design included the following key elements (other elements, such as the consultant model and modeling homes remained unchanged):

- Revised incentive structure that continues to be based on percentage more efficient than code along with the introduction of incentives for energy-neutral homes
- Expanded marketing directed at prospective homebuyers
- Builder training on advanced construction techniques

The four tiers of the new Program are illustrated in Table 111.

Table 111. CY 2018 Incentive Structure

Certification Level	Incentive
Electric Homes	
Level 1: 25% – 29.9% more efficient than code	$0
Level 2: 30% – 34.9% more efficient than code	$350
Level 3: 35% – 99.9% more efficient than code	$550
Level 4: Energy-Neutral 100% more efficient than code	$1,000
Electric and Gas Homes	
Level 1: 25% – 29.9% more efficient than code	$0
Level 2: 30% – 34.9% more efficient than code	$1,000
Level 3: 35% – 99.9% more efficient than code	$2,000
Level 4: Energy Neutral 100% more efficient than code	$5,000

Builder Interviews

The Evaluation Team interviewed 10 participating builders and three nonparticipating builders to gather preliminary data for developing a methodology for measuring Program freeridership and spillover in future evaluations. Research questions included the following:

- How does the Program affect building practices for homes that are not certified?
- What are the indicators that the Program is influencing the building practices across the Wisconsin market?
- Are builders already building net zero energy homes?
- How close are builders to net zero energy homes?
- How does market demand influence efficient building practices?

Methodology

In consultation with the Program Administrator and the Program Implementer, the Evaluation Team developed interview guides to gauge existing construction practices among builders. The interview guides listed construction practices to help indicate how familiar builders were with advanced building

techniques and asked if they had adopted the practices and the extent to which these practices were adopted. The interviews also asked about builders' engagement with subcontractors, the perceived impact of the Program on the Wisconsin new homes market, familiarity with energy-neutral homes, and knowledge of the CY 2018 Program design (this question was specific to participating builders).

Sampling

The Evaluation Team developed a call list of participating builders from the CY 2017 Program tracking data. The Team targeted seven larger-volume builders that had certified over 10 homes in the Program in CY 2017 and three smaller-volume builders that had certified 10 or fewer homes in CY 2017. The Team prioritized interviews with the highest efficiency builders, as indicated by the percentage that their homes were more efficient than the WUDC.

To reach nonparticipant builders, the Evaluation Team relied on three sources of information:

- Net Zero Energy Ready homes builders from the U.S. Department of Energy
- A list of nonparticipating builders identified in Seventhwave's 2017 Baseline and Market Characterization Study
- Wisconsin Home Builders Association (WBHA) members (WBHA attempted to recruit survey participants through email in February 2018)

The Evaluation Team spoke with three builders who were on the U.S. Department of Energy's listing of Net Zero Energy Ready Home Partners and were not currently participating in the Focus on Energy New Homes Program. These builders were self-reported "niche" efficient home builders and, although not representative of the population of nonparticipating builders, could nonetheless offer a glimpse at a subset of nonparticipating builders in the Wisconsin market.

Builder Profiles

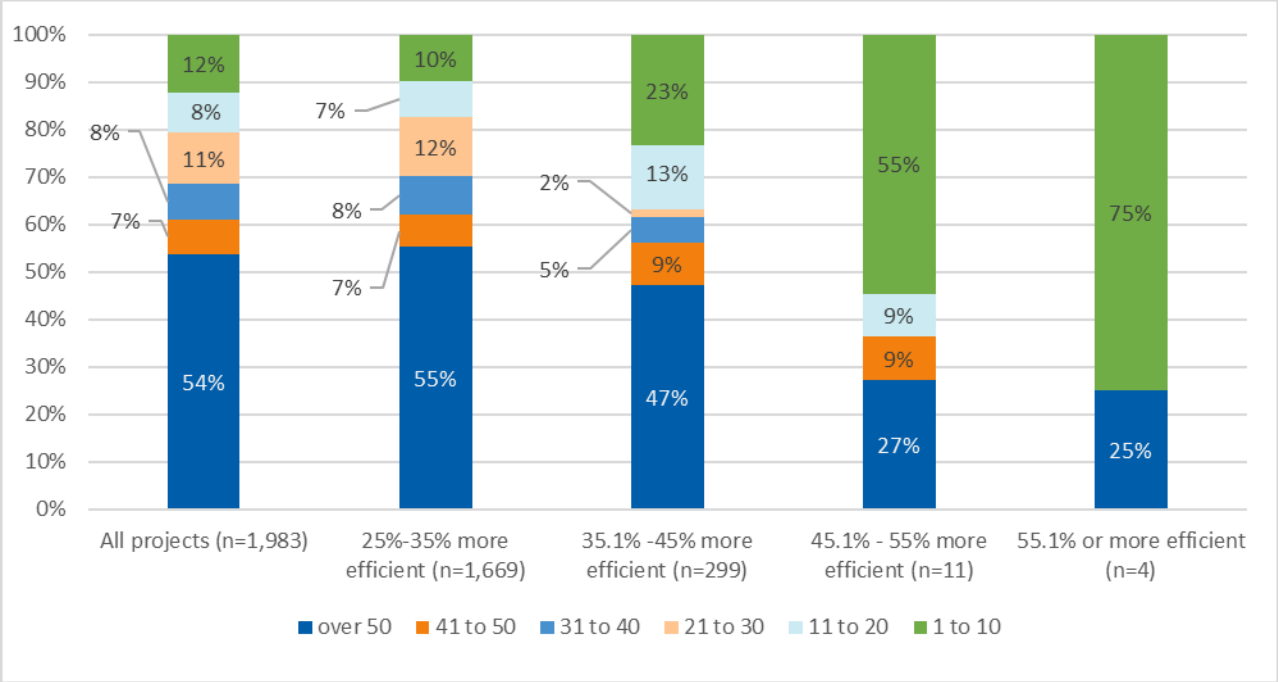
Participating Builder Profile

The Evaluation Team analyzed builder participation patterns, by the number of homes individual builders certified though the Program in CY 2017 and by the level of efficiency certified homes achieved (i.e., percentage more efficient than the WUDC).

As illustrated in Figure 74, most Program homes (1,669 of 1,983) can be categorized by efficiency (between 25% and 35% more efficient than code).[82] Larger volume participants built 55% of the 1,669 homes. Only 15 of the 1,983 Program homes were higher efficiency (at least 45.1% more efficient than code). Smaller volume builders (certified between one and 10 homes) built over half of these homes.

[82] The Evaluation Team conducted this analysis before the final tracking data, with all 2,228 builders was available. The Team does not anticipate that the distributions would be significantly different with final CY 2017 participation data.

Figure 74. Distribution of All Program Builder Activity – By Builder Volume and Efficiency Tier[1]



[1] Colors represent builders categorized by the number of homes they certified.

As illustrated in Table 112, the Evaluation Team interviewed a diverse set of participating builders, both in the number of homes they built and certified and in the level of efficiency. Seven builders certified all of the homes they built in CY 2017 through the Program. The three builders who built both certified and noncertified homes in Wisconsin said they did not certify all of their homes because some clients wanted wood-burning fireplaces, certification was not important as a sales tool, and lining up a BCP was difficult at times. Two builders said there was no difference between their certified and noncertified homes, and one builder said the only difference was that installing wood-burning fireplaces meant the home could not be certified.[83]

[83] The Team notes that homes with wood burning fireplaces can be certified by the Program if the home meets defined criteria.

Table 112. Overview of Participating Builders Interviewed

Builder #	Number of Homes Built (Certified)[1]	Highest Efficiency Level (% More Efficient than WUDC)	Reason for Building Noncertified Homes	Blower Test or Rating Service on Noncertified Homes
1	396	41%		
2	155	61%		
3	87 (79)	36%	To be able to include a wood-burning fireplace	Yes
4	138	45%		
5	74	36%		
6	56	51%		
7	23 (14)	53%	Certification not critical to making a home sale	No
8	10	47%		
9	4	49%		
10	2 (1)	71%	Sometimes unable to line up a BCP for two visits	Yes

Source: CY 2017 tracking data and Participant Builder Interview Guide: Question A1 b), "Of your new homes, how many do you expect to be certified through the Program?" (n=10), Question A1 d), "Why do you build both certified and noncertified homes?"(n=3), Question A4 b), "Do you conduct blower door tests on noncertified homes?" (n=3), Question A4 b), "Do you use building consultants for noncertified homes?" (n=3). The Evaluation Team used the reported number of homes built for this reporting, and used interview responses to extrapolate the number of homes built.

[1] Total number of homes built in CY 2017 are outside of parentheses. Numbers in parentheses indicate the number of homes certified. No parentheses indicate that the builder certified all of their homes.

Nonparticipating Builder Profile

As shown in Table 113, the three nonparticipating builders are low-volume, custom home builders. All knew about the Program and said they chose not to participate because the incentives were not worth the time the Program required. Two were affiliated with the Passive House Institute and focused on a high-end, "niche" market,[84] two had experience building energy-neutral homes, two had participated in the Program in the past, and two said they would consider participating if Focus on Energy raised incentives.

Table 113. Nonparticipating Builder Profile

Builder #	Builder Affiliation	Number Homes Built (2017/2016)	HERS Rating Achieved	Energy Neutral Homes Experience	Past Program Participation
1	None	9/3	-	No	Yes
2	Passive House Institute	1/0	38	Yes	Yes
3	Passive House Institute	0/1	10	Yes	No

The nonaffiliated builder, who had participated in the Program in the past, said that he had learned efficient building practices while in the Program, such as "how to do good insulation, choosing the right bath fans, right-sizing furnaces, and installing whole house ventilation." One of the Passive House

[84] The Passive House Institute does not offer incentives to builders who meet its building requirements.

Institute builders said his past Program participation had not affected how he built homes because he was already an efficient builder (he noted that the first home he built achieved a HERS score of 60, compared to the average CY 2017 Program home score of 56).

Participating Builder Awareness of Planned Program Changes

The Evaluation Team asked participating builders if they were aware of the planned Program changes for CY 2018, what they anticipated the effects of the changes would be on their participation, and which changes they considered to be most significant. The Team also asked if builders were familiar with energy-neutral homes (or net zero energy homes) and if they planned to build or were already building such homes.

General Awareness of Program Changes

Nine of the 10 builders said they were aware of the planned changes, although four said they had only some knowledge about them. One builder said his company does not "pay much attention to the incentive program," and another said he was "not personally involved" and relied on the BCP to track Program changes.

Of the nine builders, five said they did not expect the planned Program changes to impact their participation in the Program. One builder said he knew his company would still achieve the minimum Program requirements. Another said he did not expect the changes to affect participation because his company "already goes way above code regardless of the [Program] benefits" and that the Program "doesn't necessarily affect" how the company builds homes. Another noted that although he expected other builders to struggle the changes would not affect his company because the builder "has always been trying to stay ahead of the curve."

Two builders said they expected that some of their homes would not qualify under new Program rules. One builder thought that 50% to 75% of the homes that currently qualify would no longer meet Program requirements. He said he did not expect that not receiving certification would affect his company's sales. The other builder said some homes would no longer qualify, but that the company would prefer all homes to either qualify or not qualify. He said the company's "base specifications have gotten to [the Program] level" and the company was currently conducting an analysis, with assistance from the Program Implementer, to determine if it was economical to again raise its base specifications to the new Program level.

Six builders gave their thoughts on the most significant Program changes. Five builders thought the most significant changes included the increased minimum efficiency level, one builder said the increase in Program incentives, and one builder said the requirement that gas water heaters must be installed in homes with gas lines.

Participant and Nonparticipating Builder Familiarity with Energy Neutral Homes

The Evaluation Team asked builders if they were familiar with energy-neutral or net zero energy homes,[85] if they had built such homes in the past three years, and if they planned to build these homes in Wisconsin in the next three years. As shown in Table 114, most participant builders were familiar with these homes, but only two had built them in the past and only one thought the company would build them in the next three years. The two builders who had built energy-neutral homes did not have current plans to build them. The builder who was planning to build energy-neutral homes in the future had not built them in the past.

Table 114. Builder Energy Neutral Home Activity

Familiar with Energy-Neutral Homes	Built Energy-Neutral Homes in Wisconsin in the Last Three Years	Plans to Build Energy-Neutral Homes in the Future
9 builders	2 builders	1 builder

Source: CY 2017 Tracking data and Participant Builder Interview Guide: Question C2, "Are you familiar with net zero energy or net zero ready homes?" (n=10); Question C3, "Have you built any net zero energy or net zero energy ready homes in Wisconsin the last three years?" (n=9); Question C4, "Do you plan to (or continue to) build any net zero energy or net zero energy ready homes in Wisconsin in the last next three years?" (n=10)

One participant builder, who built 155 homes in CY 2017 and constructed homes up to 61% more efficient than WUDC, said the company had broken ground on a subdivision (34 homes) of net zero energy ready homes in Waukesha County. The builder said the company would evaluate the benefit and cost of possibly converting these homes to energy-neutral homes, which would be a "minimal change." Additionally, two builders indicated that although they did not anticipate building energy-neutral homes in the next three years, they had "been talking about it" or tried "to head in that direction."

Advanced Building Practices

Participating Builder Familiarity with and Use of with Advanced Building Practices

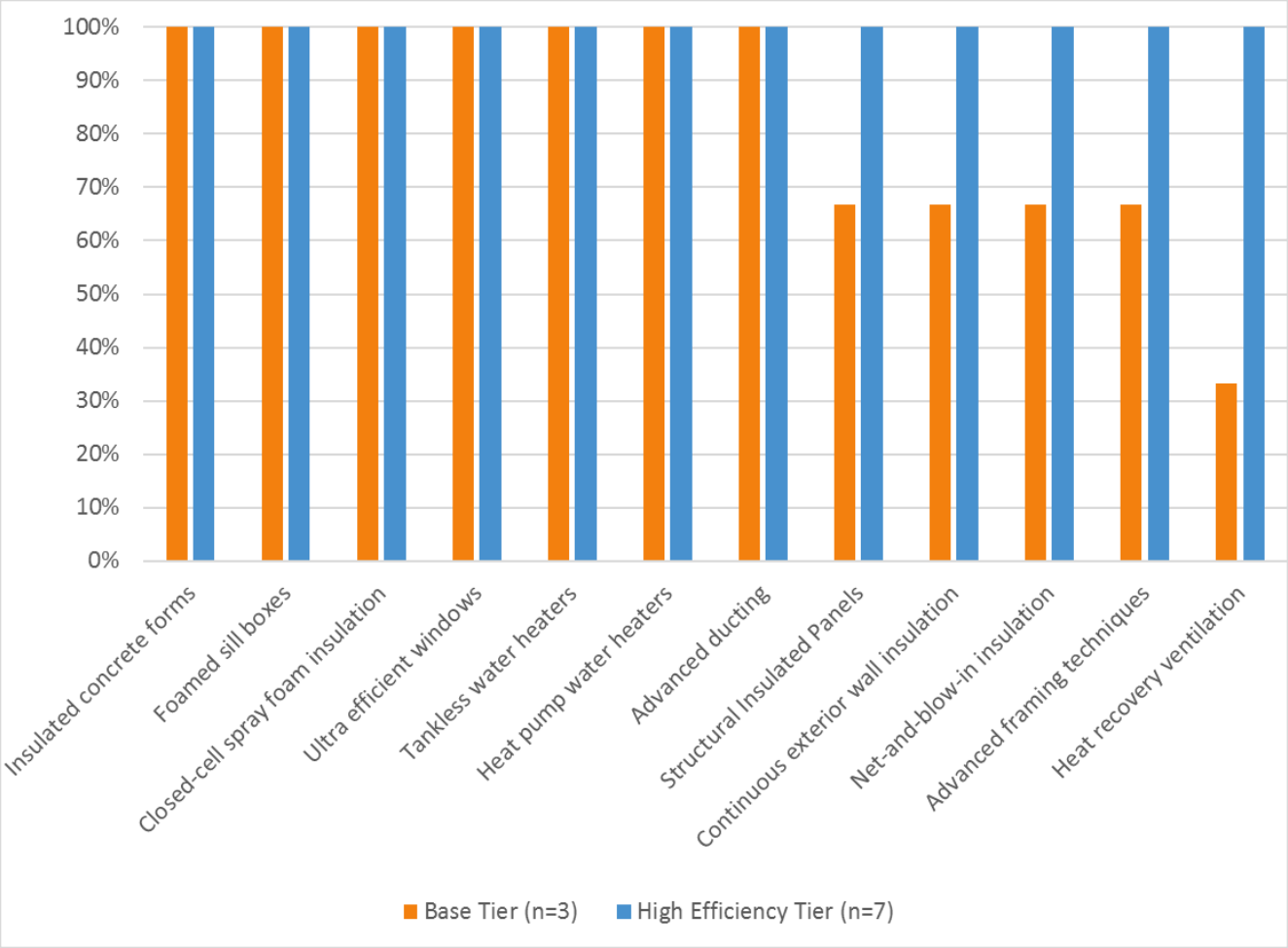
The Evaluation Team asked participating builders about various advanced building practices to develop trackable metrics by which to gauge Program impact in the future. The Team asked if the builder had heard of the practice, whether or not the builder incorporated the practice into constructing CY 2017 homes, and into what percentage of the homes. To understand how knowledge and construction practices differed among builders who achieved various levels of efficiency in their buildings, the Team also categorized the responses by builder efficiency.

The Team used two efficiency bins: "high efficiency" for builders who built homes that were at least 45% more efficient than WUDC and "base tier" for the other builders (below 45% more efficient).

As illustrated in Figure 75, many participant builders had heard of most of the construction practices, with slightly higher percentage of higher efficiency builders having heard of the various techniques.

[85] Net zero energy ready homes are so efficient that a localized renewable energy system can offset all of the homes' annual energy consumption.

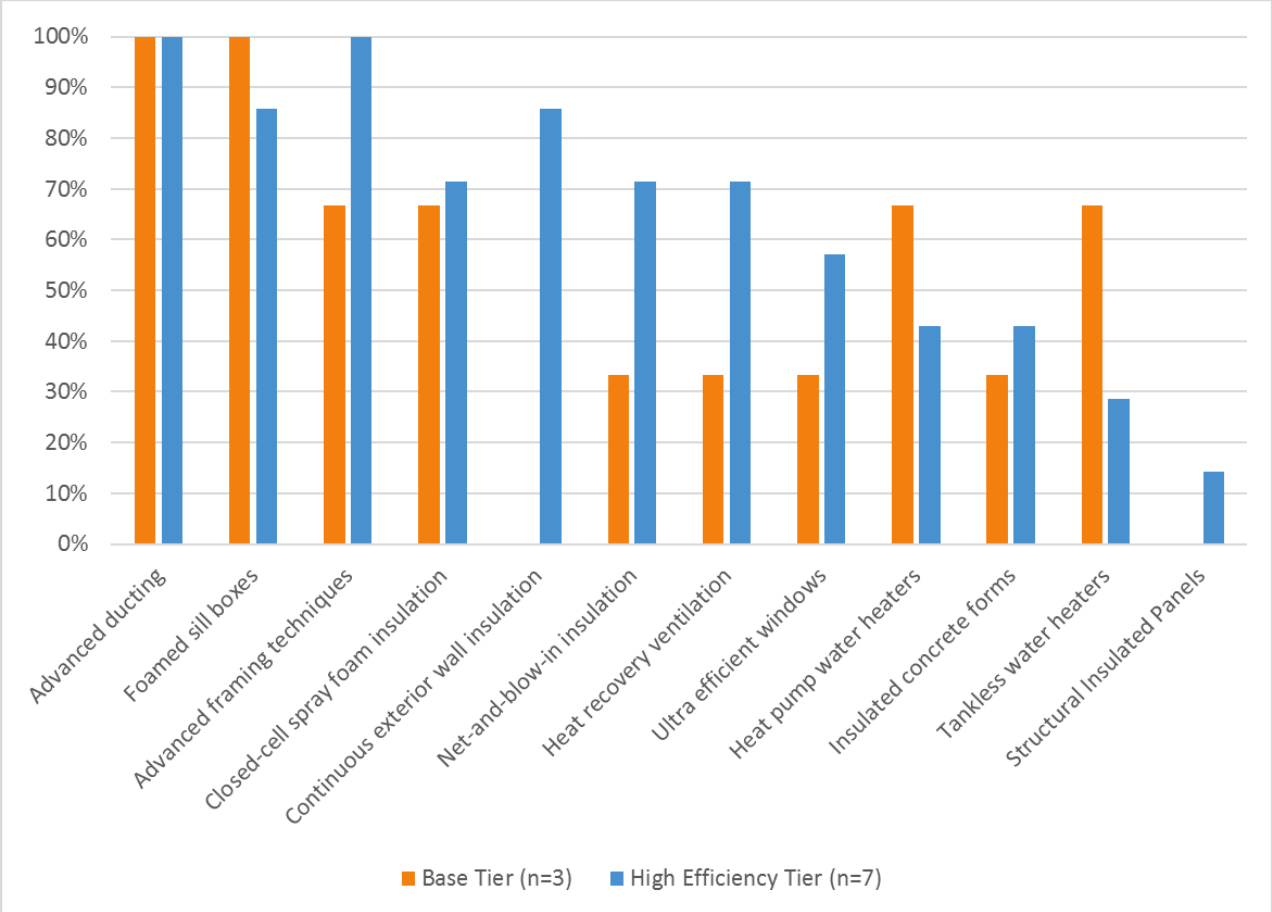
Figure 75. Percentage of Builders Who Had Heard of Advanced Building Practices



Source: Builder Interview Guide, Question C1: "I would like to ask you about a few specific building practices. Can you please tell me if you have heard of these practices, if you utilize these practices, and if so, in what percent of your homes you do so?" (n=10)

The Evaluation Team also asked builders if they incorporated the building practices in their homes. A significantly lower proportion of builders incorporated the building practices. Interestingly, although high-efficiency tier builders were more likely to incorporate advanced techniques into their homes, this did not include heat pump water heaters and tankless water heaters.

Figure 76. Percentage of Builders Who Incorporate Advanced Building Practices into Homes



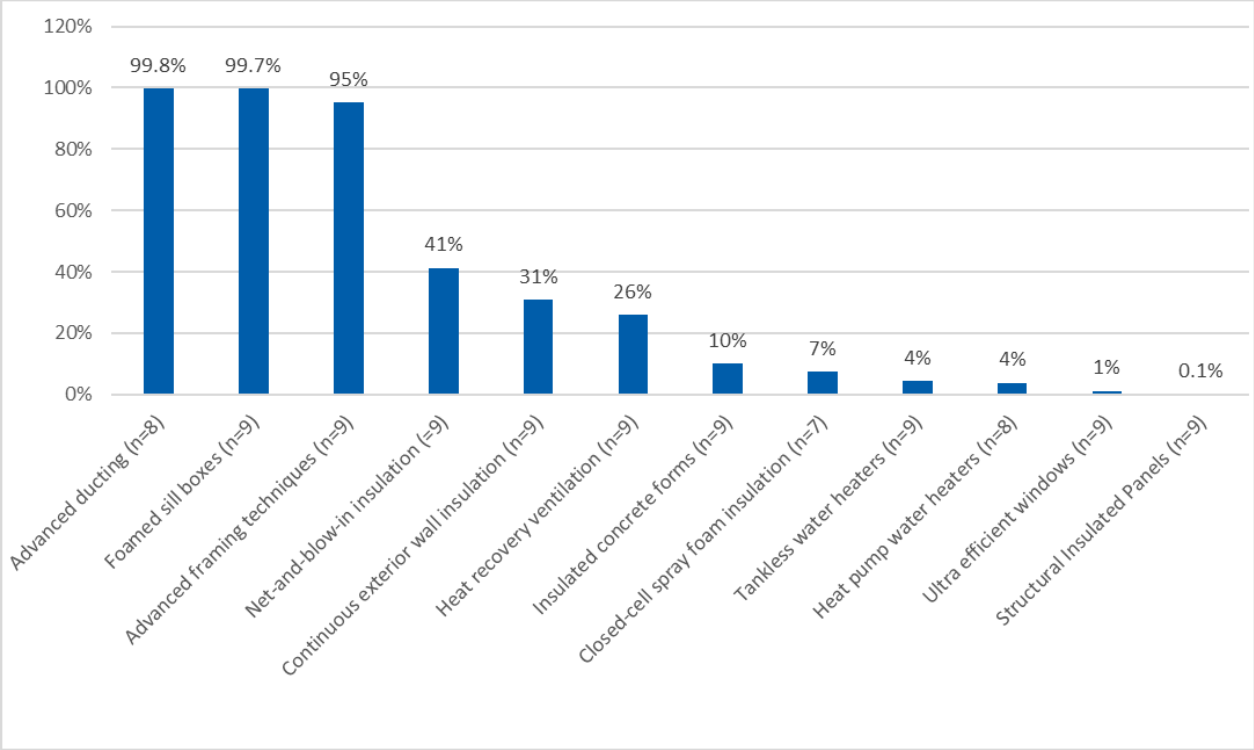
Source: Builder Interview Guide, Question C1: "I would like to ask you about a few specific building practices. Can you please tell me if you have heard of these practices, if you utilize these practices, and if so, in what percent of your homes you do so?" (n=10)

The Evaluation Team also asked builders into what percentage of homes they incorporated the various building techniques. To reflect the different volume of homes built, the Team weighted these response by the number of homes that participant builders constructed in CY 2017.[86]

As illustrated in Figure 77, according to builders, almost all homes include advanced ducting techniques, foamed sill boxes, and advanced framing techniques. Seven of 10 builders said they incorporated closed-cell spray insulation into their homes, but this technique was included in only 8% of homes. Only a very small fraction of the homes included ultra-efficient windows or structural insulated panels.

[86] Although only nine builders said that they foamed sill boxes, they were reportedly included in 99.7% of homes. This is because the builder who said he did not use them built only two homes in CY 2017.

Figure 77. Percentage of Respondents' Homes Incorporating Advanced Building Techniques



Source: Builder Interview Guide, Question C1: "I would like to ask you about a few specific building practices. Can you please tell me if you have heard of these practices, if you utilize these practices, and if so, in what percent of your homes you do so?" (n=10)

Nonparticipating Builder Use of Advanced Building Techniques

The Evaluation Team asked the three nonparticipating builders if they had heard of the advanced practices, if they used them, and in what percentage of their homes. All three builders had heard of the practices and incorporate them into their homes to varying degrees, as shown in

Table 115. Some builders also indicated why they do not use these materials or practices (indicated in the Notes column of the table).

Table 115. Nonparticipating Builder Use of Advanced Building Techniques

	Non-affiliated	Passive House	Passive House	Notes
Insulated Concrete Forms	0%	50%	0%	Not used because difficult to inspect concrete
Structural Insulated Panels	0%	50%	0%	
Foamed Sill Boxes	100%	100%	0%	
Closed Cell Spray Insulation	50%	0%	0%	Prefers more "green" friendly options, uncertainty about health impacts, uncertainty of longevity of insulation (new material)
Continuous Exterior Wall insulation	25%	90%	100%	
Net-and-Blow In insulation	25%	100%	100%	
Heat Recovery Ventilation	50%	100%	100%	
Triple Glazed Windows	10%	100%	100%	
Tankless Water Heaters	10%	25%	50%	Use of domestic solar hot water in non-gas homes
Heat Pump Water Heaters	10%	25%	25%	Unreliable technology
Advanced Framing Techniques	100%	100%	100%	
Advanced Ducting	100%	100%	100%	

Recent Changes in Construction Practices

Participating Builder Changes in Construction Practices

The Evaluation Team asked builders if they had made changes to how they built homes in the last three years.[87] Six said they had changed their standard building practices. These changes are listed in Table 116.

[87] Builders noted various construction techniques in their responses. The Evaluation Team does not necessarily endorse these as being efficient building practices.

Table 116. Changes Made by Participant Builders in the Last Three Years

Change Made	Number of Builders
Changed insulation used (spray foam in walls, dense packed walls)	3
Changed home ventilation techniques (adding balanced ventilation system, radon vents, making heat recovery ventilation standard practice)	2[1]
Improved exterior air sealing (conducting blower door test prior to adding insulation to check for air tightness, taping nail heads on sheathing, introducing continuous exterior wall panel system)	2
Changed framing techniques (2x6 wall construction, double studded walls to facilitate dense packing of walls)	2
Adjusted HVAC system to allow for centralized air return	1
Installed 100% LED bulbs	1

Source: Builder Interview Guide, Question B2 "What other changes have you made to building practices in the last three years?" (n=10)
[1] Three builders said the trend toward building tighter homes required builders to pay more attention to properly ventilating homes

Additionally, the Evaluation Team asked builders specifically about trends they had seen in home building shells. Although none said they had observed trends in the Wisconsin market, three builders described practices they had observed. One high-efficiency builder said his firm used structural insulated panels for construction, another high-efficiency builder said his company wrapped all homes in one-inch foam, and another builder, who is in the base efficiency tier, said his company applied plywood sheathing to the exterior of the homes.

Nonparticipating Builder Changes in Construction Practices

Only one of the three nonparticipating builders said he had made changes in his building practices in the last three years. This change consisted primarily of sourcing materials from outside his local market. He noted that specialized foam, R-5 windows, and other materials are not available in his local market; the only material he sources locally is lumber. He noted that "there is no demand for advanced materials in this area."[88]

Only one builder said he had observed changes in the new homes market. He said construction prices have risen recently because of labor shortages and increased material costs. This change, he said, has caused buyers to demand smaller homes because they would "rather go down in size than skimp on windows and insulation."

Engagement with Subcontractors

The Evaluation Team asked participating builders a series of questions about their level of engagement with subcontractors to ensure their homes could qualify for Program certification. Two builders said they have long-standing relationships with their subcontractors and conducted much of the home construction with in-house crews. Other builders worked with various trades to construct their homes and said they engaged with their subcontractors to construct their homes.

[88] The builder is headquartered in Duluth, Minnesota, and is active in northwestern Wisconsin.

Table 117. Builder Engagement with Subcontractors

Builder Efficiency Tier	Direct Training of Contractors	On-Site Supervision of Contractors	Consultations on Building Practices with Contractors
High	6	4	2
Base	1	1	1[1]

Source: Builder Interview Guide, Question B3 "Have you had to work with your architects or subcontractors (such as framers, HVAC contractors, electricians) to ensure that they were able to help you build Program-standard homes?" (n=10)
[1] This builder said he involves the BCP in regular bimonthly "Tuesday" meetings with the subcontractor. The BCP shares observations and also has a direct relationship with contractors.

Additionally, six of the 10 participating builders said they faced no challenges identifying qualified contractors to build Program-standard homes (as noted above, two builders have long-term relationships with their subcontractors). Four contractors said it was challenging to find qualified contractors, particularly carpenters and framing crews.

Effect of Program on Building Practices

The Evaluation Team also asked participant builders what effect the Program had on their building practices.

Four of the 10 builders said the Program had affected how they built their homes. Three of these four said the Program had helped them by providing expert advice through its conferences and technical advisors. These builders said they had made the following changes to their construction practices because of the Program:

- Upgrading insulation (two builders)
- Using building consultants (two builders)
- Foaming sill boxes (one builder)
- Conducting blower door testing (one builder)
- Installing all LED lighting (one builder) Upgrading ventilation systems (one builder)
- Upgrading wall construction (one builder)

Although six builders said the Program had not affected how they built homes, three had had long-standing participation in the Focus on Energy or ENERGY STAR programs. One of these builders said his company was a "long time participant in the ENERGY STAR program" and that the company "would do the majority of [efficient building practices] anyway." Another said that when his company joined the Program six or seven years ago, the BCPs "were already impressed" and that his company "didn't have to do anything to meet or exceed Program standards." This builder added that the company had participated in the ENERGY STAR program before joining the Focus on Energy New Homes Program.

Another builder said his company joined the ENERGY STAR program 18 years ago, making major changes to construction practices at that point. From then on, his company "got into the mindset of continually improving homes." Although he said he could no longer point to "major changes" his company had

made because of the Program, he said the Program partnership "has helped to build high performance homes that are good for the customer."

Three builders said the Program had no effect on their building practices, and they also did not mention long-standing Program participation. Two of these builders noted, however, that the Program had helped them to market their homes.

Table 118. Effect of Program on Building Practices

Builder Efficiency Tier	Program Had Direct Effect	Noted Long-Standing Participation in New Homes Program	Program Had No Effect
High	3	2	2
Base	1	1	1

Source: Builder Interview Guide, Question B4 "What effect has the Focus on Energy New Homes Program had on how your company builds homes in Wisconsin?" (n=10)

Market Demand for Efficient Homes

The Evaluation Team asked builders how homebuyer demand and builder competition affected the way they built homes. Four builders said they were market leaders, setting the baseline for market demand and standard for other builders to follow. These builders were both high-volume and low-volume builders and represented both the base and high-efficiency tier.

Six builders said that market demand had an effect on how they built homes in terms of the following:

- Energy efficiency features (four builders)
- Interior amendments (four builders)
- Overall home quality (three builders)
- Home size (one builder said the market demanded smaller homes and another said that market demanded larger homes)
- Exterior curb appeal (one builder)
- Integrating smart home features (one builder)

Customer Demand for Energy Efficient Home Features

The Team asked builders if their customers asked them to make energy efficiency upgrades beyond their usual building practices. Four said they did not receive such requests, two builders said they infrequently received requests, three said they occasionally received requests, and one frequently received requests.

Two builders who said they did not receive requests for efficiency upgrades said their customers already knew that the builder's homes were very efficient, one builder said he built homes in an area where customers prioritized energy efficiency over cost, and one said his clients were mostly first-time homebuyers who were not yet savvy about efficiency upgrades.

Of the builders who received requests for energy efficiency upgrades, three builders said they received requests for solar panels, three said for higher levels of insulation, two said for efficient furnaces, one said for tankless water heaters, and one said for high-efficiency windows.

Builder Marketing Practices

All 10 builders said they marketed their homes as energy-efficient. Marketing practices differed between builders and included the following:

- Advertising green or energy-efficient practices on the builder website (four builders)
- Training and informing realtors to explain energy-efficient attributes to customers (four builders)
- Providing information to customers in brochures, fliers, spec sheets, or other printed material (four builders)
- Using Focus on Energy Program materials (three builders)
- Using social media to advertise energy-efficient building practices (two builders)
- Providing information to homebuyers in face-to-face interactions, such as a homebuyer seminar (two builders)
- Including the Focus on Energy logo in multiple listing services (one builder)

The Evaluation Team also asked builders how important the Program was for them in generating new sales leads or making a sale on a Program-certified home. As shown in Table 119, builders found that the Program was more valuable in closing a sale than for generating leads for new homes sales.

Table 119. Importance of Focus on Energy Marketing

Level of Importance	Generating Sales Leads	Making a Sale on a Certified Home
Very important	-	-
Somewhat important	4	6
Not too important	2	3
Not at all important	4	2

Source: Builder Interview Guide, Question D4 "How valuable is the New Homes Program is in generating new leads for your company?" (n=10) and D5 "How valuable is the Focus on Energy marketing to you in terms of making a sale on a certified home?" (n=10)

Asked what would need to occur for the builders to increase the efficiency of the homes they built, participating builders offered the following:

- Increased customer demand for efficient homes (three builders; one of these expected that increased energy costs would drive this demand)
- Decrease in the costs of building homes decrease, including the costs of equipment and land development (three builders)
- Increase in the supply of qualified subcontractors (two builders)

- Reinstatement of the $2,000 federal new energy efficient homes tax credit (one builder)
- Increased stringency of residential building codes (one builder)

The Evaluation Team asked builders if Focus on Energy could do more to help them build more energy-efficient homes. Builders offered the following suggestions:

- Focus on Energy should increase marketing of the Program (two builders)
- Remove the new gas water heater Program requirement (one builder)
- Provide payback period analysis for new measures (one builder)
- Increase incentives (one builder)
- Provide additional training on how to build energy-efficient homes (one builder)
- Lobby the federal government to reinstate the federal energy-efficient homes tax credit (one builder)

Effect of Program on Market Demand

Asked how the Program affects the new homes market in Wisconsin, five builders said the Program had an impact on the market, and three said the Program did not. Three builders said Focus on Energy marketing and branding raises awareness among homebuyers about energy efficiency—this increased awareness leads customers to inquire about efficient building practices and causes builders to be more competitive in offering energy efficiency. Two builders said that when large firms construct efficient homes, smaller builders will naturally follow their practices to remain competitive.[89] One builder also thought that when subcontractors learn advanced skills while working on Program homes they can carry these skills to other non-Program homes.

Two of the three builders who said the Program did not have an impact on the new construction market in Wisconsin said only a few customers valued or knew about energy-efficient building practices, and one builder said building practices in the market were primarily influenced by changes in the building code.

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the total resource cost (TRC) test. Appendix F includes a description of the TRC test.

[89] Participant data showed that smaller builders (with less volume) are more likely to build the most efficient Program homes.

Table 120 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the New Homes Program.

Table 120. New Homes Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$696,950	$1,170,050	$1,605,000

The Evaluation Team found that the CY 2017 New Homes Program was cost-effective (with a TRC B/C ratio of 1.39). Table 121 lists the evaluated costs and benefits.

Table 121. New Homes Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$200,203	$224,605	$243,045
Delivery Costs	$456,553	$512,199	$554,252
Incremental Measure Costs	$1,550,502	$306,382	$369,797
Total Non-Incentive Costs	**$2,207,258**	**$1,043,185**	**$1,167,094**
Benefits			
Electric Benefits	$1,147,693	$0	$0
Gas Benefits	$1,639,098	$1,738,214	$1,455,814
Emissions Benefits	$286,822	$154,636	$132,587
Total TRC Benefits	**$3,073,613**	**$1,892,850**	**$1,588,401**
Net TRC Benefits	**$866,355**	**$849,664**	**$421,307**
TRC B/C Ratio	**1.39**	**1.81**	**1.36**

Evaluation Outcomes

The Evaluation Team identified the following outcomes.

Outcome 1. One participating builders is currently planning on building net zero ready or energy-neutral homes in Wisconsin, suggesting that the future program design will experience some level of freeridership for the energy-neutral homes component. Although nine of 10 participating builders were aware of energy-neutral homes and three of these had limited experience with them in the past, only one builder expressed plans to build these types of homes in the next three years.

Outcome 2. Participating builders are aware of advanced building practices and are incorporating some of them into their homes. Most builders said they were aware of the advanced building techniques described in this study. The most commonly adopted practices included advanced ducting techniques, foamed sill boxes, and advanced framing techniques. Practices such as the use of net and blow-in insulation, continuous exterior wall insulation, tankless or heat pump water heaters, ultra-efficient windows, and structural insulated panels were less common. Additionally, the two highly efficient nonparticipating builders said they incorporated net and blow-in insulation, continuous exterior wall insulation, and ultra-efficient windows into all of their homes, but they did not incorporate

insulated concrete forms, structural insulated panels, and foamed sill boxes because not all of these advanced building techniques are necessary to build highly efficient homes. Nevertheless, to achieve energy-neutral homes, builders will have to adopt most of these advanced techniques.

Recommendation: Continue promoting innovative techniques that provide promising cost-effective energy benefits, and educate builders about how to balance energy and cost savings when incorporating these techniques into their homes by providing case studies of program homes that have integrated these techniques and successfully overcome challenges. A possible candidate for promoting the Program is continuous exterior wall insulation (adopted in 32% of respondents' homes), which can create a tighter home and provide additional insulation benefits; however, it is known in the building industry to present installation concerns.

Recommendation: Ensure that all builders are aware of the benefits of efficient building techniques already adopted by respondent builders. The Evaluation Team focused on interviewing the most efficient builders in the Program. These builders said they have adopted advanced framing techniques (in nearly 100% of the homes built). Advanced building techniques have energy efficiency benefits and can reduce the amount of lumber needed for constructing a home. These practices may be less wide-spread among less-efficient builders. The Program should consider promoting advanced framing techniques to less-efficient builders, possibly by providing lessons learned from more experienced builders.

Recommendation: Track participant homebuilding features in a database for possible future analysis of trends in adoption and correlation to savings. Consider using the database features built into the REM/Rate software. With modest effort, REM/Rate is capable of exporting all modeled building characteristics into a SQL or Access database (the Evaluation Team has developed such a tool for other projects). Modeling building characteristics would allow the Program Administrator and evaluators to identify trends of participant homes over time. If the tool is implemented, the Team also recommends retroactively adding all available past participants to the database if this can be done cost-effectively.

Outcome 3. Respondents indicate that they invest time and effort into ensuring that their subcontractors are able to build Program-qualifying homes. Seven builders said they train their subcontractors, five said they provide on-site supervision to subcontractors, and three said they consult with their contractors on building techniques. Two builders said they would need to see an increase in the number of qualified subcontractors to build even more efficient homes, which suggests the possibility of a spillover effect from the Program's contractor training.

Recommendation: Track contractor participation in the Program in order to measure the overall market effects of the Program. Evaluating the extent to which contractors bring skills to the wider new homes market, and how these skills affect the energy-efficient building practices of nonparticipating builders, will be an important aspect of measuring Program effects. A future evaluation task would likely include interviews or surveys with subcontractors. The Program could facilitate this process by tracking subcontractor information.

Retail Lighting and Appliance Program

Focus on Energy's Retail Lighting and Appliance Program partners with retailers and manufacturers to provide instant discounts on qualified lighting and appliance products to residential customers throughout Wisconsin. The Program also offers a wide range of retail support such as training to retail staff, in-store display materials, and other marketing activities. In calendar year (CY) 2017, APTIM was the Program Administrator and ICF International was the Program Implementer.

In addition to providing results from impact and process evaluation activities for the Retail Lighting and Appliance Program, this chapter includes results from an evaluation of the Retail Products Platform (RPP), although formally a separate pilot project. The RPP is a collaborative initiative facilitated by the U.S. Environmental Protection Agency (EPA) and is designed to increase sales of ENERGY STAR® products by offering incentives to participating retailers. The *Retail Products Platform* section includes a more thorough description of the midstream Program design, details about its reported CY 2017 *ex ante* savings, and preliminary market characterization data.

Table 122 lists the actual spending, savings, participation, and cost-effectiveness of the Retail Lighting and Appliance Program.

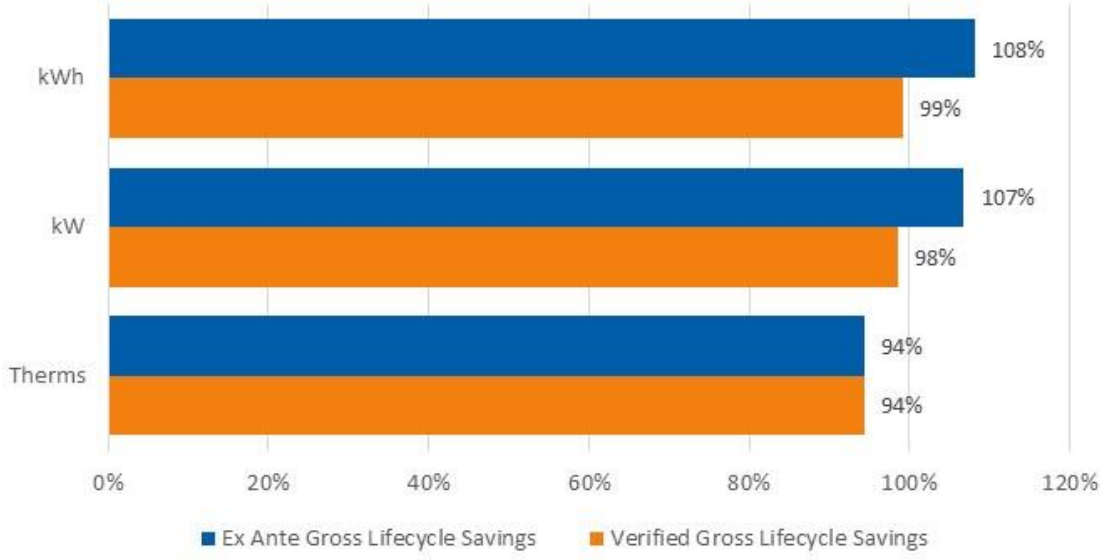
Table 122. Retail Lighting and Appliance Program Summary

Item	Units	CY 2017	CY 2016
Incentive Spending	$	$9,184,298	$8,439,351
Participation	Number of Participants	881,427	688,204
	Quantity of Units	5,076,261	4,092,599
Verified Gross Lifecycle Savings	kWh	3,379,582,904	2,265,216,411
	kW	19,527	17,135
	therms	2,262,347	-
Verified Gross Lifecycle Realization Rate	% (MMBtu)	92%	83%
Net Annual Savings	kWh	80,560,957	105,898,165
	kW	9,126	12,349
	therms	162,889	-
Annual Net-to-Gross Ratio	% (MMBtu)	48%	72%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	5.83	4.51

Figure 78 shows the percentage of gross lifecycle savings goals achieved by the Retail Lighting and Appliance Program in CY 2017. The Program exceeded CY 2017 goals for *ex ante* kW and kWh goals; it did not meet goals for *ex ante* therms or the verified savings goals.[90]

[90] Program goals were adjusted in late 2017 to include additional savings from 2016 carryover budget.

Figure 78. Retail Lighting and Appliance Program Achievement of CY 2017 Gross Lifecycle Savings Goal



Note: In CY 2017, the Program Implementer's contract goal for *ex ante* gross lifecycle savings was 100%. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

The Evaluation Team verified the achievement of 99% of the electric energy and 98% of the electric demand goals. The verified gross electric energy savings and demand savings were lower than *ex ante* savings because of the Evaluation Team's application of in-service rate (ISR) adjustments and assignment of commercial bulbs, described in the *Impact Evaluation* section.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted a limited process evaluation and an impact evaluation of the Retail Lighting and Appliance Program in CY 2017. Although an official impact evaluation of the RPP will not be conducted until CY 2018, preliminary results, including a glimpse into future market characterization approaches, are described in this report. The Evaluation Team designed its evaluation, measurement, and verification approach to primarily evaluate Program savings for assessing the Retail Lighting and Appliance Program.

Table 123 lists the specific data collection activities and sample sizes used in the evaluations. Note that many of these data collection activities, which are described below, were performed only for the lighting measures offered through the Retail Lighting and Appliance Program and the RPP.

Table 123. Retail Lighting and Appliance Program and Retail Products Platform Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)	Applicable Program Category
Program Actor Interviews	2	RLAP and RPP
Tracking Database Review	Census	RLAP and RPP
Ongoing Participant Satisfaction Surveys	1,737	RLAP
In-Home Audits	116	RLAP
Lumen Equivalence Analysis	Census	RLAP

Program Actor Interviews

The Evaluation Team interviewed the Program Administrator and the Program Implementer in June and July 2017 to learn about the status of and any high-level changes, successes, and concerns for the Retail Lighting and Appliance Program and the RPP. Topics included changes to Program design and goals, marketing strategies, measure offerings, and data tracking.

Tracking Database Review

The Evaluation Team reviewed the census of the Retail Lighting and Appliance Program and the RPP SPECTRUM tracking data, which involved these activities:

- Thoroughly reviewing data to ensure that totals in SPECTRUM matched totals reported by the Program Administrator
- Reassigning "adjustment measures" to appropriate measure names
- Checking for the complete and consistent application of data fields (such as measure names, first-year savings, and effective useful lives)

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct satisfaction surveys beginning in CY 2015 for the CY 2015 to CY 2018 quadrennial. The goal of these surveys was to provide a quick and easy feedback opportunity for recent Program participants, ensure timely feedback close to the participation experience, enable problem identification at any time of year, and identify energy efficiency opportunities for delivering follow-up information to interested participants.

The Program Administrator deployed online surveys through SPECTRUM to all CY 2017 participants with an email address within two weeks of their participation in the Program. The retail smart thermostat customer satisfaction survey was fielded regularly throughout CY 2017, while the online LED sale and pop-up retail customer satisfaction surveys were fielded once each following the associated sale events. The Evaluation Team gathered online survey results via SPECTRUM for annual reporting.

In CY 2017, 1,737 Retail Lighting and Appliance Program participants (909 online LED sale, 675 retail smart thermostat, and 153 pop-up retail) responded to customer satisfaction surveys.

In-Home Audits

The Evaluation Team recruited participants from the general population survey for in-home audits to inventory lighting and appliances. Conducting annual in-home audits allows for the tracking of bulb purchases, installations, and failure and removal rates over time. In the summer of 2015, the Evaluation Team made the first of several annual visits, completing 124 audits. In the summer of 2016, the Team revisited 120 of the original sites. In 2017, the Team conducted final visits to 116 of these same homes.

The main objective of the audits was to gather information to determine the following:

- Changes in penetration (use of one or more) and saturation (prevalence of technology) of bulb technologies, by home and room
- Bulb replacements (e.g., CFL to CFL and CFL to LED replacements)
- First-year in-service rate (ISR), by technology and room type
- Short-term storage duration
- How often bulbs fail or are replaced in a home
- Remaining potential for efficient bulbs

Lumen Equivalence Analysis

Consistent with the previous years' evaluation and the CY 2017 plan, the Evaluation Team employed the lumen equivalence method to determine the appropriate baseline wattages for each Program bulb. This method, which adheres to the best practices prescribed by the Uniform Methods Project (UMP),[91] maps each efficient wattage to a corresponding baseline wattage by using the lumen output of the efficient bulb to determine the least efficient wattage allowed by federal standards.

Point-of-Sale Data Analysis

The Evaluation Team developed a national lighting sales model to determine Program attribution for the Wisconsin efficient lighting market. The model quantified the relationship between Program intensity (such as Program spending per household) and efficient lighting sales (the percentage of light bulb purchases that are efficient), which was used in the Program's NTG triangulation task.

[91] The UMP is a framework and set of protocols established by the U.S. Department of Energy for determining energy savings from energy efficiency measures and programs. Its latest update was in February 2015. National Renewable Energy Laboratory. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* "Chapter 21: Residential Lighting Evaluation Protocol." Prepared by Apex Analytics, LLC. February 2015. Available online: http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter21-residential-lighting-evaluation-protocol.pdf

Impact Evaluation

This section provides impact evaluation findings for the Retail Lighting and Appliance Program based on several methods:

- Gross savings methods
  - Tracking database review
  - In-home audits
  - Engineering reviews
- Net savings methods
  - National sales data modeling

The Evaluation Team calculated gross savings for each individual bulb sold through the Program using the bulb's model information and inputs calculated from the gross savings methods (database reviews, in-home audits, and engineering reviews). The Team calculated gross savings for smart thermostats and smart strips using algorithms and inputs listed in the Wisconsin TRM.

To determine an overall Program NTG ratio, the Evaluation Team used results from national LED sales data modeling and the CY 2016 Smart Thermostat Pilot survey results.

Evaluation of Gross Savings

The Evaluation Team reviewed the tracking database and applied the most recent research to determine estimated verified gross savings.

Tracking Database Review

The Evaluation Team reviewed the census of CY 2017 Retail Lighting and Appliance Program data contained in SPECTRUM for appropriate and consistent application of unit-level savings and (EUL values in adherence with the Wisconsin TRM or other deemed savings sources. The Team found that all the inputs used in the SPECTRUM database were consistent with the deemed values in the Wisconsin TRM.

The Evaluation Team also reviewed the CY 2017 sales data for information required to calculate savings and found complete data for all the inputs used in the gross savings analysis (such as model number, measure description, quantity, and wattage).

To verify the lighting dataset, the Team used the model number and description of each bulb to gather data on lumens, wattage, and bulb type from the ENERGY STAR lighting database and was able to match 95% of the total bulbs listed in the Program. For bulbs that were not matched in the ENERGY STAR database, the Team deferred to the values listed in the tracking database. The Team applied other inputs for the savings analysis, such as hours of use, from the Wisconsin TRM. The Evaluation Team made no adjustments to the tracking data. A comprehensive list of *ex ante* and verified inputs are provided in Appendix H.

Verified Unit Energy Savings

Lighting

The Evaluation Team used these algorithms to calculate the verified, gross unit energy savings and demand reduction for LEDs installed in residential and nonresidential applications:

$$\Delta kWh = {}^{\Delta Watts}/_{1{,}000} * ISR * HOU * 365$$

$$\Delta kW = {}^{\Delta Watts}/_{1{,}000} * ISR * CF$$

Appendix H provides the descriptions, values, and sources for all the inputs that the Program Implementer applied to estimate *ex ante* savings and that the Evaluation Team applied to estimate verified savings. The verified gross unit savings separated by residential and nonresidential savings is presented in Appendix H.

Advanced Power Strips

The Evaluation Team used these algorithms provided in the Wisconsin TRM to calculate the verified, gross unit energy savings and demand reduction for advanced power strips:

$$\Delta kWh = (kWh_{Base} - kWh_{ee}) * ISR$$

$$\Delta kW = \Delta kWh * CF/HOU$$

The inputs for advanced power strips were provided in the Wisconsin TRM.

Smart Thermostats

The Evaluation Team used these algorithms and inputs provided in the Wisconsin TRM to calculate the verified, gross unit energy savings, demand reduction, and therm savings for smart thermostats:

$$kWh_{Heating} = \frac{EFLH_{Heat} * CAP}{HSPF * 3.412} * ESF_{Heating}$$

$$kWh_{Cooling} = \frac{EFLH_{Cool} * MBtuH}{SEER} * AC\% * ESF_{Cooling}$$

$$Therms = \frac{HOU_{Heating} * CAP}{AFUE * 100} * ESF_{Heating}$$

Table 124 provides the *ex ante* gross unit savings and the verified gross unit savings with associated realization rates.

Table 124. CY 2017 Lighting Unit Savings by Measure

Measure	MMID	Quantity	*Ex Ante* Unit Savings			Verified Gross Unit Savings			Realization Rate		
			kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
LED, Reflector, 12 Watt, Retail Store Markdown	3357	758,545	50	0.0058	0	46	0.0053	0	91%	92%	--
LED, Omnidirectional, 310–749 Lumens, Retail Store Markdown	3353	256,375	23	0.0027	0	25	0.0029	0	108%	107%	--
LED, Omnidirectional, 750–1,049 Lumens, Retail Store Markdown	3354	3,603,225	32	0.0037	0	29	0.0034	0	91%	92%	--
LED, Omnidirectional, 1,050–1,489 Lumens, Retail Store Markdown	3355	83,223	39	0.0045	0	35	0.0041	0	90%	91%	--
LED, Omnidirectional, 1,490–2,600 Lumens, Retail Store Markdown	3356	365,861	55	0.0064	0	49	0.0058	0	90%	90%	--
Adjustment Measure	2849	82	19,533	-7.462	-3,865	19,533	-7.462	-3,865	100%	100%	100%
Adjustment Measure, Incentive Only	2852	38	0	0.000	0	0	0.000	0	--	--	--
Advanced Power Strip, Retail, APS Tier 1	4275	1,001	80	0.011	0	53	0.007	0	65%	65%	--
Smart Thermostat, Existing Air-Source Heat Pump	3611	88	431	0.175	0	431	0.175	0	100%	100%	--
Smart Thermostat, Existing Natural Gas Boiler	4301	122	325	0.000	53	325	0.000	53	100%	--	100%
Smart Thermostat, Existing Natural Gas Furnace	4302	2,722	439	0.000	30	439	0.000	30	100%	--	100%
Smart Thermostat, Existing NG Boiler	3609	154	0	0.000	136	0	0.000	136	--	--	100%
Smart Thermostat, Existing NG Furnace	3610	4,733	76	0.127	92	76	0.127	92	100%	100%	100%
Smart Thermostat, Existing Air-Source Heat Pump	4303	21	440	0.000	0	440	0.000	0	100%		

In-Service Rates

Lighting Measure In-Service Rate

The Evaluation Team calculated two types of LED ISRs in CY 2017: first-year and lifetime. The first-year ISR represents the percentage of bulbs that were still installed, in use, and operating properly 12 months after the bulbs' purchase. During the CY 2017 in-home audits, the Evaluation Team inventoried LED bulbs and estimated a first-year ISR, shown in Table 125.

Table 125. CY 2017 LED First-Year In-Service Rate

Bulb Type	First-Year ISR
LED	56%

The first-year ISR helps explain installation behaviors during the first year after purchase, but it does not account for the eventual installations of bulbs in storage in subsequent years. A common approach to determining the eventual installation, which is being adopted in various jurisdictions, is to factor in the trajectory of installations.[92] This approach is also documented in the UMP.[93]

The trajectory of installations is imputed annually between year one (in this case, CY 2017) and out to CY 2020 or beyond, depending on when the Energy Independence and Security Act (EISA) backstop provision of 2020 will take effect, which will be the last year LED replacements and associated savings should be claimed.[94] The calculation relies on participant surveys to inform the first-year ISR, with four different sunset-year scenarios that reflect the uncertainty of when the EISA legislation will be enforced.

Table 126 shows the ISR of an LED over six years based on bulbs being installed from storage after the initial Program year. The Evaluation Team recommends that Focus on Energy capture the likelihood of future installations by using the net present value ISR of 87%.

Table 126. CY 2017 LED Lifetime In-Service Rate

Bulb Type	First-Year ISR	Second-Year ISR	Third-Year ISR	Fourth-Year ISR	Fifth-Year ISR	Sixth-Year ISR	Net Present Value ISR
LED	56%	67%	75%	81%	85%	89%	87%

[92] Program administrators in Arkansas, Missouri, North Carolina, Pennsylvania, South Carolina, Georgia, and other states have adopted this approach.

[93] National Renewable Energy Laboratory. *Uniform Methods Project, Chapter 6: Residential Lighting Evaluation Protocol*. October 2017. Available online: https://www.nrel.gov/docs/fy17osti/68562.pdf

[94] CY 2022 allows two years for potential sell-through, lack of enforcement, and political uncertainty, and aligns with a common halogen lifetime, which would likely be installed December 31, 2019, and last through CY 2022. See page 13 of the current UMP, Chapter 6, for additional details.

Appliance Measure In-Service Rates

For advanced power strips, the Evaluation Team applied the TRM's recommended ISR of 100%.

The TRM does not, however, specify an ISR for smart thermostats and the Evaluation Team was unable to benchmark a value from other jurisdictions. Given the measure's small impact on the program and lack of more accurate data, the Evaluation Team applied an ISR of 100% to smart thermostat measures. The Team will be able to update this input in 2018 with results from the 2018 participant survey.

Delta Watts Analysis

The Evaluation Team employed the lumen equivalence methodology to determine the baseline wattage for each Program bulb. Calculating the difference between the baseline and efficient wattages provided the delta watts input.

The Evaluation Team matched individual bulbs from the Program Implementer's tracking database, using its model number, to its corresponding listing in the ENERGY STAR–qualified product list database. The ENERGY STAR database provided other product details for each bulb, including lumen output, rated wattage, type, and ENERGY STAR certification status. If these data were not available, the Evaluation Team used the database values for lumens, efficient wattage, or both from the Program Implementer's database, or conducted internet searches based on product make and model numbers.

The Evaluation Team then categorized each bulb into specific bins, based on the bulb lumen output and type. Each bin had an assumed baseline wattage for use in the delta watts calculation. The UMP provides lumen bins for standard, decorative, globe, and EISA-exempt lamps. For example, the bins and associated baseline halogen watts for standard bulbs are shown in Table 127.

Table 127. EISA (Phase 1) Lumen Bins and Baseline Watts for Standard Bulbs

Lumen Bin	CY 2016 EISA Baseline	EISA
0–309	25	Not impacted by EISA
310–449	25	Impacted by EISA
450–799	29	
800–1,099	43	
1,100–1,599	53	
1,600–1,999	72	
2,000–2,600	72	
2,601–3,300	150	Not impacted by EISA
3,301–4,815	200	

Source: *Energy Independence and Security Act of 2007*. Public Law 110-140-. 121 Stat. 1492. December 19, 2007. Available online: https://www.gpo.gov/fdsys/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf. Note that in December 2016, the U.S. Department of Energy issued two final rules: one proposing to keep the existing EISA Phase 2 backstop provision set to take effect on January 1, 2020, and one expanding the definition of EISA general service lamps (and thus the types of lamps impacted by the backstop provision) to include several previously exempted lamps, including globes, candelabras, reflectors, and lamps up to 3,300 lumens. Although these rules do not immediately impact the first-year savings for lighting, they could impact the measure lifetimes for a wider assortment of bulbs than were previously impacted. See: U.S. Department of Energy, 10 CFR Part 430, Docket Number EERE–2013–BT–STD–0051, RIN 1904-AD09.

EISA affects only the bulbs in the 310 to 2,600 lumen output range. The Team applied a similar methodology to categorize specialty bulbs, reflectors, and EISA-exempt bulbs into their respective bins with different lumen ranges and different baselines.

To determine the lumen bins for reflectors, the UMP defers to federal requirements and does not list lumen bins explicitly. Based on federal requirements, the Mid-Atlantic TRM defines lumen bins for six categories of reflector types and diameters.[95]

The average delta watts for each category compared to the *ex ante* delta watts are shown in Table 128. The *ex ante* delta watts are based on values deemed in the 2016 Wisconsin TRM and not directly on the sales data (which can vary within each measure name category). The average, verified gross delta watts was calculated by subtracting the wattage of the efficient bulb from the baseline wattage as determined from its lumen bin, which causes the variation shown between the *ex ante* delta watts and the evaluated delta watts. Similar to CY 2016, the comparison in Table 128 shows strong agreement between the verified and *ex ante* delta watts values.

Table 128. CY 2017 *Ex Ante* and Verified Gross Delta Watts

Measure	*Ex Ante* Delta Watts	Average Verified Gross Delta Watts
LED, Reflector	53	53
LED, Omnidirectional, 310–749 Lumens	22	29
LED, Omnidirectional, 750–1,049 Lumens	32	34
LED, Omnidirectional, 1,050–1,489 Lumens	40	41
LED, Omnidirectional, 1,490–2,600 Lumens	55	57

Cross-Sector Sales

In CY 2015, the Evaluation Team conducted a residential general population survey and surveyed a subset of Focus on Energy small business customers to estimate the percentage of customers (from each population) who purchased CFLs, LEDs, or both from a participating retailer during the previous 12 months. Because store intercept studies and the phone surveys have inherent biases specific to the populations they target and the methods they employ, the Evaluation Team combined the results from the CY 2015 phone surveys (6.0%) with those from the CY 2014 intercept study (7.1%), for an average cross-sector sales proportion of 6.6%.

Because there had been no large changes to the Program design or population from CY 2015 to CY 2017, the Evaluation Team applied the 6.6% cross-sector sales proportion to CY 2017 bulbs. Appendix I of the

[95] Northeast Energy Efficiency Partnership. *Mid-Atlantic Technical Reference Manual*. Version 5.0. May 2015. Available online: http://www.neep.org/mid-atlantic-technical-reference-manual-v5

Focus on Energy CY 2015 Evaluation Report describes the full methodology and findings of the cross-sector sales analysis.[96]

CY 2017 Verified Gross Savings Results

Overall, the Retail Lighting and Appliance Program achieved an annual evaluated realization rate of 92% for electric energy savings and 104% for demand savings (Table 129).[97]

Table 129. CY 2017 Retail Lighting and Appliance Program Annual and Lifecycle Realization Rates by Measure Type

Measure	MMID	Annual Realization Rate				Lifecycle Realization Rate			
		kWh	kW	Therms	MMBtu	kWh	kW	Therms	MMBtu
Adjustment Measure	2849	100%	100%	100%	100%	100%	100%	100%	100%
Adjustment Measure, Incentive Only	2853	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Advanced Power Strip, Retail, APS Tier 1	4275	100%	100%	n/a	100%	100%	100%	n/a	100%
LED, Omnidirectional, 1,050–1,489 Lumens, Retail Store Markdown	3555	90%	103%	n/a	90%	90%	103%	n/a	90%
LED, Omnidirectional, 1,490–2,600 Lumens, Retail Store Markdown	3556	90%	101%	n/a	90%	90%	101%	n/a	90%
LED, Omnidirectional, 310–749 Lumens, Retail Store Markdown	3553	108%	121%	n/a	108%	108%	121%	n/a	108%
LED, Omnidirectional, 750–1,049 Lumens, Retail Store Markdown	3554	91%	104%	n/a	91%	91%	104%	n/a	91%
LED, Reflector, 12 Watt, Retail Store Markdown	3557	91%	103%	n/a	91%	91%	103%	n/a	91%
Smart Thermostat, Existing Air-Source Heat Pump	3611	100%	100%	n/a	100%	100%	100%	n/a	100%
Smart Thermostat, Existing Air-Source Heat Pump	4303	100%	n/a	n/a	100%	100%	n/a	n/a	100%
Smart Thermostat, Existing Natural Gas Boiler	4301	100%	n/a	100%	100%	100%	n/a	100%	100%
Smart Thermostat, Existing Natural Gas Furnace	4302	100%	n/a	100%	100%	100%	n/a	100%	100%
Smart Thermostat, Existing NG Boiler	3609	n/a	n/a	100%	100%	n/a	n/a	100%	100%
Smart Thermostat, Existing NG Furnace	3610	100%	100%	100%	100%	100%	100%	100%	100%
Average		**92%**	**104%**	**100%**	**92%**	**92%**	**104%**	**100%**	**92%**

[96] Cadmus. *Focus on Energy Calendar Year 2015 Evaluation Report Appendices.* May 20, 2016. Available online: https://www.focusonenergy.com/sites/default/files/WI%20FOE%20CY%202015%20Appendices.pdf

[97] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

The main factor causing realization rates to go up was the difference in delta watts between verified and *ex ante* savings. Most notably, the Evaluation Team found that EISA-exempt lamps had a larger verified delta watts value in the lowest lumen bin (310 lumens to 749 lumens). The largest factor causing some realization rates to be lower than 100% was the LED ISR. The evaluation team applied an ISR of 87% to the to the verified LED savings, while the *ex ante* savings did not apply an ISR.

Table 130 lists realization rates for the annual and lifecycle gross savings for the CY 2017 Retail Lighting and Appliance Program.

Table 130. CY 2017 Retail Lighting and Appliance Program
Annual and Lifecycle Gross Savings Summary by Measure Type

Measure	Annual Realization Rate			Lifecycle Realization Rate		
	kWh	kW	Therms	kWh	kW	Therms
Lighting	92%	104%	n/a	92%	104%	n/a
Appliances[1]	100%	100%	100%	100%	100%	100%
Average	**92%**	**104%**	**100%**	**92%**	**104%**	**100%**

[1] Appliance realization rates include adjustment measures.

Table 131 lists the *ex ante* and verified annual gross savings for the CY 2017 Retail Lighting and Appliance Program.

Table 131. CY 2017 Retail Lighting and Appliance Program
Annual Gross Savings Summary by Measure Type

Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
	kWh	kW	therms	kWh	kW	therms
Lighting	182,495,127	21,140	-	167,332,662	21,943	-
Appliances[1]	3,325,127	15	226,235	3,325,127	15	226,235
Total	**185,820,254**	**21,155**	**226,235**	**170,657,789**	**21,958**	**226,235**

[1] Appliance savings include adjustment measures.

Table 132 lists the *ex ante* and verified lifecycle gross savings for the CY 2017 Retail Lighting and Appliance Program.

Table 132. CY 2017 Retail Lighting and Appliance Program
Lifecycle Gross Savings Summary by Measure Type

Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
	kWh	kW	Therms	kWh	kW	Therms
Lighting	3,649,902,540	21,140	-	3,346,653,233	21,943	-
Appliances[1]	32,929,671	15	2,262,347	32,929,671	15	2,262,347
Total	**3,682,832,211**	**21,155**	**2,262,347**	**3,379,582,904**	**21,958**	**2,262,347**

[1] Appliance savings include adjustment measures.

Evaluation of Net Savings

This section details the Evaluation Team's methods for estimating the net Program savings.

Lighting Net-to-Gross

The Evaluation Team developed a national lighting sales model to determine Program attribution for the Wisconsin efficient lighting market. The model quantified the relationship between Program intensity (Program spending per household) and efficient lighting sales (the percentage of light bulb purchases that are efficient). This section provides a high-level overview of the Team's analysis and findings. National sales data modeling findings are provided in more detail in Appendix I.

Data Sources

The Evaluation Team relied on a variety of data sources to develop the model but primarily on 2016 sales data prepared by the Consortium for Retail Energy Efficiency Data (CREED) LightTracker initiative.[98] Most of these sales data were generated from two sources—state point-of-sale (POS) data (representing one group of retail channels) and National Consumer Panel state sales data (representing a different group of retail channels)—that collectively represent the majority of bulb sales across the United States. The model also included inputs from a combination of Program data collected by the Evaluation Team and household and demographic data collected through various publicly available websites.

There were several primary model input data sources:

- National bulb sales
  - POS data (grocery, drug, dollar, discount, mass merchandiser, and selected club stores)
  - Panel data (home improvement, hardware, online, and selected club stores)
- ENERGY STAR shipment data (imports and ENERGY STAR market share)
- North American Electrical Manufacturers Association shipment data
- American Community Survey data (household characteristics and demographic data)

[98] CREED is a consortium of program administrators, retailers, and manufacturers that collect the necessary data to better plan and evaluate energy efficiency programs. LightTracker, CREED's first initiative, focused on acquiring full-category lighting data—including incandescent, halogen, CFL, and LED bulb types—for all distribution channels in the United States. As a consortium, CREED speaks as one voice for program administrators nationwide as they request, collect, and report on the sales data needed by the energy efficiency community. More details are available online: https://www.creedlighttracker.com. Note that 2016 data was the most recent year available at the time of this study.
The information contained herein is based in part on data reported by IRI through its Advantage service, interpreted solely by LightTracker. Any opinions expressed herein reflect the judgement of LightTracker, Inc. and are subject to change. IRI disclaims liability of any kind arising from the use of this information.

- Retailer square footage per state (based on the two primary retailer channel data sources)
- General population surveys, lighting saturation studies, and other primary data collection made publicly available through evaluation reports

Modeling Methods

The primary goal of the model was to quantify the impact of state-level program activity on the sales of efficient lighting. Several factors influence the sales of efficient lighting and, as noted above, the Evaluation Team considered a number of demographic and household characteristics, as well as retail channel variables, to capture and control for the unique characteristics of each state that could affect the uptake of efficient lighting products.

Using the regression model results, efficient bulb sales data, and Program tracking databases, the Evaluation Team estimated NTG ratios for all LEDs in 2016. The Team derived a NTG ratio by first using the model to predict the share of efficient bulbs with and without a program (determining the counterfactual of no program activity by setting the program variable to zero). This change in share represents the program lift, or net increase in the share of efficient bulbs resulting from Program activity.

To then calculate NTG, the Team multiplied the change in share by the total number of bulbs—for all bulb types—sold in 2016. This value represents the net Program impact (that is, the total lift in the number of efficient bulbs sold), which the Team then divided by the total number of Program bulbs sold (the gross number of bulbs) to determine NTG:

$$NTG = \frac{(\#\ bulbs\ sold\ with\ Program - \#\ bulbs\ sold\ with\ no\ Program)}{\#\ of\ Program\ bulbs\ sold}$$

Results

As shown in Table 133, the estimated CY 2017 NTG modeled ratio for CFLs and LEDs combined is 46.7%. This estimate considers current Program spending and current Program age; it does not include market effects. The Team also calculated a NTG ratio of 71.0% that includes market effects (i.e., the Program's current and past influence on the market), and is comparable to the Program's 2016 NTG ratio of 68%.

Stakeholders agreed to apply the NTG ratio that does not account for market effects (46.7%) to CY 2017, and apply the NTG ratio that accounts for market effects (71.0%) at the end of the quadrennium. This will result in final quadrennial NTG ratio that is higher than the CY 2017 ratio presented in this report.

Table 133. LED Net-to-Gross Calculations

Calculation Term	Value
Total Wisconsin Bulbs 2016 (A)	25,438,532
Program Spending per Household Actual (B)	$4.13
Program Spending per Household Counterfactual (C)	$0.00
Program Age Actual (D)	14
Program Age Counterfactual (E)	13
LED Market Share Counterfactual (F)	26.8%
LED Market Share Modeled (G)	33.0%
LED Quantity Modeled (H=A*G)	8,394,716
LED Quantity Counterfactual (I=A*F)	6,804,807
Net LEDs Modeled (J=H-I)	1,589,909
Program Bulbs 2016 (K)	3,405,692
NTG (L=J/K)	**46.7%**

Appliance Net-to-Gross

To estimate net savings for appliance measures, the Team applied results from the CY 2016 smart thermostat pilot survey analysis to CY 2017 Program savings, and applied a NTG ratio of 100% to advanced power strips due to the lack of a more accurate estimate.

NTG values for appliances are shown in Table 134.

Table 134. Smart Thermostat and Advanced Power Strip Net-to-Gross Values

Measure	Freeridership	Spillover	NTG = 1 - (Freeridership + Spillover)
Smart Thermostats	29%	1%	72%
Advanced Power Strips	0%	0%	100%

CY 2017 Verified Net Savings Results

Table 135 shows the annual net energy impacts by measure type for the CY 2017 Retail Lighting and Appliance Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 135. CY 2017 Retail Lighting and Appliance Program Annual Net Savings

Measure	Annual Net		
	kWh	kW	therms
Lighting	78,144,353	9,112	-
Appliances[1]	2,156,489	(419)	(149,637)
Total Annual	**80,300,842**	**8,693**	**(149,637)**

[1] Appliance savings include adjustment measures.

Table 136 shows the lifecycle net energy impacts by measure for the CY 2017 Retail Lighting and Appliance Program.

Table 136. CY 2017 Retail Lighting and Appliance Program Lifecycle Net Savings

Measure	Lifecycle Net		
	kWh	kW	therms
Lighting	1,562,887,060	9,112	-
Appliances[1]	21,243,292	(419)	(1,496,367)
Total	**1,584,130,352**	**8,693**	**(1,496,367)**

[1] Appliance savings include adjustment measures.

Process Evaluation

In CY 2017, the Evaluation Team conducted interviews with the Program Administrator and the Program Implementer as part of the process evaluation activities. The process evaluation focused on these two topics for the Retail Lighting and Appliance Program:

- Program successes and challenges
- Identify opportunities for process improvements

Retail Lighting and Appliances Program Design, Delivery, and Goals

The goal of the Retail Lighting and Appliance Program is to increase the awareness and sales of energy-efficient products sold in retail locations. To achieve this goal and to help overcome customers' barriers related to product cost and lack of information about energy efficiency, the Retail Lighting and Appliance Program offers upstream incentives to the manufacturers of ENERGY STAR products, conducts various marketing activities, and engages directly with retail staff. Focus on Energy partners with manufacturers to determine qualified ENERGY STAR lighting, advanced power strips, and smart thermostat products; establish target retail prices; and t set promotional timelines. Focus also partners with retailers to conduct in-store promotional activities and train sales staff and hosts an online marketplace to provide consumer information about efficient products, many of which are given incentives through the Retail Products Platform pilot.

These partnerships are managed under memorandums of understanding (MOUs), which set product-specific incentive amounts, catalogue stock-keeping unit numbers (SKUs) for incented products, and list agree-upon base retail prices for lighting products and advanced power strips. Manufacturers send invoices to the Program Implementer on a weekly, biweekly, or monthly basis (depending on the MOU), then the Program Implementer processes the incentives. These invoices include the number of products sold and the retailer that sold the product and are supported by retailer POS data.

Customers who purchase a smart thermostat apply for an incentive directly by completing an online application on the Focus on Energy website. Advanced power strips were not yet available through retailers in 2017, but the Program sold them at pop-up retail events.

The Retail Lighting and Appliance Program helps manufacturers and retailers promote efficient products by providing POS materials and educating retailers about the products. Additionally, the Program Implementer conducts a state-wide marketing campaign that involves both digital and traditional strategies.

Program Changes

In CY 2017, the Program expanded offerings beyond light bulbs by introducing smart thermostat, advanced power strips (CEE Tier 1), and connected lighting measures.

Smart thermostats. The Program Administrator said the Retail Lighting and Appliance Program introduced smart thermostats more slowly than planned because of the limited time to stock inventory in stores.

Advanced power strips. The Program Implementer said it faced delays in signing an MOU with a manufacturer of advanced power strips, therefore the Retail Lighting and Appliance Program could not offer these products under its upstream market design. Nevertheless, Focus on Energy offered incentives for advanced power strips during 66 pop-up events conducted in CY 2017.

Connected lighting measures. The Program Administrator said only one company, Philips, manufactures ENERGY STAR–connected lighting measures. The Program Implementer signed an MOU for this measure in CY 2017; however, Philips did not initially have sufficient inventory to offer the measure through the Retail Lighting and Appliance Program, although these measures were offered later in the year.

Program Management and Delivery Structure

In CY 2017, the Program Administrator was responsible for managing the Program budget and overseeing the work of the Program Implementer.

The Program Implementer was responsible for these activities:

- Overseeing contracts and MOUs
- Conducting Program planning
- Tracking Program data
- Identifying and coordinating with retail partners
- Conducting marketing activities at retail locations
- Conducting digital and traditional appliance marketing campaigns
- Processing manufacturer and customer incentives and payments
- Representing Focus on Energy regarding the RPP

Program Goals

The overall goal of the Retail Lighting and Appliance Program was to increase awareness and sales of energy-efficient products sold through retail outlets. Its CY 2017 goals and energy-savings achievements are shown in Table 137.

Table 137. CY 2017 Retail Lighting and Appliance Program Goals and Achievements

Performance Metric	CY 2017 Goal	CY 2017 Actual (*Ex Ante*)
Lifecycle electric savings (kWh)	3,407,146,177	3,682,832,211
Demand savings (kW)	19,834	21,155
Natural gas savings (Therms)	2,396,640	2,262,347
Lifecycle energy savings (MMBtu)	11,864,847	12,792,058

The Program achieved 108% of its CY 2017 *ex ante* MMBtu goal.

The Program Implementer also tracked other KPIs to measure Retail Lighting and Appliance Program performance and met 10 of its 13 KPI goals. Table 138 shows these KPIs and the CY 2017 results from monthly reports by the Program Implementer.

Table 138. Retail Lighting and Appliance Program CY 2017 Key Performance Indicators

Desired Outcome	KPI	Goal	CY 2017 Result
Expand Participation for all Eligible Customers while Achieving Cost-Effective Savings	Manage SKUs and incentive levels across MOUs to increase kWh savings per dollar spent on incentives	Increase kWh savings per dollar spent on incentives by 5% over CY 2016	**Accomplished**: Achieved 426 kWh/$ in CY 2017.
	Increase the number of new retail locations and monitor performance and impact to Program cost-effectiveness and ensure access to eligible customers based on drive-time analysis	Increase number of new retail locations by 5% (Goal of 1,100 total locations, up from 1,048 in 2016); conduct drive-time analysis	**Nearly Accomplished**: Achieved 1,095 store locations of 1,100 store goal (99%).
	Pursue online retail opportunities so that 5% of savings are realized from online opportunities	Realize 5% of savings from online opportunities.	**Nearly Accomplished**: Achieved 4.3% savings from online opportunities (86%).
Capture and Capitalize on New Market Opportunities	Conduct at least two shelf surveys annually across promoted products and recommend adjustments to Program based on market conditions	Conduct at least two shelf surveys annually.	**Accomplished**: Conducted two shelf surveys.
	Implement at least two new digital strategies that lead to a 2% click-through rate (CTR) or higher	Add two new digital strategies that lead to 2% or higher CTR	**Accomplished**: Achieved through Facebook advertisement for 1000bulbs.com (2.3% CTR) and smart thermostats (2.46 CTR)
	Implement at least two new marketing strategies that are proven to be successful in the field by creating a baseline response rate	Conduct two new marketing strategies	**Accomplished**: Launched billboard advertising for lighting in February and for smart thermostats in October

Desired Outcome	KPI	Goal	CY 2017 Result
Provide Superior Trade Ally Experience	Provide year-end reporting by percentages to key Trade Ally partners to highlight their contribution to Program energy-savings achievement	Provide year-end reporting for key Trade Allies (retailers and manufacturers)	**Nearly Accomplished**: Accomplished in January 2018. Communication required final invoice processing in early 2018
	Conduct quarterly trainings with Program representatives through webinar and in-person meetings	Conduct quarterly training for CrossMark representatives	**Accomplished**: Held in-person training on customer service and Focus on Energy offerings
Build Affinity and Support for Focus on Energy	Increase webpage visits and engagement by 10% using 2016 Google Analytics as a baseline.	Increase webpage visits by 10%.	**Accomplished**: Achieved 10% increase in webpage visits
	Expand pop-up retail events during CY 2017 in close coordination with Strategic Energy Management Program Implementer	Expand pop-up retail events with partner TechniArt	**Accomplished**: Completed 54 events
	Work with Program Administrator to establish a customer satisfaction baseline for smart thermostats and to measure customer satisfaction for lighting and other retail products when possible	Establish a customer satisfaction score for smart thermostats	**Accomplished**: Established Q3 survey customer satisfaction baseline of 8.9
	Cross-promote programs throughout the Focus on Energy portfolio to existing customers who already have participated	Design two promotions to encourage existing customers to engage with other programs offered by Focus on Energy	**Accomplished**: Completed promotions with field representatives and pop-up using residential collateral, and is developing a cross-promotional piece with appliance recycling
Streamline Operations and Optimize Processes	Update utility allocation for upstream lighting import with recommendations by end of Q1 and with implementation by end of Q2	Update utility allocation for upstream lighting by Q1, implement by Q2 (approval)	**Accomplished**: Completed in December 2017

Note: The KPI goals and results listed in this table are based on reports regularly submitted by the Program Implementer.

Data Management and Reporting

Focus on Energy used SPECTRUM, the data management tool, to track Program data and to send incentive checks to participating manufacturers and retailers. In CY 2017, the Program Implementer stored RPP tracking and sales data in SPECTRUM as well. The Program Implementer also used SPECTRUM to process customers' smart thermostat payments after receiving online applications via the VisionDSM platform.

For measures other than smart thermostats, the Program Implementer's data processing team reconciles manufacturer invoices with a summary of POS data provided by the manufacturer.

Marketing and Outreach

The Program Implementer is primarily responsible for developing and executing Program marketing. The Program Implementer said its team of 12 field representatives conduct approximately 1,000 retail store visits per month, during which they verify that products are sold at the prices agreed to in MOUs, place POS advertisements, help store personnel find prime locations for efficient light bulbs, and provide stores with marketing materials. In CY 2017, the Program Implementer focused on increasing the number of visits to independent retailers and said its teams exceeded the number of independent retail store visits in CY 2017 by approximately 800 visits compared to the previous year.

The Program Implementer conducted a digital marketing campaign that included social media and search engine advertisements. Focus on Energy provided an online marketplace so customers could shop for and compare products offered through the Retail Lighting and Appliance Program and the RPP.[99]

Although the Program Implementer could track site traffic, including unique visits to the site and the number of visitors who clicked through to visit a retailer's website, it could not trace the number of sales initiated through the online marketplace. The online marketplace registered 584 product comparisons and 905 "buy now" clicks (when a website visitor clicks to visit a retailer website). The highest level of activity for both product comparisons and "buy now" clicks was in May 2017. Refrigerators were the most compared product and were the product that site visitors most frequently visited retailers for.

LED Market Assessment

The Evaluation Team collected data from retailer websites to assess current lighting prices, inform the process evaluation, and provide an understanding of the lighting market. The Team used a web-based search tool to monitor program and non-program lamp inventory and pricing at participating and nonparticipating big box stores in Wisconsin to determine:

- Availability (number of models stocked) of program and non-program lamps at participating and nonparticipating retailers including incandescent, halogen, CFL, and LED in both standard and specialty forms.
- Regular and sales prices offered by retailers (not utility incentives) for both program and non-program lamps
- Customer satisfaction, by tracking customer reviews and product ratings.

The LED market has changed rapidly over recent years. The collected data allowed the team to measure the number of models available through the targeted Wisconsin retailers and pricing changes over 2017.

Some retailers provided bulb characteristics that allowed the Team to verify which bulbs qualify for ENERGY STAR 2.0 certification and which bulbs fall into the "value LED" category that does not meet

[99] Focus on Energy. "Find Energy Saving Products Online." Available online: www.focusonsaving.com

ENERGY STAR standards. However, not all retailers provided data consistently enough to identify ENERGY STAR qualified bulbs.

The Team also compared customer satisfaction ratings of ENERGY STAR qualified and "value LED" products and compared ratings between participating and nonparticipating retailers to assess customer satisfaction with non-ENERGY STAR qualified products compared with qualified products.

Data Collection

The Team collected data from the following stores in Wisconsin. All retailers have sold program bulbs.

- 20 local stores from a large do-it-yourself retailer (DIY 1)
- 14 stores from another large do-it-yourself retailer (DIY 2)
- 26 stores from one large mass-market retailer (mass-market 1)
- 25 stores from another large mass-market retailer (mass-market 2)

For the first round of data collection, one store was chosen at random as the origin location. The additional stores were selected from the list of stores within a 50-mile radius of the origin store. Stores were selected this way to take advantage of the websites' design, which asks the user to choose a store to see inventory for a selected product. Once the user chooses a store and product, they are able to see inventory at nearby locations for the same product. This process allowed for efficient, reliable data collection. All subsequent rounds of data collection targeted the stores selected during the first round so that the same stores were observed over time.

One large retailer, which accounts for a large share of program LEDs sold in 2017, is not included in this analysis. The retailer's website does not provide the option to view product availability within specific store locations and did not consistently feature program LEDs on its website when the Team was developing the data collection tools.

The Evaluation Team found that prices differed very little between store locations and customer ratings were not store-location specific but rather included ratings from all users who provided ratings on the retailer's site.

Additionally, DIY 1 was the only participating retailer in this market assessment study and was the only retailer for which inventory data was reliably available to allow the Team to compare the share of program LEDs and non-program LEDs within participating stores.

The Team reviewed the data for completeness. These key factors were necessary for a successful analysis:

- Prices (original and sale price)
- Number of packs in stock (for DIY 1 stores only); or available for same day pick up for other retailers
- Date of data collection

- Pack size
- Product identifier (store SKU, model number)
- Brand or manufacturer
- Bulb characteristics (base code, shape code, lumens, specialty type, ENERGY STAR certified, rated watts, color temp, color rendering index, technology, average life hours)

The data collection tool pulled data for all light bulbs, including nonresidential, appliance lights, and decorative/holiday lights. To ensure a meaningful comparison, all bulbs that were not directly comparable to products featured in the Program (tube bulbs, appliance bulbs, heat lamps or black lights, holiday lighting string, bullet shaped bulbs, programmable or connected bulbs) were removed from the data.

Table 139 shows the total number of unique SKUs observed in the data collected from the retailers' websites, the number of SKUs successfully matched from the tracking data, and the number of Program lamp SKUs from the tracking data that could not be matched to web data.

Table 139. Web and Tracking Matching Accuracy

Bulb Shape	Unique SKUs in Web Data	Matched Program SKUs	Unmatched from Tracking Data
A-Line	195	75	4
Decorative/Globe	75	2	17
Reflector	122	72	5

Both reflector and A-line bulbs have a relatively low number of Program lamps with unmatched SKUs in the web data, which suggests that the comparisons of prices and inventory would change little regardless of whether these SKUs were considered as Program or other LEDs. For decorative bulbs, accurately identifying the program LEDs would lead to a more substantial change in the inventory of program lamps or in price comparisons discussed in the following section.

LED Market Characterization

The Team determined market share of LEDs based on each store's on-hand quantity and product item number collected from the website. Table 140 compares the share of available inventory within the 20 DIY 1 stores by bulb shape and technology category—CFL, halogen, incandescent, Program LED, and other LED (LEDs for which the Program did not provide incentives).

The market share of CFL bulbs has decreased markedly as the LED market has matured, suggesting that consumers in the market for efficient lighting are more likely to purchase LED bulbs. The Team did not observe any CFLS in specialty categories (globes and candelabra styles).

Incandescent bulbs were primarily limited to decorative and globe bulbs and accounted for around one-quarter of available inventory of these bulb types.

Table 140. Share of Available Bulb Inventory by Bulb Style and Technology Category

Bulb Style	Technology	Percentage of Inventory	
		October 2017	December 2017
A-Line	CFL	10%	6%
	Halogen	14%	12%
	Incandescent	11%	12%
	Other LED	34%	31%
	Program LED	30%	39%
Decorative Candle	Halogen	18%	12%
	Incandescent	25%	23%
	Other LED	56%	64%
	Program LED	1%	2%
Globe	Halogen	45%	17%
	Incandescent	20%	31%
	Other LED	34%	52%
Reflector	CFL	0.2%	0.3%
	Halogen	38%	22%
	Other LED	44%	42%
	Program LED	18%	35%

Halogen bulbs accounted for a large share of reflector globe bulbs and a smaller share of A-line bulbs. The share of halogen bulbs decreased between October and December 2017 in both the globe and reflector categories and to a lesser degree for decorative bulbs.

The share of Program LEDs in the decorative and globe categories may be underrepresented in these data. These bulb styles were the most difficult to match between the Program tracking data and the data collected from the retailer website. There were multiple products with descriptions that looked very similar to Program product descriptions but there was not enough detail to confirm a match. In total, the Evaluation Team could not match 26 model numbers. Of these, five were reflectors, four were A-line, and 17 were globe/candelabra bulbs.

In the A-line and reflector categories, program LEDs accounted for 18% to 39% of available inventory, and non-program LEDs accounted for 31% to 42% of available bulbs.

LEDs would have accounted for the largest share of any technology category even if the Program LEDs would not have been available absent Program incentives (which is unlikely, as the Evaluation Team has observed many of these products in areas with no residential lighting program). Assuming inventory is a reasonable proxy for sales (retailers would be expected to keep higher levels of inventory for products with high volume sales) the inventory data suggests customers may be equally likely to purchase a Program LED or a non-Program LED.

Bulb Pricing

The Team also compared the average price per bulb across technology categories. Given the large number of unique products available in DIY 1 stores and the wide range of prices observed, the team compared both the mean price per bulb as well as the median price.

Note, DIY 1's website often shows sales prices that include utility incentives if the store location selected is participating in a utility-sponsored residential lighting program. Therefore, the average prices shown in Table 141 do not reflect the full price the Program bulbs would have sold for absent Program incentives.

Because data was collected on only one day in each month, the Evaluation Team is not drawing any conclusions about trends between October and December 2017 since the inventory. Availability is likely to fluctuate between any two days due to restocking or shopping patterns that the Evaluation Team could not observe or identify with only two data points.

Table 141. Average per Bulb Price by Bulb Type and Technology Category – DIY 1

Bulb Shape	Technology	October 2017		December 2017	
		Mean Price per Bulb ($)	Median Price per Bulb ($)	Mean Price per Bulb ($)	Median Price per Bulb ($)
A-Line	CFL	$2.12	$1.74	$2.04	$1.74
	Halogen	$1.70	$1.49	$1.62	$1.49
	Incandescent	$2.97	$2.74	$3.03	$2.97
	Other LED	$3.66	$2.47	$3.85	$2.39
	Program LED	$3.84	$2.35	$3.61	$1.52
Decorative	Halogen	$5.72	$5.97	$6.09	$5.99
	Incandescent	$1.60	$1.24	$1.58	$1.24
	Other LED	$4.26	$2.66	$2.93	$2.98
	Program LED	$6.97	$6.97	$6.97	$6.97
Globe	Halogen	$2.66	$2.66	$2.66	$2.66
	Incandescent	$2.19	$2.32	$2.09	$2.32
	Other LED	$5.56	$4.97	$4.77	$4.66
Reflector	CFL	$2.44	$2.44	$2.44	$2.44
	Halogen	$6.34	$4.99	$6.99	$5.99
	Other LED	$8.34	$5.86	$8.66	$7.44
	Program LED	$8.18	$7.07	$6.58	$4.38

For A-line bulbs, the mean and median prices are comparable between Program and non-Program LEDs in October, though the final Program price may be lower when taking all incentives into account. In December, the median prices for Program LEDs are lower but the mean prices are still comparable. Additionally, the median price is only a dollar more than halogen bulbs. Mean prices of reflector LEDs are also comparable between Program LEDs and non-program LEDs in October, with the median price of Program LEDs higher than non-Program LEDs. In December, both the mean and median prices are lower for Program LEDs. Price tables with the full range of prices per category (minimum, maximum, mean, median, and product counts) are included in Appendix H.

For retailers other than DIY 1, the Evaluation Team was not able to match Program tracking data to the data from retailer websites because inconsistent tracking of model numbers and product characteristics collected from the retailer sites. Therefore, the price comparisons cannot distinguish between Program LEDs and non-Program LEDs.

However, the Team summarized the prices in the Program tracking data, both the final incented price and the original price absent incentives, for bulbs sold at these retailers. This information shows where Program LEDs fall within the options available at each retailer. Additionally, the Team collected data from mass-market 1 stores, which sold Program LEDs in 2016 but not in 2017. This provides a picture of the market absent Program intervention. The following tables walk through these results.

Table 142 compares mean and median prices of A-line bulbs by technology across three retailers and Table 143 compares prices of reflector bulbs. There were no sales of specialty LEDs at these retailers in 2017.

Table 142. Average A-Line Bulb Prices by Retailer and Technology

Retailer	Technology	July 2017		October 2017		December 2017	
		Mean Price per Bulb	Median Price per Bulb	Mean Price per Bulb	Median Price per Bulb	Mean Price per Bulb	Median Price per Bulb
DIY 2	CFL	$3.85	$2.50	$3.85	$2.50	$3.59	$2.50
	Halogen	$2.23	$2.00	$2.18	$2.00	$1.92	$1.79
	Incandescent	$2.50	$1.89	$2.49	$1.89	$1.91	$1.54
	LED	$6.70	$4.98	$6.21	$4.78	$5.82	$4.10
Mass-market 1	Halogen	$2.35	$2.00	$2.35	$2.00	$2.18	$2.00
	Incandescent	$4.60	$2.79	$2.36	$2.50	$2.37	$2.50
	LED	$8.86	$8.10	$9.81	$8.00	$8.59	$6.05
Mass-market 2	CFL	$3.22	$3.94	N/A	N/A	N/A	N/A
	Halogen	$2.39	$1.55	$3.03	$1.55	$3.60	$1.91
	Incandescent	$3.01	$2.56	$1.50	$1.19	$4.80	$2.62
	LED	$5.18	$3.93	$5.46	$3.92	$5.85	$4.75

Mass-market 1 stores have the highest prices across all time periods for LEDs. For bulbs at DIY 2 stores and mass-market 2, the median prices are lower than the mean prices, which means there are a number of high prices bulbs that increase the mean. In all cases, LED prices are at least twice the price of comparable halogen bulbs.

Table 143. Average Reflector Bulb Prices by Retailer and Technology

Retailer	Technology	July 2017		October 2017		December 2017	
		Mean Price per Bulb	Median Price per Bulb	Mean Price per Bulb	Median Price per Bulb	Mean Price per Bulb	Median Price per Bulb
DIY 2	CFL	$4.58	$4.58	$3.49	$3.49	$3.20	$3.20
	Halogen	$6.84	$7.74	$6.34	$6.98	$6.11	$7.09
	Incandescent	$5.00	$4.48	$5.01	$4.48	$4.58	$3.39
	LED	$11.43	$9.98	$10.64	$9.98	$10.15	$8.99
Mass-market 1	Halogen	$7.40	$7.75	$7.55	$7.95	$5.72	$5.51
	Incandescent	$7.50	$6.53	$6.66	$5.00	$6.77	$5.00
	LED	$11.95	$11.10	$11.24	$10.49	$11.67	$10.50
Mass-market 2	CFL	$3.22	$3.94				
	Halogen	$5.61	$4.94	$4.26	$3.90	$8.98	$9.03
	Incandescent	$5.22	$5.22	$2.38	$2.38	$3.48	$3.48
	LED	$6.51	$4.95	$5.54	$4.01	$8.06	$5.80

For reflector bulbs, the difference in price between LEDs and halogen bulbs was less than A-line bulbs, though LEDs were still priced higher, on average. Prices for reflector LEDs at mass-market 2 stores are lower than reflector bulbs at DIY 2 and mass-market 1 stores, which could reflect differences in target demographics between retailers.

Table 144 compares Program LED prices within DIY 2 and mass-market 2 stores. The mean and median prices before incentives in DIY 2 stores were higher than overall A-line LEDs shown in Table 142. The mean and median prices after incentives were still higher than the overall in Table 142 (Average A-Line Bulb Prices by Retailer and Technology). This means that more than half of the A-line LEDs on the shelf in DIY2 stores were cheaper than Program LEDs even after incentives. This is not unexpected because the ENERGY STAR-qualified bulbs tend to have higher rated life hours and prices reflect the costs of testing and meeting ENERGY STAR standards.

Table 144 shows similar findings for A-line LEDs at mass-market 2 stores. The mean prices before incentives are higher than the mean LED prices in Table 142. However, after incentives, the median price of Program bulbs is comparable to the overall median price in Table 142.

And both the mean and median prices of reflectors after incentives in mass-market 2 stores are lower than the median of all reflectors in Table 143. This means that in mass-market 2 stores, Program reflector bulbs are cheaper than 50% of reflectors after incentives.

Table 144. Average Program LED Prices Before and After Incentives

Bulb Type	Retailer	Original Price		Final Incented Price	
		Mean Price per Bulb	Median Price per Bulb	Mean Price per Bulb	Median Price per Bulb
A-Line	DIY 2	$8.71	$6.99	$6.61	$4.49
	Mass-market 2	$4.03	$2.98	$2.60	$1.94
Reflector	Mass-market 2	$6.14	$6.21	$3.83	$3.71

Overall, comparing the prices before and after incentives of Program bulbs to all comparable LEDs (including the Program LEDs since the Evaluation Team could not identify these bulbs at these retailers) shows that the Program LEDs are in the mid-to-upper range of prices of available products. After incentives, prices shift to the mid-to-lower-mid range.

As noted with the DIY 1 price comparisons, price tables with the full range of prices per category (minimum, maximum, mean, median, and product counts) are included in Appendix H

Customer Ratings

Finally, the Evaluation Team compared customer ratings collected from retailer websites. Customer ratings provide a measure of customer satisfaction with each technology and the available options. When non-ENERGY STAR-qualified LEDs first started to gain a foothold in the market, many with a background in utility-sponsored residential lighting programs were concerned about the quality of these "value line" LEDs and did not want customers to have a bad experience with LEDs that would in turn affect their long-term perception of the technology, as had occurred with some customers who used early versions of CFL bulbs.

145 compares the customer ratings across retailer for A-line bulbs by technology.

Table 145. Customer Ratings for A-Line LEDs by Retailer and Technology

Retailer	Technology	Product Count	Minimum Customer Rating	Mean Customer Rating	Maximum Customer Rating
DIY 1	CFL	20	3.30	3.89	4.60
	Halogen	28	1.00	2.54	4.30
	Incandescent	37	1.00	3.62	5.00
	Other LED	68	1.00	3.79	4.90
	Program LED	38	3.00	4.23	5.00
DIY 2	CFL	9	2.50	3.67	4.50
	Halogen	21	1.00	3.69	5.00
	Incandescent	19	1.00	3.29	5.00
	LED	34	1.00	3.91	5.00
Mass-market 1	Halogen	17	1.00	3.52	5.00
	Incandescent	7	2.33	3.69	5.00
	LED	92	1.00	4.21	5.00

Mass-market retailer 2 is not included in this comparison because the Team could not distinguish Program LEDs from non-program LEDs. Mass-market retailer 1 had no Program supported LEDs and

therefore provides a point of comparison for the product assortment absent Program support. DIY 2 includes five models of LEDs that are Program LEDs that the Team could also not distinguish but, given the small number of products and the fact that the Program only supported these products in November and December 2017, Program support had little influence on the assortment of products available at this retailer.

CFL bulbs showed higher minimum ratings than halogen, incandescent, or other LED bulbs and were competitive with Program LEDs.

Ratings for products at DIY 1 stores are the most telling because Program LEDs are distinguished from non-Program LEDs. The minimum rating for non-Program LEDs is lower than the minimum rating for Program LEDs, suggesting some difference in quality between some Program products and those that do not qualify for the Program. However, the average and maximum ratings are more comparable and the average ratings for both Program and non-Program LEDs are higher than halogen bulbs. Assuming customer ratings are a reliable measure, customers are at least as satisfied with most LEDs as with other technologies, even if LEDs have higher up-front costs. If customers were experiencing higher than expected failure rates for LEDs and had the perception that LEDs were not worth the cost, it is likely that this would be seen in greater numbers of low ratings for LED bulbs.

Market Assessment Conclusions

Overall, LEDs have a strong presence in the market and there are a large number of products available at most retailers. Prices are slightly higher for some LEDs than other technologies without Program incentives, but there are a number of competitively priced products in the market. And, overall LEDs appear to be competitive with less efficient products even with a slightly higher price point. Customers appear to be highly satisfied with LEDs, even with LEDs that do not qualify for Program incentives according to ratings of products at DIY 1 stores.

Historical support from utility-sponsored programs has likely helped speed the maturation of the LED market, but the market appears to reaching a stable point where national brands that have traditionally focused on ENERGY STAR bulbs now have “value” bulbs. Consumers appear satisfied with LEDs, regardless of whether the bulbs are program-qualified. Prices are more competitive with less efficient technologies and the share of available products is heavily geared toward LEDs across retailers, even those with no current Program support.

Although it is impossible to assess the rate to which LED sales would slow if Program support ended, results from this study suggest that the degree to which the LED market is dependent on Program support is decreasing.

Annual Results from Customer Satisfaction Surveys

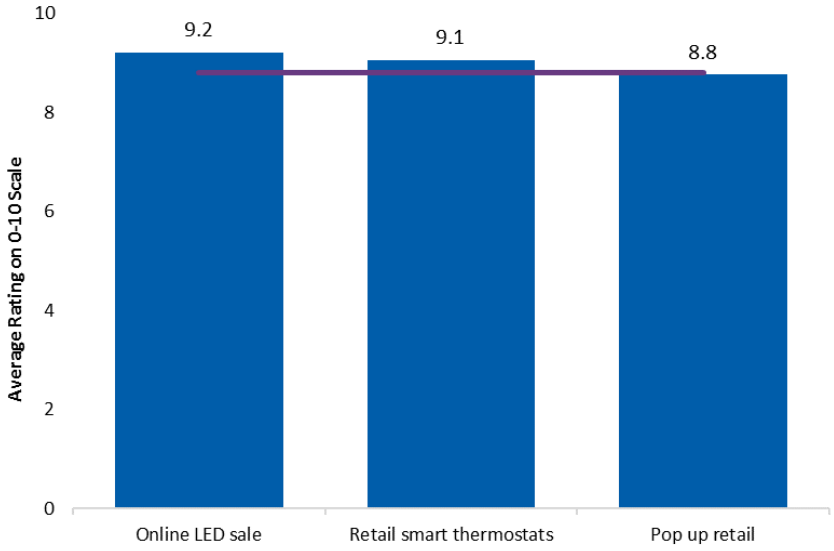
The Evaluation Team began surveying Retail Lighting and Appliance Program participants in CY 2017 to measure their satisfaction with three Program components:

- Online LED sale (a one-time promotional event)
- Retail smart thermostats
- Pop-up retail events

Respondents answered questions related to satisfaction and likelihood on a scale of 0 to 10, where 10 indicated the highest satisfaction or likelihood and 0 the lowest.

Figure 79 shows the overall satisfaction ratings from Retail Lighting and Appliance Program participants for the three Program components. The CY 2017 average satisfaction ratings for the online LED sale (9.2) and retail smart thermostats (9.1) were significantly higher than the portfolio baseline, while pop-up retail (8.8) was statistically equivalent to the baseline. [100]

Figure 79. CY 2017 Overall Satisfaction with Retail Lighting and Appliance Program Components

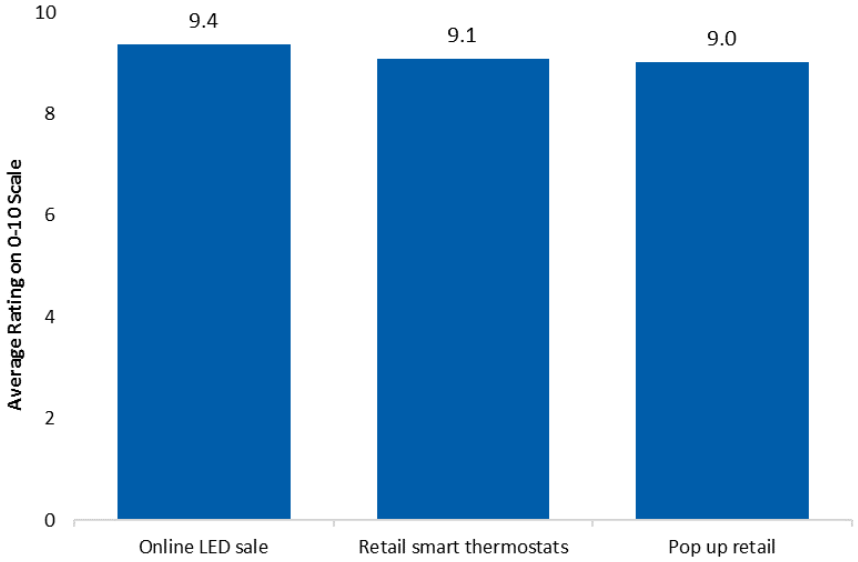


Sources: Online LED Sale Satisfaction Survey Question: "Overall, how satisfied are you with the Focus on Energy online LED lighting promotion that you participated in on November 28?" (n=896); Retail Smart Thermostat Customer Satisfaction Survey Question: "Overall, how satisfied are you with the Focus on Energy program?" (n=671); and Pop-Up Retail Customer Satisfaction Survey Question: "Overall, how satisfied are you with the Focus on Energy sale that you participated in?" (n=148)
The portfolio baseline (8.8) is indicated by a purple line.

[100] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015–2018 quadrennium).
$p < 0.05$ using binomial t-tests.

Figure 80 shows that Retail Lighting and Appliance Program participants were satisfied with the Program equipment they purchased. Online LED sale participants rated their satisfaction with the LEDs they purchased as a 9.4, retail smart thermostat participants rated their thermostat satisfaction as a 9.1, and pop-up retail participants rated their satisfaction with item they purchased as a 9.0.

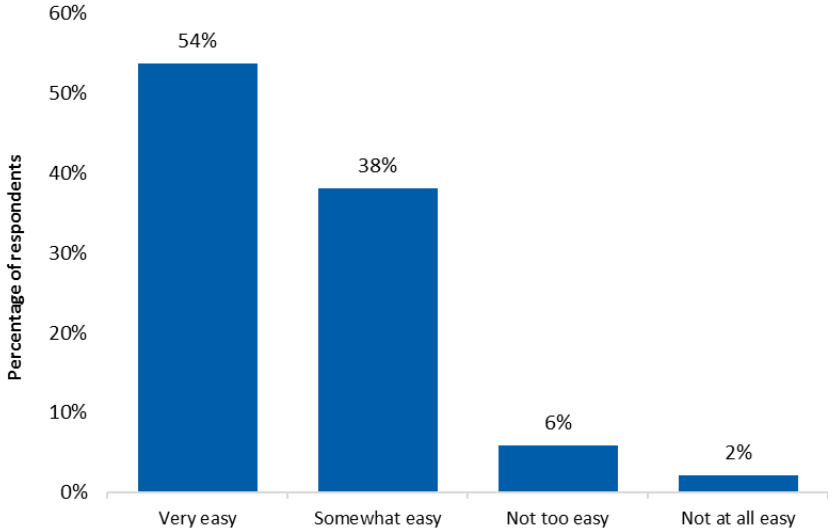
Figure 80. CY 2017 Satisfaction with Measures for Retail Lighting and Appliance Program Components



Sources: Online LED Sale Satisfaction Survey Question: "How satisfied are you with the energy efficient light bulbs you received?" (n=830); Retail Smart Thermostat Customer Satisfaction Survey Question: "How satisfied are you with the smart thermostat you purchased?" (n=664); and Pop-Up Retail Customer Satisfaction Survey Question: "How satisfied are you with the energy-efficient product(s) you purchased?" (n=144)

Retail smart thermostat survey respondents were asked how easy it was to install their smart thermostat. Figure 81 indicates that most (54%) found their smart thermostat "*very easy*" to install, and only 8% reported that it was either *"not too easy*" or "*not at all easy*."

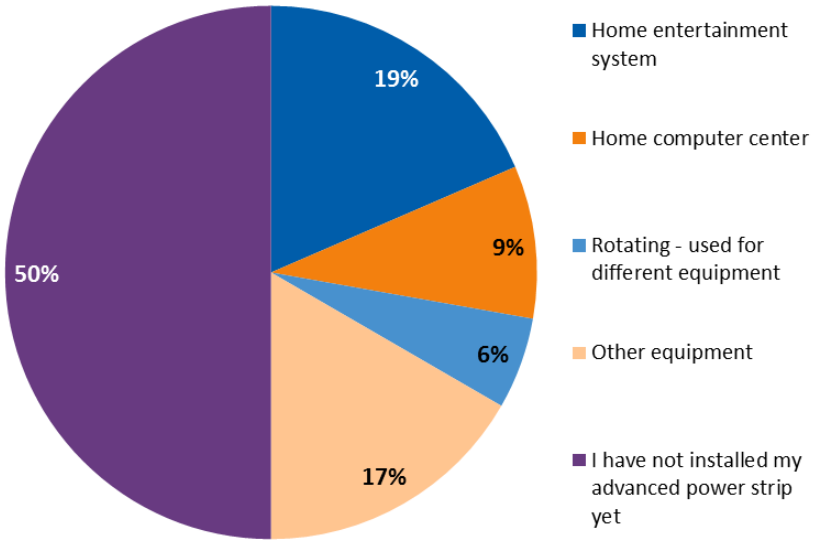
Figure 81. CY 2017 Retail Smart Thermostat Customers – Ease of Installing Thermostat



Source: Retail Smart Thermostat Customer Satisfaction Survey Question: "How easy was it to install your smart thermostat?" (n=658)

Pop-up retail customers who purchased advanced power strips were asked what equipment they had plugged into them. Half (50%) had not started using their power strips by the time they were surveyed, while home entertainment systems (19%) and home computers (9%) were the most common types of equipment plugged into power strips purchased through the program (Figure 82).

Figure 82. CY 2017 Pop-Up Retail Customers – Advanced Power Strip Installation

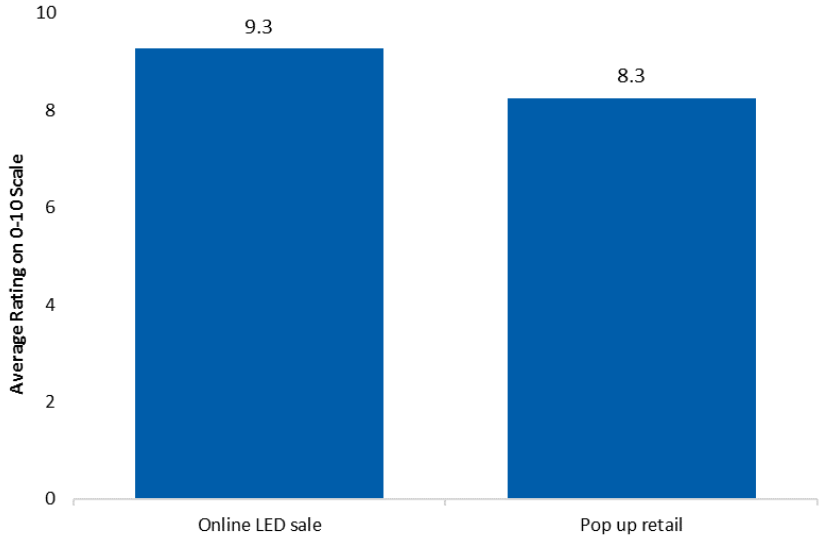


Source: Pop-Up Retail Customer Satisfaction Survey Question: "If you purchased an advanced power strip, what equipment is it plugged into?" (n=54).

Figure 83 shows that online LED sale participants were very satisfied with their online shopping experience (giving an average satisfaction rating of 9.3), while pop-up retail participants were relatively less satisfied with their shopping experience (giving an average satisfaction rating of 8.3).

Retail smart thermostat participants were not asked an equivalent question, though they did rate their satisfaction with the incentive they received through the CY 2017 Program as an average of 8.6.[101]

Figure 83. CY 2017 Satisfaction with Shopping Experience for Retail Lighting and Appliance Program Components



Sources: Online LED Sale Satisfaction Survey Question: "How satisfied are you with the online experience for purchasing the bulbs?" (n=900) and Pop-Up Retail Customer Satisfaction Survey Question: "How satisfied are you with the event experience for purchasing the energy efficient products?" (n=152). Retail smart thermostat participants were not asked an equivalent question.

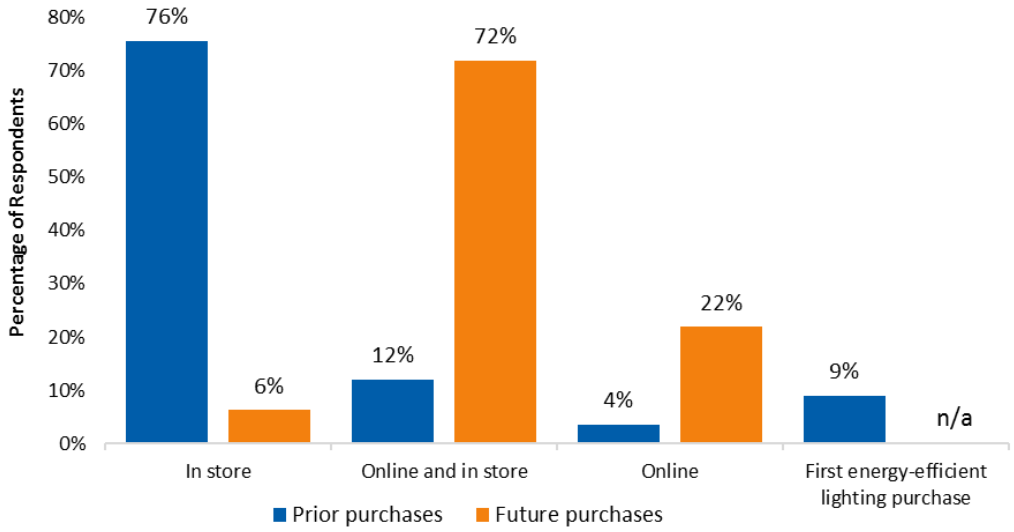
The Evaluation Team asked online LED sale and pop-up retail survey respondents if they were aware that Focus on Energy offered instant discounts on lighting from participating retailers, and only 12% (n=886) of online LED sale and 24% (n=144) of pop-up retail respondents were aware of the discounts.

The Evaluation Team asked online LED sale respondents asked where they had previously purchased efficient lighting, and where they would consider shopping for efficient lighting in the future. Figure 84 indicates a significant shift between participants' previous efficient lighting purchases and the channels they would consider in the future. Combining the responses for making purchases online exclusively and making purchases both at the store and online, only 16% of respondents had purchased any efficient lighting online before the online LED sale, while 94% would consider online purchases in the future after having participated in the online sale.

[101] Source: Retail Smart Thermostat Customer Satisfaction Survey Question: "How satisfied are you with the amount of incentive you received?" (n=675)

Only 6% of respondents intend to shop for efficient lighting exclusively in stores in the future, while 76% had previously purchased efficient lighting exclusively from stores. Just 4% of respondents reported that they had previously purchased efficient lighting exclusively online, while 22% said they would shop exclusively online in the future. Another 9% of respondents had never purchased efficient lighting prior to the online LED sale.

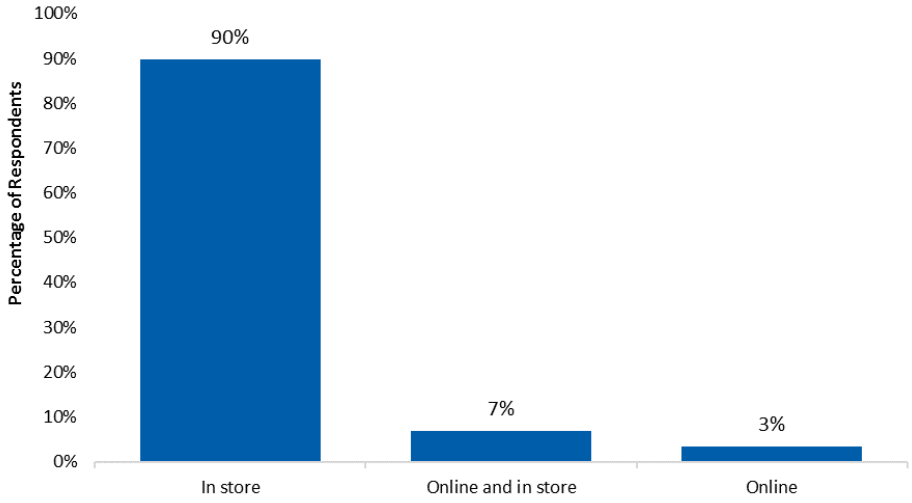
Figure 84. CY 2017 Online LED Sale Customers' Prior Efficient Lighting Purchases and Future Purchase Preferences



Source: Online LED Sale Satisfaction Survey Questions: "Prior to this purchase, where have you bought energy efficient lighting in the past? Energy efficient lighting includes CFLs and LEDs." (n=903) and "In the future, will you prefer to purchase energy efficient bulbs in-store or online?" (n=904).

Pop-up retail participants were also asked about their previous efficient lighting purchases but not about their future purchase intentions. Figure 85 shows that 90% of these customers had previously purchased efficient lighting exclusively in stores, while 3% had purchased efficient lighting exclusively online and 7% had purchased through both channels.

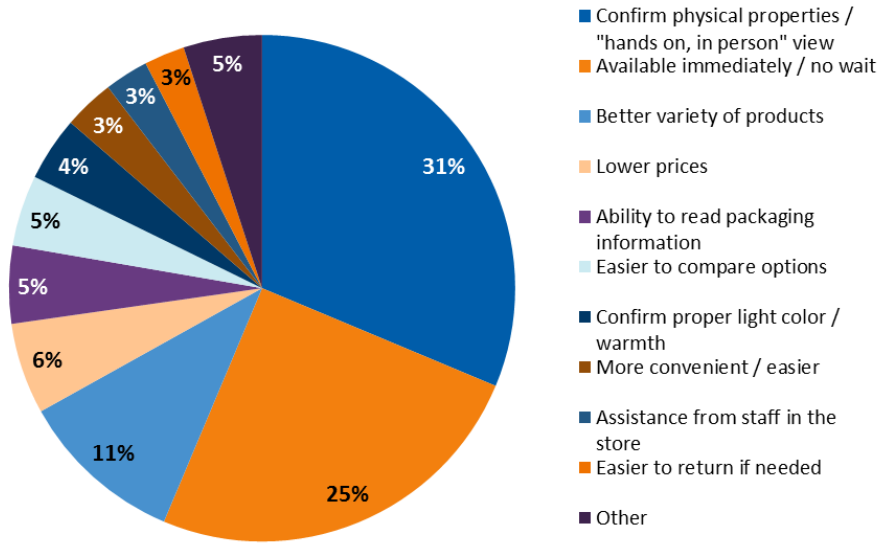
Figure 85. CY 2017 Pop-Up Retail Customers' Prior Efficient Lighting Purchases



Source: Pop-Up Retail Satisfaction Survey Question: "Prior to this purchase, where have you bought energy efficient lighting in the past?" (n=147).

The Evaluation Team asked online LED sale respondents who indicated that they would make future efficient lighting purchases from stores, or who would consider both store and online purchases, what they preferred about the in-store shopping experience relative to online shopping. The Team coded responses from 429 customers who answered the question into 465 mentions, shown in Figure 86. Nearly one-third (31%) mentioned the benefit of getting a "hands on" or "in person" view of products when in the store to confirm the physical properties such as size and appearance. Another one-quarter (25%) mentioned the benefit of acquiring the products immediately from the store and not having to wait on shipping. The variety of products available (11%) and lower prices (6%) were also mentioned as benefits of in-store shopping.

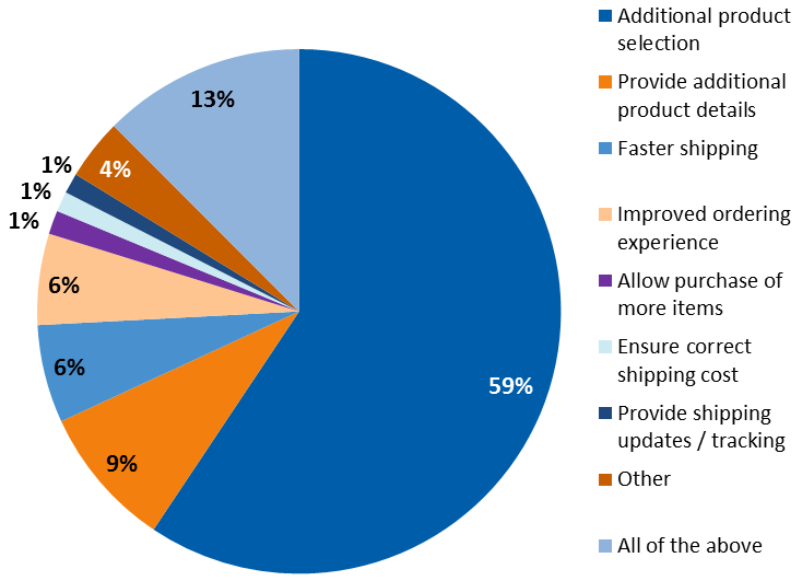
Figure 86. CY 2017 Online LED Sale Customers' Reasons for Preferring In-Store to Online Shopping



Source: Online LED Sale Satisfaction Survey Question: "What do you like better about the in-store experience over the online purchasing experience?" (n=465 mentions)

The Evaluation Team asked online LED sale respondents how their online experience could have been improved. Nearly half (46%; n=897) selected the response option "nothing needed improvement," while the remaining 480 respondents made suggestions which are shown in Figure 87. Overwhelmingly, respondents wanted a larger selection of products (59%), followed by wanting additional product details (9%), faster shipping (6%), and improvements to the ordering process (6%). Thirteen percent suggested that every aspect of the experience could be improved (selecting "all of the above").

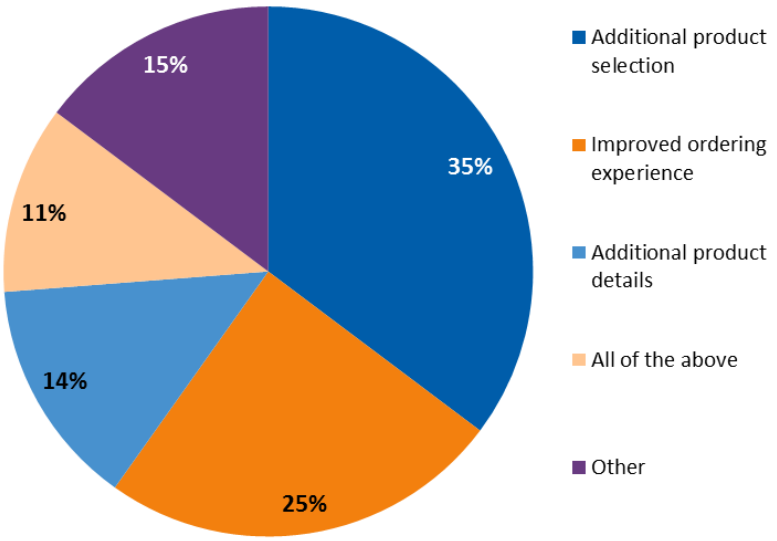
Figure 87. CY 2017 Online LED Sale Customers' Suggestions for Improving the Online Experience



Source: Online LED Sale Satisfaction Survey Question: "How could the online experience have been improved for you?" (n=480)

The Evaluation Team asked pop-up retail respondents how their online experience could have been improved. More than one-quarter (29%; n=149) selected the response option "nothing needed improvement," while the remaining 107 respondents made 122 suggestions, shown in Figure 88. Offering additional product selection (35%) was the most frequent response, followed by improving the ordering experience (25%) and providing more detailed information about products (14%). Another 11% of respondents reported that all these aspects could be improved (selecting "all of the above").

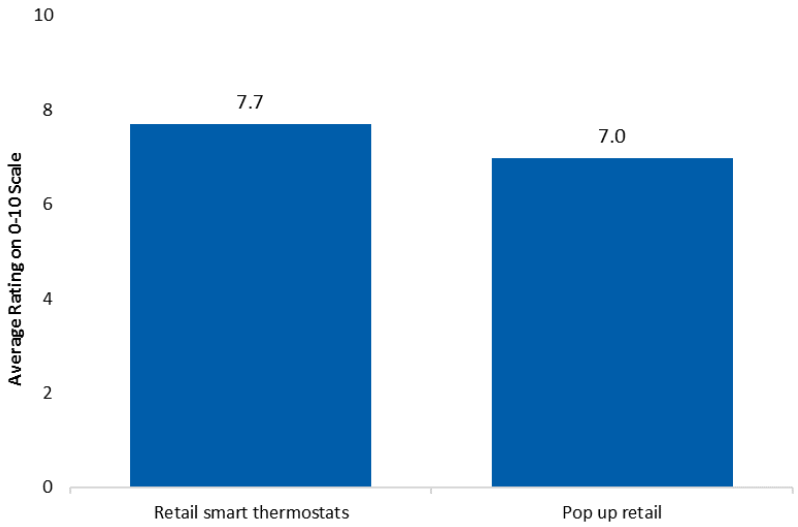
Figure 88. CY 2017 Pop-Up Retail Customers' Suggestions for Improving the Event Experience



Source: Pop-Up Retail Satisfaction Survey Question: "How could the event experience have been improved for you?" (n=122 mentions)

Figure 89 shows that Retail smart thermostat participants gave an average rating of 7.7 for their likelihood to initiate more improvements in the next year, while pop-up retail participants gave average ratings of 7.0. Online LED sale participants were not asked an equivalent question.

Figure 89. CY 2017 Likelihood of Initiating Energy Efficiency Improvements for Retail Lighting and Appliance Program Components

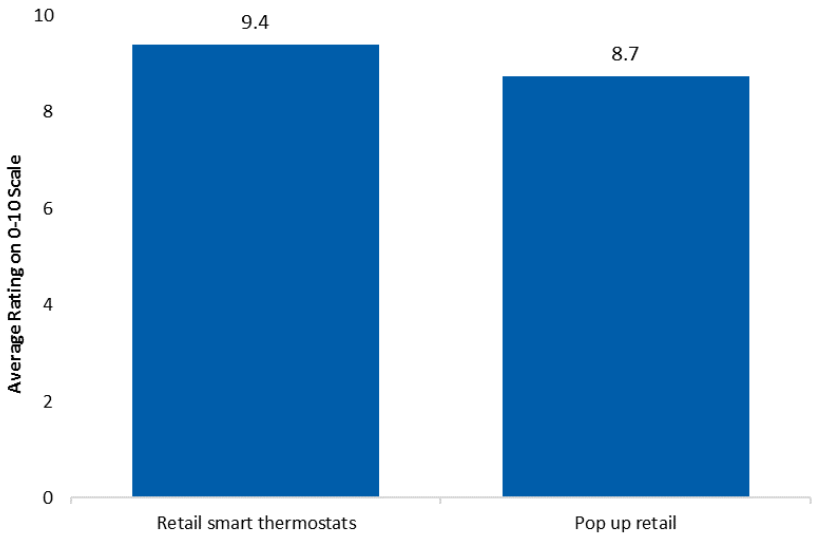


Sources: Retail Smart Thermostat Customer Satisfaction Survey Question: "How likely are you to initiate an energy efficiency improvement in the next 12 months?" (n=608) and Pop-Up Retail Customer Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (n=143). Online LED sale participants were not asked an equivalent question.

Figure 90 shows that retail smart thermostat participants gave an average rating of 9.4 for their likelihood of recommending the Program, while pop-up retail participants gave an average rating of 8.7 for recommending Focus on Energy.[102] Online LED sale participants were not asked an equivalent question.

[102] Customers who said they have already recommended the Program or Focus on Energy are counted in mean ratings as a rating of 10 (most likely).

Figure 90. CY 2017 Likelihood of Recommending the Program for Retail Lighting and Appliance Program Components



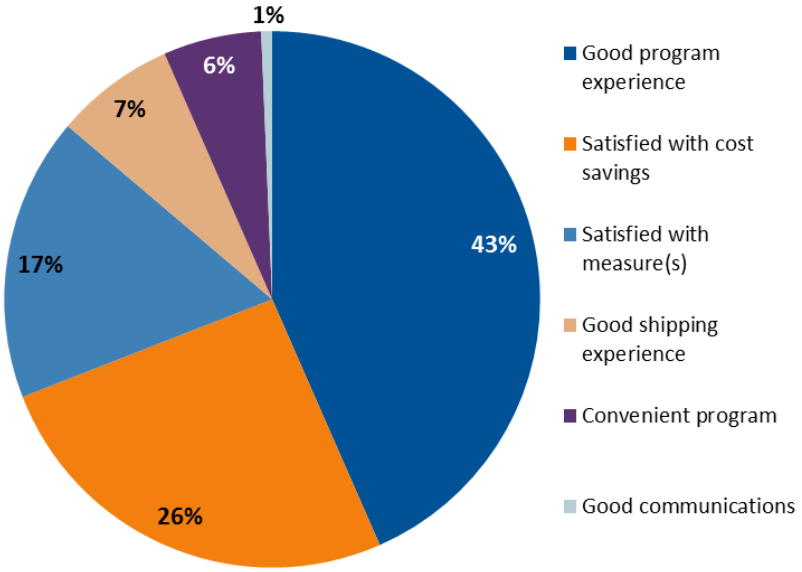
Sources: Retail Smart Thermostat Customer Satisfaction Survey Question: "How likely is it that you would recommend the Focus on Energy program to others?" (n=672) and Pop-Up Retail Customer Satisfaction Survey Question: "How likely is it that you would recommend Focus on Energy to others?" (n=151). Online LED sale participants were not asked an equivalent question.

Using these survey data, the Evaluation Team calculated a net promoter score (NPS) based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6). The retail smart thermostats NPS is +82, based on 86% of participants identifying as promoters and 4% identifying as detractors. The pop-up retail NPS is +58, based on 68% of participants identifying as promoters and 10% identifying as detractors.

During the customer satisfaction surveys, the Evaluation Team asked respondents if they had any comments or suggestions for improving the Program. Of the 909 participants who responded to the online LED sale survey, 272 (30%) provided open-ended feedback, which the Evaluation Team coded into a total of 329 mentions. Of these mentions, 152 (46%) were positive or complimentary comments, and 177 (54%) were suggestions for improvement.

Positive comments about the online LED sale are shown in Figure 91, with most comments reflecting a generally good experience (43%), satisfaction with cost savings (26%), and satisfaction with the measures purchased (17%).

Figure 91. CY 2017 Positive Comments about Online LED Sale

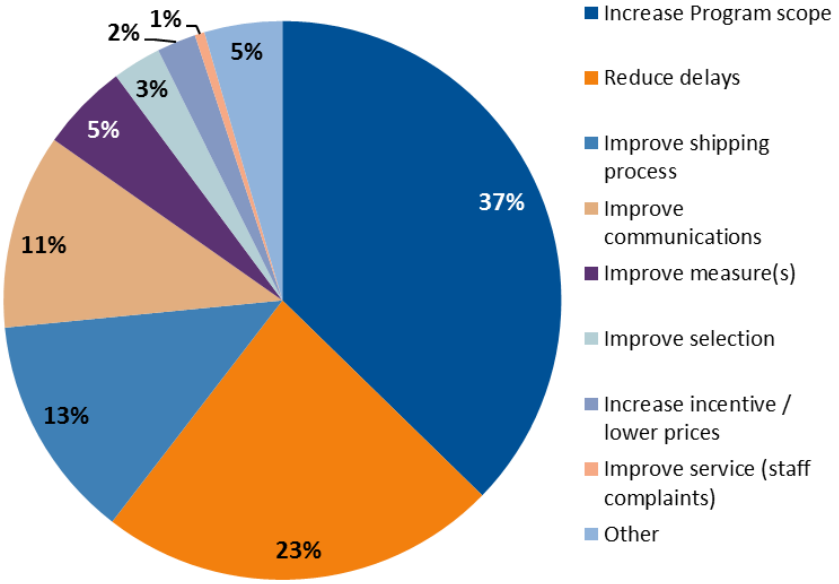


Source: Online LED Sale Customer Satisfaction Survey Question: "Please tell us more about your experience or any additional suggestions for improvement." (n=152 positive mentions)

Suggestions for improving the online LED sale are shown in Figure 92. The most common suggestions were to increase the Program scope (37%), reduce delays in order processing and shipping (23%), improve the shipping process, and improve communications (11%).

Respondent suggestions about Program scope were requesting LEDs with both higher and lower wattages, different colors and shapes, and additional specialty types such as three-way and exterior lighting. Customers with suggestions to improve the shipping process often referred to additional shipping charges the post office had requested upon delivery, though some also mentioned damaged packaging and products. Comments about communications often requested more follow-up after placing an order, particularly when shipments were delayed or there were other issues such as receiving the wrong type or quantity of items. A few respondents also suggested that initial communications should prominently feature logos from energy providers as an assurance of the Program's validity.

Figure 92. CY 2017 Suggestions for Improving Online LED Sale

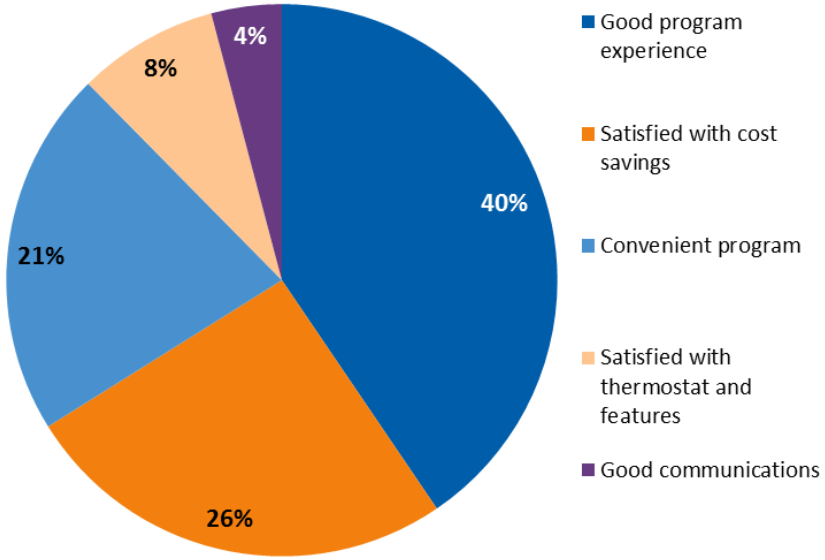


Source: Online LED Sale Customer Satisfaction Survey Question: "Please tell us more about your experience or any additional suggestions for improvement." (n=177 suggestions for improvement)

Of the 675 participants who responded to the retail smart thermostat survey, 196 (29%) provided open-ended feedback, which the Evaluation Team coded into a total of 243 mentions. Of these mentions, 121 (50%) were positive or complimentary comments, and 122 (50%) were suggestions for improvement.

Positive comments about retail smart thermostats are shown in Figure 93, with most comments reflecting a generally positive Program experience (40%), satisfaction with cost savings (26%), and the convenience of participating in the Program (21%).

Figure 93. Positive Comments about CY 2017 Retail Smart Thermostats

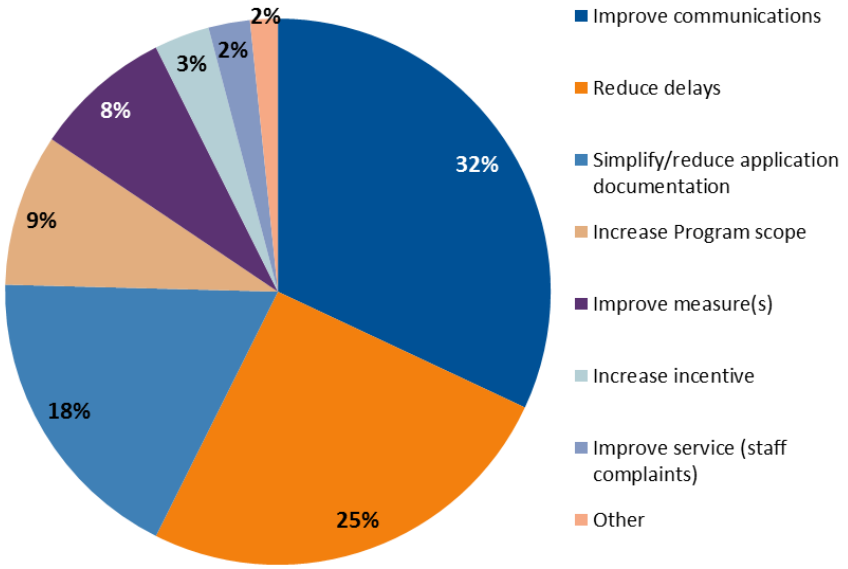


Source: Retail Smart Thermostat Customer Satisfaction Survey Question: "Please tell us more about your experience and any additional suggestions for improvement." (n=121 positive mentions)

Suggestions for improving the retail smart thermostat component of Retail Lighting and Appliance Program are shown in Figure 94. The most common suggestions were to improve communications (32%), reduce delays in rebate processing (25%), and simplify and reduce the documentation required to apply for the rebate (18%).

Suggestions for improving communications included increasing awareness by marketing the rebate more widely, improving the navigability of the website, and providing more and better follow up to applications and customer inquiries. Suggestions about simplifying application documentation frequently referred to difficulties uploading receipts to the website and to the Program's acceptance of electronic proofs of purchase, particularly for thermostats purchased directly from Nest and Ecobee.

Figure 94. CY 2017 Suggestions for Improving Retail Smart Thermostats

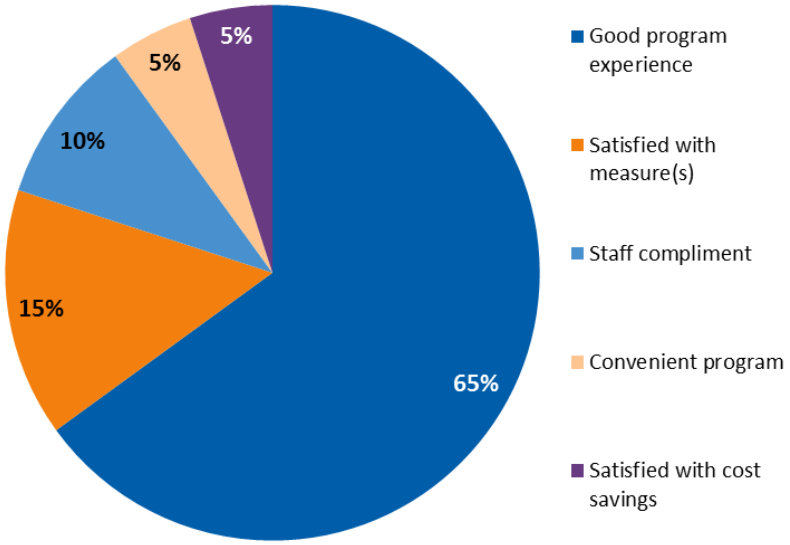


Source: Retail Smart Thermostat Customer Satisfaction Survey Question: "Please tell us more about your experience and any additional suggestions for improvement." (n=122 suggestions for improvement)

Of the 153 participants who responded to the pop-up retail survey, 59 (39%) provided open-ended feedback, which the Evaluation Team coded into 66 total mentions. Of these mentions, 20 (30%) were positive or complimentary comments, and 46 (70%) were suggestions for improvement.

Positive comments about the pop-up retail event are shown in Figure 95, with most comments reflecting a generally positive Program experience (65%), followed by satisfaction with the measures purchased (15%).

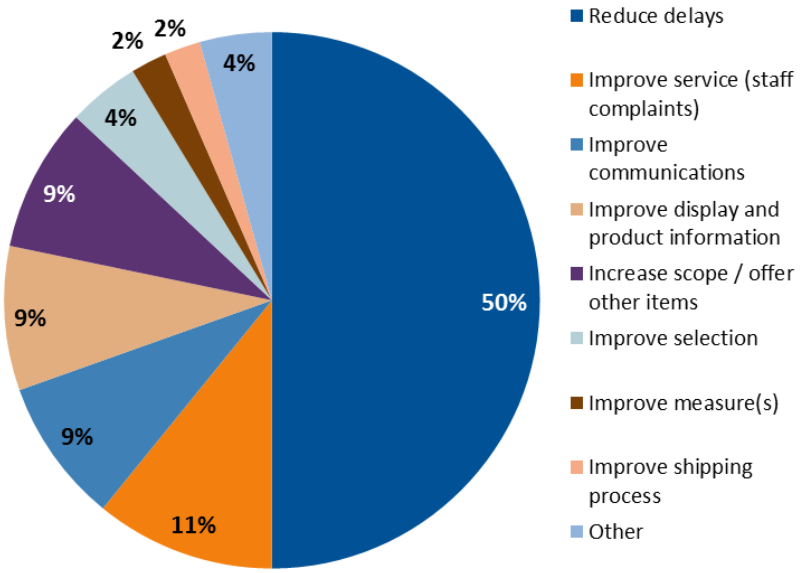
Figure 95. CY 2017 Positive Comments about Pop-Up Retail Event



Source: Pop-Up Retail Customer Satisfaction Survey Question: "Please tell us more about your experience or any additional suggestions for improvement." (n=20 positive mentions)

Suggestions for improving the pop-up retail event are shown in Figure 96; half of these suggestions were to reduce delays in placing and picking up orders (50%), with some customers reporting that the entire process took as long as an hour. Five comments (11% of 46) suggested improving customer service: three of these stemmed from orders that were not fulfilled correctly and two from the demeanor of staff at the event.

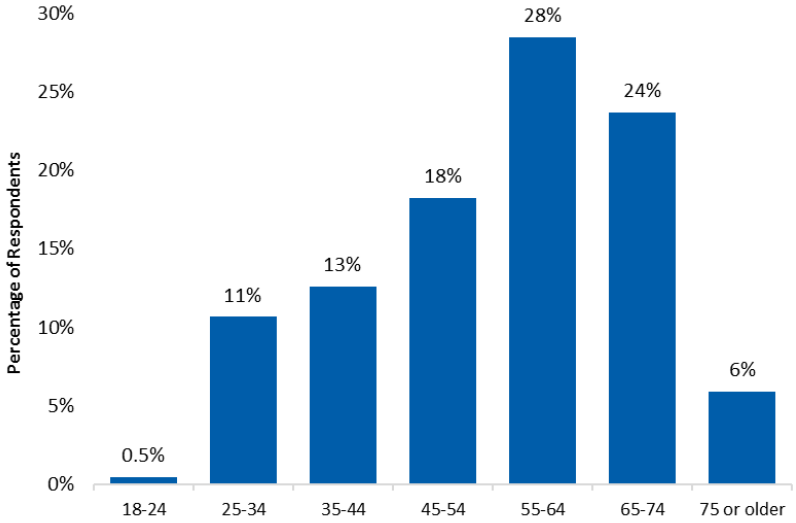
Figure 96. CY 2017 Suggestions for Improving Pop-Up Retail Event



Source: Pop-Up Retail Customer Satisfaction Survey Question: "Please tell us more about your experience or any additional suggestions for improvement." (n=46 suggestions for improvement)

The Evaluation Team asked online LED sale satisfaction survey respondents how old they were (Figure 97). The median and modal response for respondent ages was 55 to 64 years old.

Figure 97. CY 2017 Online LED Sale – Respondent Age Distribution



Source: Online LED Sale Survey Question: "Which of the following categories best represents your age?" (n=882)

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the total resource cost (TRC) test. Appendix F includes a description of the TRC test.

Table 146 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Retail Lighting and Appliance Program.

Table 146. Retail Lighting and Appliance Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$9,197,123	$8,439,351	$8,299,005

The Evaluation Team found that the CY 2017 Retail Lighting and Appliance Program was cost-effective (with a TRC B/C ratio of 5.83). Table 147 lists the evaluated costs and benefits.

Table 147. Retail Lighting and Appliance Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$1,042,219	$982,240	$772,876
Delivery Costs	$2,376,723	$2,239,945	$1,762,503
Incremental Measure Costs	$16,425,723	$27,050,675	$7,799,306
Total Non-Incentive Costs	**$19,844,664**	**$30,272,860**	**$10,334,685**
Benefits			
Electric Benefits	$97,771,265	$115,493,355	$80,312,783
Gas Benefits	$1,171,688	$0	$0
Emissions Benefits	$16,756,088	$20,972,436	$16,566,153
Total TRC Benefits	**$115,699,041**	**$136,465,790**	**$96,878,936**
Net TRC Benefits	**$95,854,377**	**$106,192,931**	**$86,544,251**
TRC B/C Ratio	**5.83**	**4.51**	**9.37**

Retail Products Platform

The Program Administrator launched the RPP as a pilot in the summer of CY 2016. The RPP is a nationwide, midstream collaboration between energy efficiency Program sponsors (such as Focus on Energy), participating retailers, and the U.S. Environmental Protection Agency (EPA). The goal of the RPP is to increase the sales of ENERGY STAR products, with the long-term goal of allowing energy efficiency Program sponsors to capture energy savings from appliances sold in retail outlets and to find efficiencies in Program and incentive delivery by collaborating nationwide on evaluation, measurement, and verification; data management; product specification; marketing; and outreach.

Retail Products Platform Design

According to the ENERGY STAR website, the RPP is currently offered in a pilot stage in 12 states, has eight Program sponsor partners, includes six retail partners,[103] and sells efficient products at 1,211 stores. In Wisconsin, efficient products are sold at 109 stores, including the following outlets:

- Best Buy (22)
- Home Depot (27)
- Kmart (14)
- Sears (11)
- Independent retailers (35)

The RPP operates by delivering incentives to participating retailers to promote and sell qualified products. The goal of the RPP is to accelerate the stocking of energy-efficient appliances by engaging

[103] Retailers include Best Buy, Home Depot, Kmart, Sears, Nationwide Marketing Group, and Lowe's.

directly with key, national-level retailer decision makers. In the long term, the RPP is intended to transform the market such that the purchase of efficient appliances becomes standard practice.

Program Changes

In CY 2017, the Nationwide Marketing Group was added as an RPP retail partner. Nationwide is a marketing and buying organization serving independent retailers.

Additionally, the RPP added several products and shifted the efficiency tiers for existing products. Table 148 shows the products incented through the RPP in CY 2017.

Table 148. Retail Products Platform Qualifying Products and Specifications in CY 2017

Qualifying Product	Tier	Specification
Soundbar	Basic	ENERGY STAR v3 + 15%
	Advanced	ENERGY STAR v3 + 50%
Air Cleaner	Basic	ENERGY STAR v1.2 + 30%
	Advanced	ENERGY STAR v1.2 + 50%
Freezer	Basic	ENERGY STAR v5
	Advanced	ENERGY STAR v5 + 5%
Electric Dryer	Basic	ENERGY STAR v1
	Advanced	ENERGY STAR Most Efficient 2017
Room AC	Basic	ENERGY STAR v4
	Advanced	ENERGY STAR V4 + connectivity
Clothes Washer	Basic	ENERGY STAR Most Efficient 2017
	Advanced	ENERGY STAR Most Efficient 2017 + 5%
Refrigerator	Basic	ENERGY STAR v5
	Advanced	ENERGY STAR Most Efficient 2017

Program Management and Delivery Structure

Program partners meet in a regular workgroup to decide measure offerings and incentive levels and to receive updates from participating retailers. The EPA initiated and facilitates the RPP, and the consultant Navitas manages the day-to-day activities of the workgroup, including communication with retailers. The Program Implementer represents Focus on Energy at these workgroup meetings. Whereas the Retail Lighting and Appliance Program is intended to reduce the price-point of energy-efficient lighting and appliances, the RPP is focused on increasing the number of ENERGY STAR products stocked at retailers. Accordingly, the Program Implementer does not verify product prices at the RPP's participating retail locations.

Program Goals

The goals of the RPP are to expand product offerings and to find innovative ways to capture energy savings with appliances. Although the initiative has no formal savings goal, the Program Implementer tracked six KPIs. In CY 2017, the Program Implementer accomplished four of these goals (two goals were not reported in the final CY 2017 report submitted to the Program Administrator, as illustrated in Table 149).

Table 149. CY 2017 Retail Products Platform Key Performance Indicators

Desired Outcome	KPI	Goal	CY 2017 Result
Capture and capitalize on new market opportunities.	Continue to participate in the nationally coordinated ENERGY STAR RPP pilot.	Continue to support Focus on Energy's participation in the RPP.	**Accomplished**: Program Implementer supported Focus on Energy's participation in the RPP.
	Conduct self-surveys across products being promoted through the RPP to recommend Program adjustments based on market conditions.	Conduct at least two self-surveys annually for RPP products.	**Not Reported**
Expand participation for all eligible customers while achieving cost-effective savings.	Add two products to the RPP.	By Q2, add two products to the RPP, if approved by the collaborative.	**Accomplished**: Added clothes washers and refrigerators in CY 2017.
Provide superior Trade Ally experience.	Provide year-end reporting by percentages to key Trade Ally partners to highlight their contribution to RPP energy-savings achievement.	Provide year-end reporting for key Trade Allies (retailers and manufacturers).	**Not Reported**
Build affinity and support for Focus on Energy.	Through enhancements to Focus on Energy's Online Marketplace and by offering additional marketing, increase customer traffic to the tool by 8%.	Increase traffic to Online Marketplace by 8%.	**Accomplished**: Increased traffic by 219%.
	Cross-promote programs throughout the Focus on Energy portfolio to existing customers who already have participated.	Design a minimum of two promotions to encourage existing customers to engage with other programs in Focus on Energy's portfolio.	**Accomplished**: Conducted cross-promotion on appliance marketplace and appliance recycling websites, as well as in bill inserts.

Note: The KPI goals and results listed in this table are based on reports regularly submitted by the Program Implementer.

Data Management and Reporting

RPP unit-level sales data are tracked in SPECTRUM. Retailers upload sales data directly to a portal maintained by the Program Implementer, which uploads shipment data and reviews the data imported by the retail partner before uploading it to SPECTRUM.

Marketing and Outreach

The Program Implementer conducts marketing and outreach at participating RPP locations in coordination with marketing for the Retail Lighting and Appliance Program. Program representatives visit participating retail locations to display POS material, interact with sales staff, and cross-promote Retail Lighting and Appliance Program and RPP products.

According to the Program Implementer, the RPP sales material have the same look and feel as the Retail Lighting and Appliance Program sales materials. The Program Implementer also conducts digital and social media advertisement focused on ENERGY STAR products and developed two direct mail advertisements. Additionally, Focus on Energy marketed the RPP through the online marketplace, as described above.

Preliminary Analysis

Although no savings are being claimed in CY 2017 for the RPP Program, the Evaluation Team conducted some preliminary analysis to ensure evaluability of gross savings for CY 2018. The preliminary analysis tasks included the following:

- Review of unit energy consumption (UEC) and unit energy savings (UES) values tracked in the data portal maintained by the Program implementer.
- Comparing quantities reported in the implementer data portal to those reported in SPECTRUM
- Estimating a high-level net-lift in market share of qualified products by retailer
- Review of shelf-stocking data collected by the program implementer
- Preliminary review of market characterization data

UEC Review

The UEC values represent the baseline consumption for a given product whereas the UES values are the difference between the baseline UEC and the UEC for basic or advanced tier Program-qualified products. UECs have a variety of sources, depending on the product, including using a TRM or the Database of Energy Efficiency Resources as a secondary source, primary product analysis undertaken by the implementer, or applying the reported UEC for each product.

Given that many of these savings or UEC sources rely on model-specific information, the Evaluation Team was not able to replicate the UECs for baseline or qualified products. The primary limitation to this level of verification is the national structure of the RPP program and the confidentiality restrictions that retailers place on the data evaluators can access in the portal. The portal does not include any characteristics for each model number, other than the tier, that could be used as inputs to savings equations. Similarly, SPECTRUM does not report quantities of specific model numbers sold.

Savings are reported in the portal by tier, retailer, and time-period (month/year) but include only retail product line detail (refrigerator, freezer, air conditioner, etc.) rather than model-specific quantities. Without such model-specific quantities, the Evaluation Team is unable to replicate claimed savings within any given month. The Evaluation Team will initiate discussions on this topic within the national RPP EM&V working group in 2018 to encourage improvements in the transparency and replicability of savings.

Quantity Review

The Evaluation Team attempted to reconcile the quantities in the implementer's data portal with those reported in SPECTRUM. SPECTRUM includes records for each retail-partner by time period, product

category, and tier, with a total quantity of qualified units for each time period. These records correspond with a "SPECTRUM Application Name" field that includes the month and year in which the qualified products sold.

The implementer's data portal includes a "Qualifying Sales Total" report that includes the retailer, product category, tier, total qualified sales, and total incentives. Those using the portal can filter and export the report for a given month, but each month's report must be filtered and exported manually.

Once the reports were all collected and compiled, the monthly totals from the portal were matched to SPECTRUM by retailer, product category, tier, and time period. SPECTRUM distinguishes between gas and electric measures for some product categories and reports each separately within an application name. The portal data does not distinguish between the two and reports quantities and savings by product category and tier for each month. The Team summed the quantities reported in SPECTRUM to collapse across the gas and electric measures within product categories and application name to try to match the level of aggregation in the portal. Discrepancies remained and the Team was not able to replicate all of the quantities in SPECTRUM.

Table 150 shows the unit counts tracked in SPECTRUM and the matched quantities from the Program Implementer's data portal. The counts are similar but do not align exactly within any of the product categories, and overall the portal quantities are lower by 3,507 units. The Evaluation Team has brought the count discrepancies to the attention of the Program Implementer and will coordinate with it to improve reporting, which should benefit reconciling unit quantities in CY 2018.

Table 150. RPP Program Preliminary Savings to Date

Product	Actual Units	Portal Qty	Preliminary kWh	Preliminary Therms	Preliminary kW	Net Lift Estimate	Net Savings kWh	Net Therms	Net kW
Air Cleaner	1,026	767	389,167	-	-	-12%	(47,553)	-	-
Air Conditioner	3,324	1,927	193,485	-	-	7%	14,389	-	-
Clothes Washer	9,216	8,484	1,164,504	31,670	187	15%	179,246	4,875	29
Dryer	14,123	12,427	1,696,987	11,693	205	19%	322,448	1,789	41
Freezer	2,467	2,212	92,224	(2,136)	17	3%	2,847	(77)	1
Refrigerator	3,861	3,629	264,038	(7,142)	58	2%	4,820	(130)	1
Soundbar	1,577	2,641	79,708	-	0	4%	2,970	-	0
Total	**35,594**	**32,087**	**3,880,113**	**34,085**	**467**	**12%**	**479,167**	**6,457**	**72**

The portal reports overall savings by product category, tier, and retailer, but not by unit. As the Program is not claiming savings in CY 2017, SPECTRUM did not include any savings. Since the counts did not align between SPECTRUM and the portal, the Evaluation Team calculated preliminary savings as the total monthly savings in the portal divided by the number of reported units sold that month in order to get an

average monthly per-unit savings. These estimated per-unit savings were then multiplied by the quantities in SPECTRUM.

Preliminary Market Lift Estimates

To estimate net lift for the Program, the Evaluation Team relied on the Qualifying Penetration Percentage by Retailer report from the data portal. This report tracks the market share of qualified products by month, retailer, product category, and tier.

The Team ran a simple regression model for each retailer, product category, and tier comparing the market share in months prior to and after Program launch. If the change in market share was statistically significant, the Team recorded the estimated lift. This approach is likely to be modified in the Team's CY 2018 impact analysis when savings will be claimed. The Team is building a more robust baseline modeling approach that can account for changes in market share unrelated to the Program and captures external trends. The estimate presented in Table 150 is preliminary and meant to give a sense of the maximum potential lift in market share up to this point; it does not account for any external market trends, which the Team hopes to incorporate in the CY 2018 analysis.

This preliminary market lift estimate is meant to provide some context for a Program that contains a great degree of complexity and uncertainty, including whether there would be any measurable changes in market share at all. No formal savings goals were available in 2017 but the Program Implementer suggested a preliminary goal of 5%-10% lift. If the maximum estimated lift was inconsistent with Program success, this would provide an early indication and perhaps encourage near-term changes to Program design.

Market Data Collection

The Evaluation Team has also collected a variety of market data with the goal of identifying external market trends and changes. The Team is also planning to participate in a national effort to conduct in-depth interviews with participating retailers. These can provide some insight into what, specifically, retailers are doing to encourage purchases of qualified products and gather their internal estimates of the effectiveness of various efforts.

As with the Table 151 in the residential lighting section above, retailer names are anonymized in the following comparisons.

Shelf-Stocking Study

Additionally, the Program Implementer is conducting biannual shelf-stocking studies of both participating and nonparticipating retailers while visiting various store locations. Prior to completing its CY 2017 analysis, the Evaluation Team received two rounds of data collected while in the field, from December of 2016 and August of 2017. Field staff collected the number of products that were ENERGY STAR-rated, the share of products that were on sale, any products that were featured on end-cap or pallet displays, and the price of each model observed. The same stores were visited in both time periods. Table 151 compares these metrics at each point in time.

Table 151. Summary of Shelf Stocking Study

Retailer	Product	Program Retailer	Models ENERGY STAR Rated (%)		Models on Sale (%)		Models on End Caps (%)		Models on Pallet Displays (%)		Mean Price per Unit ($)	
			Dec-16	Aug-17	Dec-16	Aug-17	Dec-16	Aug-17	Dec-16	Aug-17	Dec-16	Aug-17
DIY 2	Air Cleaner	No	0%	33%	0%	6%	0%	0%	0%	0%	$128	$130
Mass market 1			43%	49%	25%	16%	0%	0%	0%	0%	$90	$109
Mass market 2			46%	63%	1%	0%	5%	0%	5%	0%	$99	$240
Mass market 3		Yes	30%	45%	13%	9%	7%	0%	27%	0%	$271	$157
DIY 1			90%	84%	17%	0%	0%	8%	0%	0%	$302	$177
DIY 3			94%	85%	48%	23%	0%	3%	0%	0%	$241	$164
Mass market 3	Dryer	Yes	40%	52%	0%	69%	0%	0%	0%	0%	$881	$805
DIY 2	Freezer	No	25%	38%	75%	96%	0%	0%	0%	0%	$519	$644
Mass market 3		Yes	40%	0%	32%	50%	0%	0%	3%	0%	$513	$330
DIY 1			54%	15%	29%	13%	0%	0%	4%	0%	$472	$392
Mass market 4			50%	0%	100%	50%	40%	0%	0%	0%	$258	$205
DIY 3			40%	24%	81%	67%	0%	0%	3%	0%	$798	$695
DIY 2	Refrigerator	No	42%	45%	96%	84%	0%	0%	0%	0%	$1,965	$1,977
Mass market 3		Yes	68%	60%	31%	36%	0%	0%	5%	11%	$2,285	$1,972
DIY 1			64%	61%	54%	72%	0%	0%	3%	4%	$2,329	$1,861
Mass market 4			17%	0%	100%	100%	50%	0%	0%	0%	$662	$590
DIY 3			56%	44%	80%	49%	0%	2%	9%	4%	$2,043	$2,087
Mass market 1	Sound bar	No	4%	0%	6%	0%	0%	0%	2%	0%	$141	$80
Mass market 2			11%	0%	19%	0%	11%	0%	2%	0%	$127	$75
Mass market 3		Yes	13%	10%	39%	50%	11%	0%	6%	0%	$341	$404
Mass market 4			0%	100%	47%	0%	17%	0%	6%	0%	$108	$115
DIY 3			33%	17%	53%	33%	0%	0%	7%	0%	$384	$138
Mass market 3	Washer	Yes	53%	86%	0%	56%	0%	0%	0%	0%	$714	$1,009

The participating retailers show a higher share of ENERGY STAR-rated models for air cleaners and sound bars. For the other products only one nonparticipating retailer was observed so it is difficult to draw any conclusions. Not surprisingly, more products were on sale in December than August, likely because of holiday sales. Additionally, end-cap and pallet displays tend to feature products that are on sale, and there were more displays in December.

Prices were also higher in participating stores for air cleaners in December, although they were more comparable in August of 2017. Soundbars were also priced higher in participating stores and appear to

have decreased in August at nonparticipating retailers while remaining relatively comparable between December 2016 and August 2017 at participating Mass market 3 and Mass market 4 stores.

These metrics represent a snap-shot at two brief points in time, so any conclusions that might be drawn at this point are tentative. Stocking levels and prices can change at various times of the day, depending on the volume of shoppers, which products have sold, and which remain on the shelf when the data are collected. The Program Implementer has recently shared its November 2017 data and plans to continue collecting data in 2018. The addition of data points over time will eventually result in a more comprehensive picture of the market.

Online Data Collection

To gather additional market data, the Evaluation Team has employed software programs that collect information from retailer websites bimonthly. The Team has been amassing data from participating and nonparticipating retailers across Wisconsin since July of 2017 (with plans to continue data collection through 2018). Each time the program accesses a retailer's website, it selects a specific store location and searches for a product line (refrigerator, electric or gas dryer, room air conditioner, etc.) and filters the search results to items currently available at that store.

In some cases, retailer websites provide the inventory for each product at the specific store location. Others provide an option to filter products that are available for same day pickup.

The data collected from the retailer sites includes price, ratings, and other features that customers might consider when making a purchasing decision. For example, a customer looking to purchase a clothes dryer may consider the number of cycles, whether it has wrinkle prevention features, or steam cycles. They might also consider ratings from other customers.

The Evaluation Team is working with the Program Implementer to access specific product data through the Program data portal that will enable the Team to match model numbers from the portal with the data collected from retailer websites. Currently the data portal includes only brand and model number. Without additional details for each product, matching the website data to the portal with any accuracy is difficult, and limits the Team's ability to draw product-specific conclusions.

Once the Evaluation Team can obtain accurate matches between its collected data and the qualified and non-qualified sales listed in the Program portal, it plans to measure changes in the market over time. For example, the Team can then compare qualified products to the remainder of the market, within participating retailers, and between participating and nonparticipating retailers. This could help provide context to observed changes in market share of qualified products – that is, if market share decreases, is it due to a popular product feature that is offered only in non-qualified products? Or, is market share increasing because qualified products offer popular features that non-qualified products do not?

Below is an example of such a comparison between dryers at Mass market 3, a participating retailer, and DIY 2, a nonparticipating retailer. Table 152 compares the customer ratings quartiles observed for dryers within each retailer.

Table 152. Comparison of Dryer Customer Ratings in Participating and Nonparticipating Retailers

Retailer	Percentile	Price per Unit		
		July 2017	October 2017	December 2017
Mass market 3	100	4.90	5.00	5.00
	75	4.70	4.50	4.70
	50	4.60	4.50	4.60
	25	4.60	4.50	4.60
	1	4.30	3.00	4.40
DIY 2	100	5.00	5.00	5.00
	75	4.50	4.50	4.50
	50	4.50	4.50	4.50
	25	4.50	4.50	4.50
	1	1.00	3.50	3.50

The ratings are very comparable between the two retailers, suggesting that ratings would be unlikely to influence whether a customer chose to purchase a dryer at DIY 2 or Mass market 3, based on perceived differences in the quality of models available.

Table 153 shows a similar comparison for prices of dryers available at each retailer.

Table 153. Comparison of Dryer Price in Participating and Nonparticipating Retailers

Retailer	Percentile	Price per Unit		
		July 2017	October 2017	December 2017
Mass market 3	100	$1,199.99	$1,349.00	$1,214.99
	75	$799.99	$899.00	$899.99
	50	$649.99	$764.00	$719.99
	25	$549.99	$599.00	$584.99
	1	$299.99	$299.00	$299.99
DIY 2	100	$1,899.00	$1,349.00	$1,349.00
	75	$899.00	$809.00	$809.00
	50	$749.00	$699.00	$699.00
	25	$579.00	$539.00	$539.00
	1	$299.00	$299.00	$299.00

Again, there is very little price difference between dryers at each retailer and they change little over time. There are some differences when comparing room air conditioners between retailers. Table 154 compares the quartiles of prices observed at five retailers—DIY 1 and Mass market 3 (both participating retailers), and DIY 2, Mass market 1, and Mass market 2 (nonparticipating retailers).

Table 154. Comparison of Air Conditioner Price in Participating and Nonparticipating Retailers

Retailer	Percentile	Price per Unit		
		July 2017	October 2017	December 2017
Mass market 3	100	$869.99	$319.99	$249.99
	75	$524.99	$284.99	$249.99
	50	$324.99	$219.99	$189.99
	25	$204.99	$184.99	$179.99
	1	$149.99	$179.99	$179.99
DIY 1	100		$814.00	$839.00
	75		$699.00	$789.00
	50		$444.00	$539.99
	25		$284.00	$329.00
	1		$129.00	$129.00
DIY 2	100	$599.00	$349.00	$569.00
	75	$499.00	$324.00	$469.00
	50	$334.00	$269.00	$324.00
	25	$249.00	$209.00	$239.00
	1	$179.00	$179.00	$179.00
Mass market 1	100	$599.99	$269.99	$829.99
	75	$344.99	$269.99	$494.99
	50	$284.99	$219.99	$320.49
	25	$199.99	$169.99	$229.99
	1	$149.99	$169.99	$129.99
Mass market 2	100	$459.00	$459.00	$399.00
	75	$319.00	$264.00	$319.00
	50	$235.50	$215.00	$204.47
	25	$156.00	$199.00	$146.04
	1	$112.00	$112.00	$129.00

Prices at some retailers vary by season. Mass market 3nhas higher prices in July compared to October and December, which might be expected given that air conditioners are more likely to sell in July; therefore, a wider variety of products might be available. Prices fluctuate over time at Mass market 1 stores, but with no clear pattern. DIY 1 has higher prices than the other retailers, though the Evaluation Team did not collect data for DIY 1 in July (its website was undergoing redesign so the Team had to modify the data collection tool).

It is possible with this type of analysis to observe differences between qualified and non-qualified products within participating retailer stores; the Evaluation Team plans to include this level of comparison in the CY 2018 analysis.

Evaluation Outcomes and Recommendations

The Evaluation Team has compiled the following outcomes and recommendations to improve the Retail Lighting and Appliance Program and the RPP.

Outcome 1: The overall realization rate for LEDs is less than 100% primarily because the Evaluation Team applied an 87% ISR to verified savings. *Ex ante* savings do not account for an ISR because the

inputs is not part of the TRM calculation. It is likely that the ISR will decrease even further in the future as LED prices drop and more LEDs become available in multipacks.

Recommendation 1: Focus on Energy should update the TRM to incorporate an ISR as part of the deemed savings calculations. This would allow *ex ante* savings to more closely match verified savings as ISRs continue to decrease in the future and would help ensure program planning efficiently takes into account the potential for continually decreasing realization rates.

Outcome 2: The TRM considers a commercial allocation of bulbs for hours of use and coincidence factor, but it does not consider a lifespan for nonresidential bulbs. Therefore, savings applied a 20-year EUL to both residential and nonresidential bulbs even though nonresidential bulbs have a seven-year life.

Recommendation 2: Update TRM to incorporate a separate EUL for commercial bulbs as part of the annual deemed savings calculations.

Outcome 3: The RPP Data portal is missing key product data that would allow a complete and successful evaluation, specifically, details that will align time periods and measure quantities between the portal and SPECTRUM. Additionally, any product descriptions/characteristics from manufacturers that would aid in matching model numbers and characterize qualified units.

Recommendation 3: The Program Administrator, Program Implementer, and Evaluation Team should continue working together to increase the consistency in the level of detail required to support savings verification and reconciling quantities with SPECTRUM.

Outcome 4: Through the in-home audit study, the Evaluation Team found that LED saturation remains significantly lower among renters, probably because of high turnover rates, low income, or split incentives in the case of master-metered buildings. In 2018, Focus on Energy is making the transition from a multifamily direct install program that offered high-efficiency lamps to letting multifamily customers receive Simple Energy Efficiency packs, many of which include high-efficiency lamps.

Recommendation 4: As part of this transition, Focus on Energy should consider encouraging renters to increase their purchases of LEDs by creating messages and activities that link energy savings to environmental and pro-social benefits rather than that emphasize cost benefits, which some renters may not receive.

Recommendation 5: Focus on Energy should consider testing the feasibility of lighting turn-in events as a way to remove inefficient bulbs from the current storage stock. Turn-in events require customers to relinquish incandescent light bulb(s) in exchange for free or heavily discounted LEDs. The benefits of these events are the following:

- These events remove incandescent and halogen bulbs from the large supply in storage, preventing them from being installed in the future.
- The baseline wattage for these Program LEDs could be the relinquished bulb, rather than the standard market practice baseline, resulting in high savings for these LEDs.

Simple Energy Efficiency Program

For the Simple Energy Efficiency Program, Focus on Energy mails no-cost energy-saving packs containing various combinations and quantities of LEDs, faucet aerators, showerheads, smart strips, and other energy-saving measures directly to residential customers in single-family homes with one to three units. APTIM is the Program Administrator and Energy Federation Inc. (EFI) is the Program Implementer.

At the request of the PSC, Focus on Energy added the Connected Devices Kits Program in CY 2017, which operates similarly to but independently of the Simple Energy Efficiency Program.[104] The Connected Devices Kits Program offers measures such as smart thermostats, smart power strips, and LED light bulbs and is available to customers in designated rural zip codes with access to sufficient internet speed. The Evaluation Team will verify and report savings for the two-year program upon completion in CY 2018.

The Simple Energy Efficiency Program delivered 69,886 kits in CY 2017 and had a benefit/cost ratio of 3.58. Table 155 shows CY 2017 spending, savings, participation, and cost-effectiveness.

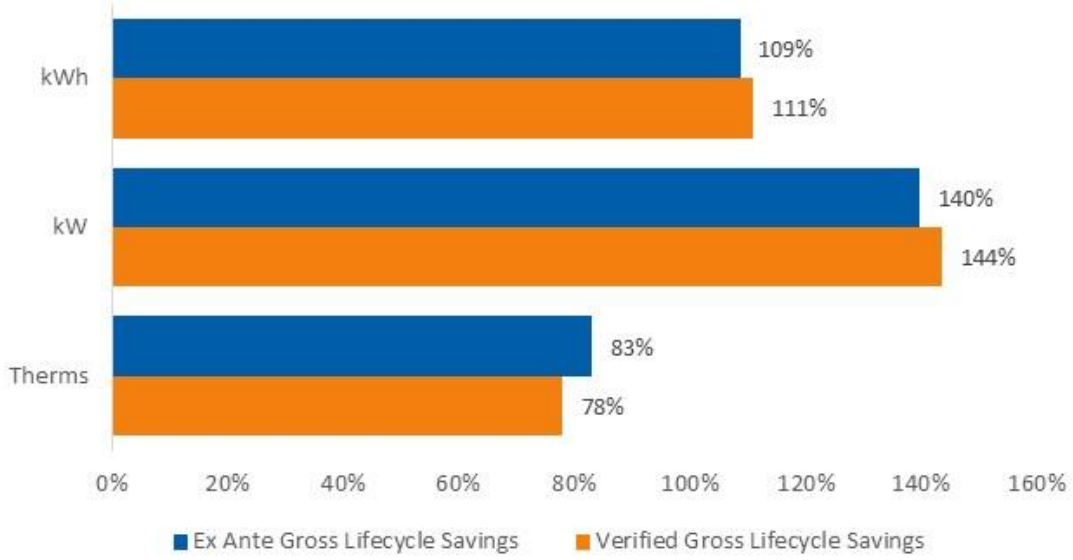
Table 155. Simple Energy Efficiency Program Summary

Item	Units	CY 2017	CY 2016
Incentive Spending	$	$1,477,862	$1,155,598
Participation	Number of Participants	69,886	70,978
Verified Gross Lifecycle Savings	kWh	171,534,543	155,686,038
	kW	1,154	880
	therms	5,755,601	6,886,124
Verified Gross Lifecycle Realization Rate	% (MMBtu)	98%	90%
Net Annual Savings	kWh	12,471,032	11,393,193
	kW	1,154	878
	therms	508,691	688,045
Annual Net-to-Gross Ratio	% (MMBtu)	100%	100%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	5.68	6.01

Figure 98 shows the percentage of gross lifecycle savings goals achieved by the Simple Energy Efficiency Program in CY 2017. The Program exceeded its CY 2017 *ex ante* and verified gross lifecycle savings goals for kilowatt-hours and kilowatts but fell short of its *ex ante* and verified gross lifecycle savings goals for therms.

[104] Focus on Energy uses the term *pack* to distinguish the Simple Energy Efficiency Program from other Wisconsin utility programs that offer energy-saving kits. Furthermore, Focus on Energy uses the term *kits* to distinguish the Connected Devices Kits Program from the Simple Energy Efficiency Program.

Figure 98. Simple Energy Efficiency Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] For *ex ante* gross lifecycle savings, 100% reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations of the CY 2017 Simple Energy Efficiency Program and a process evaluation of the CY 2017 Connected Devices Kits Program. The Team designed its EM&V approach to integrate multiple perspectives in assessing Program performance. Table 156 lists the specific data collection activities and sample sizes the Team used for the evaluations.

Table 156. CY 2017 Simple Energy Efficiency Program Data Collection Activities and Sample Sizes

Activity	Sample Size (n)
Program Actor Interviews[1]	2
Tracking Database Review	Census
Participant Surveys	3,952
Ongoing Customer Satisfaction Surveys	6,420

[1] The Evaluation Team conducted interviews for both the Simple Energy Efficiency and Connected Devices Programs. All other activities were for Simple Energy Efficiency only.

Program Actor Interviews

In October 2017, the Evaluation Team interviewed the Program Administrator and the Program Implementer to assess the status of the Simple Energy Efficiency and Connected Devices Kits Programs. During the interviews, the Team covered topics such as Program design and goals, marketing strategies, and data tracking to gain a better understanding of high-level processes, successes, and any Program concerns.

Tracking Database Review

The Evaluation Team reviewed a census of the Program SPECTRUM tracking data, which included several tasks:

- Thoroughly review the data to ensure that the SPECTRUM totals matched the totals reported by the Program Administrator
- Reassign adjustment measures to appropriate measure categories
- Check for complete and consistent application of data fields (such as measure names, application of first-year savings, and application of effective useful lives)

Participant Surveys

The Evaluation Team conducted online surveys with 3,952 customers who participated in the Program during CY 2017. Because Focus on Energy changed the Program pack contents on July 1, 2017, the Team targeted participants from both the first and second halves of the year and emailed survey invitations to a census of CY 2017 participants with a valid email address. Survey topics included Program awareness, measure installation or removal, cross-program participation, energy-saving actions, spillover, and demographics.

To achieve 90% confidence at ±10% precision for each of the 12 types of packs (six in the first half of the year and six in the second half, as shown in Table 157), the Team attempted to survey a minimum of 70 participants for each pack type, for a total of 840 customers. A census sample provided the best chance to achieve 70 completes for packs that experienced low participation in the first half of the year. Table 157 shows the participant population when the survey was fielded and the number of completed surveys by pack type.

Table 157. Simple Energy Efficiency Program Completed Surveys by Pack Type

Pack Type	Participation as of Oct. 2017	Survey Invitations Sent	Surveys Completed
Smart Strip Pack	18,523	12,271	1,685
Focus Pack	12,183	7,476	923
Showerhead Upgrade Pack	505	483	94
Flood Light Upgrade Pack	510	476	104
Decorative Light Upgrade Pack	87	83	22
Globe Light Upgrade Pack	29	29	4
Total in First Half of CY 2017	**31,837**	**20,818**	**2,832**
Light Bulb Pack	12,067	1,577	320
Pack with APS	10,049	1,344	291
Fixed Showerhead Pack	5,324	851	147
Hand-Wand Showerhead Pack	4,510	756	145
Flood Light Pack	4,040	605	137
Decorative Light Pack	2,058	266	80
Total in Second Half of CY 2017	**38,048**	**5,399**	**1,120**
Grand Total	**69,885**	**26,217**	**3,952**

All but two pack types (the Decorative Light Upgrade Pack and Globe Light Upgrade Pack) achieved enough responses to achieve the targeted levels of confidence and precision, the implications of which are discussed in the *In-Service* section.

Ongoing Customer Satisfaction Surveys

The PSC requested that the Evaluation Team conduct ongoing customer satisfaction surveys beginning in CY 2015 for the CY 2015–CY 2018 quadrennial. The goals of these surveys are to provide a quick and easy opportunity for recent program participants to provide feedback, ensure that feedback is close to the participation experience, enable problem identification at any time of year, and identify opportunities for delivering follow-up energy efficiency information to interested participants. The Program Implementer used data collected during ongoing customer satisfaction surveys to assess performance and help meet contractual obligations related to satisfaction KPIs.

The Program Administrator deployed online surveys through SPECTRUM to all CY 2017 participants with an email address within two weeks of their completing participation in the Program. The Evaluation Team gathered online survey results via SPECTRUM and sent, received, and scanned mail survey responses for participants without an email address, which were combined with the online results for quarterly and annual reporting.

In CY 2017, there were 6,420 Simple Energy Efficiency Program participants who responded to the ongoing customer satisfaction survey (after the Evaluation Team removed duplicates). The Team selected a random sample of 15%, or 958 respondents, for reporting purposes.

Impact Evaluation

This chapter provides impact evaluation findings for the Simple Energy Efficiency Program based on the tracking database review and participant surveys.

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data and ISRs from participant surveys and applied the results to the gross savings.

Tracking Database Review

The Evaluation Team reviewed the census of CY 2017 Simple Energy Efficiency Program data contained in SPECTRUM for appropriate and consistent application of unit-level savings and EUL values in adherence with the Wisconsin TRM or other deemed savings sources.

The Evaluation Team updated savings and EULs for several measures to reflect their finalized TRM values, which in some cases were not approved until late in the program year. This entailed changing the EUL assumptions for 9-watt and 11-watt general purpose LEDs and 8-watt reflector LEDs; the *ex ante* kilowatt-hour savings for 9-watt and 11-watt general purpose LEDs, pipe wrap insulation, and water heater temperature turn-down cards; and the *ex ante* kilowatt and therm savings for pipe wrap insulation and water heater temperature turn-down cards.

The Evaluation Team found that a small number of customers were tracked as having received extra measures in their kits (such as two bathroom faucet aerators instead of one in Smart Strip Packs from the first half of the year). The Program Implementer confirmed that it identified an issue in which the SPECTRUM database reported extra measures for 0.34% of customers. The Program Implementer corrected most instances and the Evaluation Team manually adjusted the remaining discrepancies. The Team also identified four measures that were not assigned to any pack type and attributed the associated savings to a Fixed Showerhead Pack. These adjustments, irrespective of the changes to the TRM, made minimal impact to the *ex ante* total gross savings assumptions.

In-Service Rates

The following sections present the first-year and lifetime ISRs the Team used to calculate verified Program savings.

First Year ISRs

In CY 2017, the Evaluation Team conducted participant surveys to verify the installed measures and to estimate the ISR at the measure level. Table 158 shows a comparison of the first-year ISRs by measure,[105] and the *Program Design* section explains why second-half ISRs commonly exceeded first-half ISRs.

Table 158. Simple Energy Efficiency Program First-Year Measure-Level In-Service Rates

Measure	CY 2017 – First Half	CY 2017 – Second Half	CY 2016
A19 LEDs	93%[1]	78%[2]	82%
Kitchen Faucet Aerators	46%	--	43%
Bathroom Faucet Aerators	51%	56%	49%
Fixed Showerheads	56%	64%	57%
Hand-Wand Showerheads	--	71%	--
Smart Strips	82%	78%	71%
Specialty LEDs[3]	79%	73%	81%
Pipe Wrap	--	40%	--
Hot Water Temperature Cards	--	17%	--

[1] See Table 167 for LED quantities in CY 2017 first-half packs.
[2] See Table 168 for LED quantities for CY 2017 second-half packs.
[3] Specialty LEDs include candelabra (candle), reflector (flood), and globe bulbs.

The survey achieved insufficient response rates from customers who received Decorative Light Upgrade and Globe Light Upgrade packs during the first half of CY 2017 to generate reliable ISRs for measures in these pack types. To calculate measure-level ISRs for these packs, the Evaluation Team weighted ISRs for identical measures in other pack types based on the distribution of each pack type.

[105] The first-year ISR represents the percentage of products that are still installed, in use, and operating properly within 12 months of receiving the products.

For example, the ISR for bathroom faucet aerator ISRs from these pack types was derived as follows, using data provided in Table 157:

$$ISR_{BFA} = \frac{\sum(units_i * ISR_i)}{\sum units_i}$$

$$ISR_{BFA} = \frac{18{,}523 * 47\% + 12{,}183 * 57\%}{18{,}523 + 12{,}183} = 51\%$$

Table 159 shows the calculated ISRs assigned to Decorative Light Upgrade Pack and Globe Light Upgrade Pack measures.

Table 159. In-Service Rate Assumptions for Pack Types with Insufficient Response Rates

Pack Name	Measure	Weighted Average ISR	Source Packs
Decorative Light Upgrade	Bathroom faucet aerator	51%	Focus Pack, Smart Strip Pack (first half)
	Kitchen faucet aerator	46%	Focus Pack, Smart Strip Pack (first half)
	Fixed showerhead	56%	Focus Pack (first half)
	Candelabra LED	80%[1]	Decorative Light Pack (second half)
Globe Light Upgrade	Bathroom faucet aerator	51%	Focus Pack, Smart Strip Pack (first half)
	Kitchen faucet aerator	46%	Focus Pack, Smart Strip Pack (first half)
	Fixed showerhead	56%	Focus Pack (first half)
	Globe LED	71%	Fixed Showerhead Pack, Hand-Wand Showerhead Pack (second half)

[1]Focus on Energy provided six candelabra LEDs in second-half Decorative Light Packs but only three in first-half Decorative Light Upgrade Packs. The ISR used for second-half Decorative Light Packs (68%) accounts for all six bulbs, which would inaccurately assume a higher storage rate (and therefore a lower ISR) for first-half Decorative Light Upgrade Packs. Accordingly, the Evaluation Team recalculated the ISR to account for survey responses related to only the first three bulbs installed.

Lifetime ISRs

The Evaluation Team also calculated lifetime ISRs for lighting measures (A19 and specialty LEDs) because first-year ISRs do not account for the future installation of bulbs placed in storage. To calculate lifetime ISRs for LEDs, the Team followed the approach documented in the UMP,[106] which was updated following the CY 2016 evaluation. The Team did not apply this approach to non-lighting measures because there is no similar evaluation protocol for these products.

The UMP imputes the trajectory of lighting installations annually for the lifetime (EUL) of the bulb or until a utility or program stops claiming lighting savings, whichever comes first. The Evaluation Team adopted the latter approach, following the methodology used in the Retail Lighting and Appliance Program, which assumes Focus on Energy will stop claiming lighting savings in 2022. The trajectory discounts future savings to account for installations in cost-effectiveness calculations. The final ISR

[106] National Renewable Energy Laboratory. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* "Chapter 6: Residential Lighting Evaluation Protocol." Prepared by Apex Analytics, LLC. October 2017. Available online: https://www.nrel.gov/docs/fy17osti/68562.pdf

values used for lifecycle savings, which includes UMP-based ISR trajectories discounted annually at 2% for LEDs, are shown in Table 160.

Table 160. CY 2017 Simple Energy Efficiency Program Measure-Level In-Service Rates

Measure	TRM ISR	First-Half ISR	Second-Half ISR	ISR Type
A19 LEDs	92%	98%	93%	Lifetime (as of 2022)
Kitchen Faucet Aerators	54%	46%	--	First year
Bathroom Faucet Aerators	54%	51%	56%	First year
Fixed Showerheads	65%	56%	64%	First year
Hand-Wand Showerheads	65%	--	71%	First year
Smart Strips	70%	82%	78%	First year
Specialty LEDs	92%	93%	91%	Lifetime (as of 2022)
Pipe Wrap	40%	--	40%	First year
Hot Water Temperature Cards	17%	--	17%	First year

Verified Unit Energy Savings

To calculate verified per-unit energy savings and realization rates, the Evaluation Team performed these activities:

- Removed the TRM ISR for each measure by dividing the *ex ante* per-unit energy savings by the TRM ISR
- Applied the evaluated ISR from the participant surveys by taking the adjusted per-unit savings from Step 1 and multiplying each measure by its evaluated ISR

Evaluated ISRs for LEDs, hand-wand (upgrade) showerheads, smart strips, and specialty LEDs were higher than the TRM ISRs, leading to realization rates greater than 100%.

Evaluated ISRs for faucet aerators and fixed showerheads were lower, leading to realization rates less than 100%.

Pipe wrap insulation and hot water temperature cards assumed TRM ISRs equal to the evaluated ISR, resulting in realization rates of exactly 100%.

Table 161 shows the *ex ante* unit savings, verified gross unit savings, and realization rates by measure.

Table 161. CY 2017 Simple Energy Efficiency Program Unit Savings by Measure

Measure	*Ex Ante* Unit Savings			Verified Unit Savings			Realization Rates		
	kWh	kW	therms	kWh	kW	therms	kWh	kW	therms
A19 LEDs, 9 Watt	26.0	0.0023	0.0	26.2	0.0023	0.0	101%	101%	n/a
A19 LEDs, 10 Watt	25.0	0.0023	0.0	26.5	0.0024	0.0	106%	106%	n/a
A19 LEDs, 11Watt	32.0	0.0029	0.0	32.4	0.0029	0.0	101%	101%	n/a
Kitchen Faucet Aerators	30.1	0.0014	5.7	25.8	0.0012	4.9	86%	86%	86%
Bathroom Faucet Aerators	7.1	0.0007	1.3	6.9	0.0007	1.3	98%	98%	98%
Fixed Showerheads	39.3	0.0021	7.4	35.3	0.0019	6.6	90%	90%	90%
Hand-wand Showerheads	39.3	0.0021	7.4	42.9	0.0023	8.1	109%	109%	109%
Smart Strips	52.5	0.0069	0.0	60.3	0.0079	0.0	115%	115%	n/a
Globe LEDs	15.0	0.0014	0.0	14.8	0.0014	0.0	99%	99%	n/a
Candelabra LEDs	26.0	0.0024	0.0	25.2	0.0023	0.0	98%	98%	n/a
Reflector LEDs, 8 Watts	42.0	0.0039	0.0	42.2	0.0039	0.0	101%	101%	n/a
Reflector LEDs, 10 Watts	41.0	0.0038	0.0	41.5	0.0038	0.0	101%	101%	n/a
Pipe Wrap[1]	34.3	0.0051	3.8	34.3	0.0051	3.8	100%	100%	100%
Hot Water Temperature Cards[1]	1.5	0.0002	0.6	1.5	0.0002	0.6	100%	100%	100%
Water-Related Energy Savings	2,998.3	0.0000	0.0	2,998.3	0.0000	0.0	100%	n/a	n/a

[1] The Evaluation Team finalized workpapers for pipe wrap and hot water temperature cards after CY 2017 was completed. The Team adjusted *ex ante* unit savings for these measures to reflect the workpapers, resulting in realization rates of 100%.

CY 2017 Verified Gross Savings Results

Overall, the Simple Energy Efficiency Program achieved an evaluated realization rate of 95%, weighted by MMBtu (Table 162).[107]

[107] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

Table 162. CY 2017 Simple Energy Efficiency Program Annual and Lifecycle Realization Rates by Measure

Measure	Annual Realization Rates				Lifecycle Realization Rates			
	kWh	kW	therms	MMBtu	kWh	kW	therms	MMBtu
A19 LEDs, 9 Watt	101%	101%	n/a	101%	105%	101%	n/a	105%
A19 LEDs, 10 Watt	106%	106%	n/a	106%	106%	106%	n/a	106%
A19 LEDs, 11Watt	101%	101%	n/a	101%	104%	101%	n/a	104%
Kitchen Faucet Aerators	86%	86%	86%	86%	86%	86%	86%	86%
Bathroom Faucet Aerators	98%	98%	98%	98%	98%	98%	98%	98%
Fixed Showerheads	90%	90%	90%	90%	90%	90%	90%	90%
Hand-wand Showerheads	109%	109%	109%	109%	109%	109%	109%	109%
Smart Strips	115%	115%	n/a	115%	115%	115%	n/a	115%
Globe LEDs	99%	99%	n/a	99%	99%	99%	n/a	99%
Candelabra LEDs	98%	98%	n/a	98%	98%	98%	n/a	98%
Reflector LEDs, 8 Watts	101%	101%	n/a	101%	101%	101%	n/a	101%
Reflector LEDs, 10 Watts	101%	101%	n/a	101%	101%	101%	n/a	101%
Pipe Wrap	100%	100%	100%	100%	100%	100%	100%	100%
Hot Water Temperature Cards	100%	100%	100%	100%	100%	100%	100%	100%
Water-Related Energy Savings	100%	n/a	n/a	100%	100%	n/a	n/a	100%
Total	**101%**	**103%**	**93%**	**97%**	**102%**	**103%**	**94%**	**98%**

Table 163 lists the *ex ante* and verified annual gross savings for the Simple Energy Efficiency Program for CY 2017.

Table 163. CY 2017 Simple Energy Efficiency Program Annual Gross Savings Summary by Measure[1]

Measure	*Ex Ante* Gross Annual			Verified Gross Annual		
	kWh	kW	therms	kWh	kW	therms
A19 LEDs, 9 Watt	2,422,654	214	0	2,441,688	216	0
A19 LEDs, 10 Watt	1,877,825	173	0	1,993,630	183	0
A19 LEDs, 11Watt	772,288	70	0	781,111	71	0
Kitchen Faucet Aerators	942,973	44	178,570	808,712	38	153,145
Bathroom Faucet Aerators	362,072	36	66,295	354,249	35	64,863
Fixed Showerheads	712,470	38	134,155	639,828	34	120,477
Hand-wand Showerheads	177,243	9	33,374	193,686	10	36,470
Smart Strips	1,500,030	197	0	1,722,862	226	0
Globe LEDs	443,835	41	0	437,364	41	0
Candelabra LEDs	325,943	30	0	317,798	30	0
Reflector LEDs, 8 Watts	1,018,080	95	0	1,023,855	95	0
Reflector LEDs, 10 Watts	83,640	8	0	84,655	8	0
Pipe Wrap	1,095,885	163	121,410	1,095,885	163	121,410
Hot Water Temperature Cards	30,023	4	12,327	30,023	4	12,327
Water-Related Energy Savings[1]	545,686	0	0	545,686	0	0
Total Annual	**12,310,646**	**1,122**	**546,130**	**12,471,032**	**1,154**	**508,691**

[1] Differences in savings are due to water adjustment measures equaling to 545,686 kWh annually (4.6%).

Table 164 lists the *ex ante* and verified gross lifecycle savings by measure for the Simple Energy Efficiency Program in CY 2017.

Table 164. CY 2017 Simple Energy Efficiency Program Lifecycle Gross Savings Summary by Measure[1]

Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
A19 LEDs, 9 Watt	34,942,125	214	0	36,625,317	216	0
A19 LEDs, 10 Watt	37,556,500	173	0	39,872,602	183	0
A19 LEDs, 11Watt	11,222,310	70	0	11,716,665	71	0
Kitchen Faucet Aerators	9,429,728	44	1,785,753	8,087,118	38	1,531,448
Bathroom Faucet Aerators	3,620,716	36	662,974	3,542,493	35	648,626
Fixed Showerheads	7,124,697	38	1,341,620	6,398,280	34	1,204,765
Hand-wand Showerheads	1,772,430	9	333,740	1,936,857	10	364,701
Smart Strips	7,710,150	197	0	8,855,504	226	0
Globe LEDs	8,876,700	41	0	8,747,278	41	0
Candelabra LEDs	6,518,853	30	0	6,355,957	30	0
Reflector LEDs, 8 Watts	15,271,200	95	0	15,357,824	95	0
Reflector LEDs, 10 Watts	1,672,800	8	0	1,693,105	8	0
Pipe Wrap	16,438,275	163	1,821,150	16,438,275	163	1,821,150
Hot Water Temperature Cards	450,350	4	184,912	450,350	4	184,912
Water-Related Energy Savings[1]	5,456,918	0	0	5,456,918	0	0
Total Lifecycle	**168,063,752**	**1,122**	**6,130,149**	**171,534,543**	**1,154**	**5,755,601**

[1] Differences in savings are due to water adjustment measures equaling 5,456,918 kWh over the lifecycle (3.4%).

Evaluation of Net Savings

Consistent with past analyses, the Evaluation Team applied a NTG ratio of 1.0 to all measures provided in kits through the Program.

The Evaluation Team has assumed no participant spillover for the Program. The Team surveyed respondents about non-like spillover actions they may have taken as a result of participating in the Program, which is discussed in the Energy-Saving Actions section.

Table 165. CY 2017 Simple Energy Efficiency Program Annual Net Savings

Program	Annual Net		
	kWh	kW	therms
Simple Energy Efficiency	12,471,032	1,154	508,691

Table 166. CY 2017 Simple Energy Efficiency Program Lifecycle Net Savings

Program	Lifecycle Net		
	kWh	kW	therms
Simple Energy Efficiency	171,534,543	1,154	5,755,601

Process Evaluation

In CY 2017, the Evaluation Team conducted program actor interviews and participant surveys as part of the process evaluation activities for the Simple Energy Efficiency Program. The Team focused on these key topics:

- Measure first-year ISRs
- Customer satisfaction with measures and other Program components
- Customer cross-participation in other Focus on Energy programs
- Effective marketing and outreach methods
- Customers' energy-saving actions after participating in the Program
- Program tracking processes and coordination between the Program Administrator and Program Implementer

Program Design, Delivery, and Goals

The Evaluation Team drew from interviews, surveys, and Program materials to document the Program design and implementation process in CY 2017.

Program Design

Through the Simple Energy Efficiency Program in CY 2017, Focus on Energy offered customers of participating Wisconsin utilities no-cost and low-cost packs containing energy-efficient products. Customers were eligible for the Program if they lived in residential properties with one to three units and had not participated in the Simple Energy Efficiency or Express Energy Efficiency programs in the last three years unless they moved to a new address. The Program required customers to provide customer information, including utility account numbers, to verify they were eligible to receive a pack.

Focus on Energy reconfigured Program offerings for the second half of CY 2017, relying on PSC feedback and customer satisfaction responses. The Program Administrator said customers wanted packs that were more focused and thematic—for example, a pack "that will finish their bathroom" instead of wide-ranging configurations of energy-saving measures. Focus on Energy also eliminated co-pays, which suppressed sales for Upgrade packs in CY 2016, and focused on configuring the packs so they would achieve balanced electric and gas savings and their contents would be similarly valued in terms of incentive dollars.

Table 167 and Table 168 list the items in each energy-saving pack offered to CY 2017 Program participants. The Program carried over pack configurations from CY 2016 for the first half of CY 2017

(January through June) and introduced new configurations for the second half (July through December). To address customer feedback and requests, the Program Implementer included pamphlets that offered technical information and installation instructions for the measures in each pack and created videos on its website. Each pack was valued at roughly $40.

Table 167. CY 2017 Simple Energy Efficiency Program Packs: First Half (January–June 2017)

Measure	Quantity per Pack					
	Smart Strip	Focus	Showerhead Upgrade	Flood Light Upgrade	Decorative Light Upgrade	Globe Light Upgrade
General Purpose LED (A19)	2	3	3			
Reflector LED (BR30)				4		
Globe LED (G25)						3
Candelabra LED (B11)					3	
Showerhead		1	1[1]		1	1
Kitchen Aerator	1	1	1		1	1
Bathroom Aerator	1	1	1		1	1
Advanced Power Strip	1					

[1] Upgraded fixed showerhead (same *ex ante* savings assumptions as standard fixed showerhead)

Table 168. CY 2017 Simple Energy Efficiency Program Packs: Second Half (July–December 2017)

Measure	Quantity per Pack					
	Light Bulb	Fixed Showerhead	Hand-Wand Showerhead	Flood Light	Decorative Light	Pack with APS
9W A19 LED	4	2			2	3
11W A19 LED	2					
Reflector LED				6		
Globe LED		3	3			
Candelabra LED					6	
Pipe Wrap (15 ft. roll)	1	1	1			1
Pipe Tape		1	1			
Showerhead		1	1[1]			
Bathroom Faucet Aerator		2	2			
Water Heater Temperature Card		1	1			1
Advanced Power Strip						1

[1] Hand-wand showerhead (same *ex ante* savings assumptions as standard fixed showerhead)

The focused, thematic configurations for second-half packs achieved higher measure-level ISRs for water-saving items, but not light bulbs and smart strips. The mid-year decrease in ISRs for LEDs is likely attributable to the increased number of LEDs per pack. First-half packs offered two to four LEDs (three on average), whereas second-half packs offered three to eight LEDs (more than five on average). Each additional LED offered in a pack is increasingly more likely to be stored for later use.

Connected Devices Kits Program

The PSC directed the Program Administrator to create the Connected Devices Kits Program in 2017 as part of a package of programs to serve rural customers and support the use of broadband internet in energy efficiency programs. The Rural Kits Program functions similarly to the Simple Energy Efficiency Program by offering five kits containing broadband and other connected household items.

Although similar to the Simple Energy Efficiency Program, the Connected Devices Kits Program operates independently of the statewide program. The Connected Devices Program targets rural customers using internet service providers (ISPs) that operate in 582 rural ZIP codes as classified by PSC staff.[108] In addition to living in a rural ZIP code, participants must also be customers of utilities affiliated with Focus on Energy and have access to internet service with a minimum speed of 10 megabytes per second (MBps). The Program Administrator designs and customizes marketing collateral for each ISP, and the ISP uses the marketing materials it sees fits its customer base. Customers who respond to the marketing receive an access code from their ISP that directs them to an exclusive Focus on Energy webstore through which they can request one Connected Devices kit.

Customers who participated in the Connected Devices Kits Program are eligible to also participate in the Simple Energy Efficiency Program. However, because the Connected Devices Kits Program targets rural customers, not all Simple Energy Efficiency Program participants are eligible to participate in the Connected Devices Kits Program.

Table 169 lists the item(s) provided in the five pack types, two of which required $120 copays, that were offered to Connected Devices Kit Program participants. Participants also received a $50 utility bill credit if they added or upgraded their internet service to a speed of 10 MBps or faster.

Table 169. CY 2017 Connected Devices Kits Program Packs

Measure	Pack 1	Pack 2	Pack 3	Pack 4	Pack 5
Co-pay	**$0**	**$0**	**$120**	**$120**	**$0**
Embertec Bluetooth Smart Strip	✓				
Philips Hue Connected LEDs	✓				
Emerson Sensi Wi-Fi Thermostat		✓			
Nest Learning Thermostat			✓		
ecobee4 Smart Thermostat				✓	
Nest E Thermostat					✓

Program Management and Delivery Structure

The Program Administrator oversees the Program Implementer and Program activity. The Program Implementer contributes to Program design and tracking, assists in Program marketing activities, processes and fulfills customer orders, and manages the customer call center.

The Program Administrator and Program Implementer noted that, overall, the Program ran smoothly in CY 2017 and that their communication was successful, with frequent contact.

Connected Devices Kits Program

Unlike the Simple Energy Efficiency Program, the Program Administrator has some implementation responsibilities by coordinating with ISPs to distribute Connected Devices Program kits to participants.

[108] The PSC classified ZIP codes as rural according to the U.S. Census Bureau then expanded the list of eligible ZIP codes to include those with a "significant" percentage of customers eligible for CAF-II and ACAM support.

The Program Administrator recruits ISPs and utilities to market the program to eligible customers, and the Program Implementer processes orders, distributes kits, and maintains the program's tracking database. When an ISP opts into the Connected Devices Kits Program, the Program Implementer provides enough access codes to accommodate the ISP's estimated customer base. This access code directs the customer to an exclusive Focus on Energy webstore to request a kit. The ISPs interface directly with customers to support them when ordering kits.

Program Goals

Table 170 lists the goals for the Simple Energy Efficiency and Connected Devices Kits programs.

Table 170. Simple Energy Efficiency and Connected Devices Kits Program Goals

Program Name	Energy Savings		Gas Savings		Participants
	Lifecycle kWh	Annual kW	Lifecycle Therms	Lifecycle MMBtu	
Simple Energy Efficiency	154,699,376	804	7,376,365	1,201,514	70,000
Connected Devices Kits[1]	170,644,587	2,437	3,706,269	952,866	86,000

[1] Two-year program goals to be evaluated after CY 2018.

In CY 2017, the Simple Energy Efficiency Program met its goals for all *ex ante* and verified savings (lifecycle and annual), except it fell slightly short of its goal for lifecycle kWh verified gross savings. This is due in part to lower ISRs for faucet aerators and showerheads, as detailed in the *Verified Unit Energy Savings* section above.

The Program Administrator tracked Program performance metrics (such as total spending, energy savings, spending per MMBtu, etc.) on a weekly basis using Tableau data visualization software. At the time of the interview, the Program Administrator expected to achieve every goal and key performance indicator (KPI) for the Program except its goal of processing pack orders within 30 days of request.

The Program Implementer was delayed in processing and uploading Program data to SPECTRUM pending the completion of workpapers that detailed savings algorithms for some measures offered in Program packs.

The Program Implementer expressed concern about the Connected Devices Kits Program meeting its two-year goals but said the Program Administrator is increasing its marketing in CY 2018, which will bolster efforts to achieve the goals and KPIs of the Connected Devices Kits Program by the end of the year.

Table 171 lists the CY 2017 KPIs and their results for the Simple Energy Efficiency Program. Table 172 lists the KPIs for the Connected Devices Kit Program, which spans two years (CY 2017–CY 2018) and will be assessed in the CY 2018 annual report.

Table 171. Simple Energy Efficiency Program CY 2017 Key Performance Indicators

KPI	Measured Value	Result	Result Source
Maintain or improve customer satisfaction score: above CY 2016 Program baseline of 8.8	8.9	KPI met	Ongoing survey
Achieve Net Promoter Score (NPS) above CY 2016 Program baseline of +75	+75	KPI met	Ongoing survey
Fulfill pack requests in two to four weeks	69% of respondents received packs in less than four weeks	KPI met	Participant survey
Submit monthly and quarterly reports by due date	12 monthly reports submitted	KPI met	PA approval
Complete at least two collateral pieces cross-promoting other Focus on Energy programs	Three collateral pieces completed	KPI met	PA approval
Distribute packs to all 72 counties in Wisconsin	72 counties reached	KPI met	PA approval
Upload pack order data to SPECTRUM within 30 days of pack shipment	<50% of orders were uploaded to SPECTRUM within 30 days of shipment	KPI not met	Quarterly reports

Table 172. Connected Devices Kits Program CY 2017-18 Key Performance Indicators

Key Performance Indicator	Result[1]
Maintain or improve customer satisfaction score: above CY 2016 SEE Program baseline of 8.8	N/A
Achieve Net Promoter Score (NPS) above CY 2016 Program baseline of +75	N/A
Fulfill pack requests in two to four weeks	N/A
Deliver ISP codes within four business days of request	N/A

[1] To be evaluated at the end of CY 2018.

Data Management and Reporting

The Program Administrator conducts monthly and mid-year program reviews with the PSC. The Program Administrator and Program Implementer collect participant data through an enrollment process and report back to SPECTRUM through a bulk uploading process after batch orders are shipped. As stated in the *Program Goals* section, the Program Implementer was delayed in processing Program data pending approval of white papers. Tracking data for the second half of CY 2017 (July through December) had not been processed and uploaded in October when the Evaluation Team interviewed the Program Administrator and Implementer but was processed and uploaded before the end of the year.

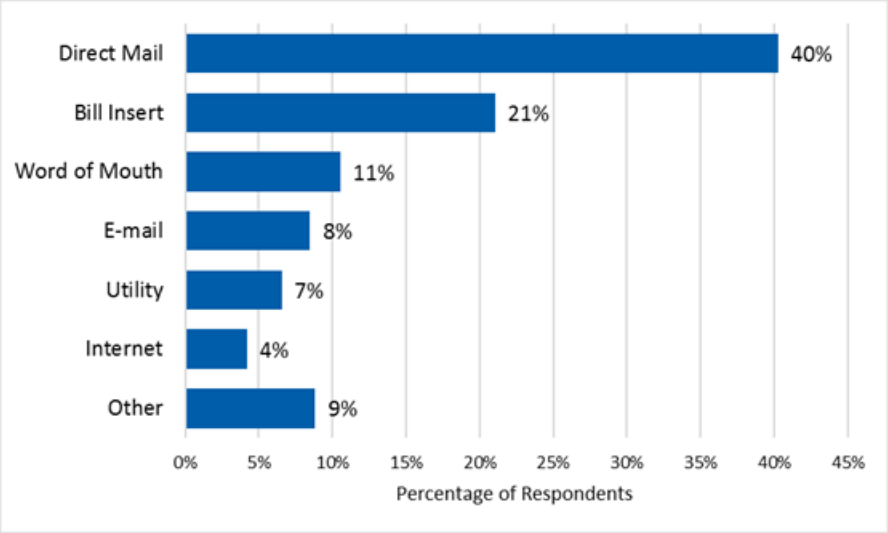
Marketing and Outreach

In CY 2017, the Program was marketed mostly through bill inserts; press releases; social media; word of mouth; and local television, print media, and radio advertisements. Most marketing collateral originated with the Program Administrator and was supplemented in collaboration with the Program Implementer and coordination with participating utilities. The Program Administrator said word-of-mouth outreach was most successful in recruiting lower-income customers and new participants who were not familiar with Focus on Energy. Program marketing referred customers to an online store or a phone number

through which they could order a pack. The Program Implementer had its own limited marketing budget and produced some collateral independently, including designing and distributing a coupon mailer.

Program tracking data indicates most participants heard about the Program via direct mail (40%), bill inserts (21%), or word of mouth (11%), as shown in Figure 99.

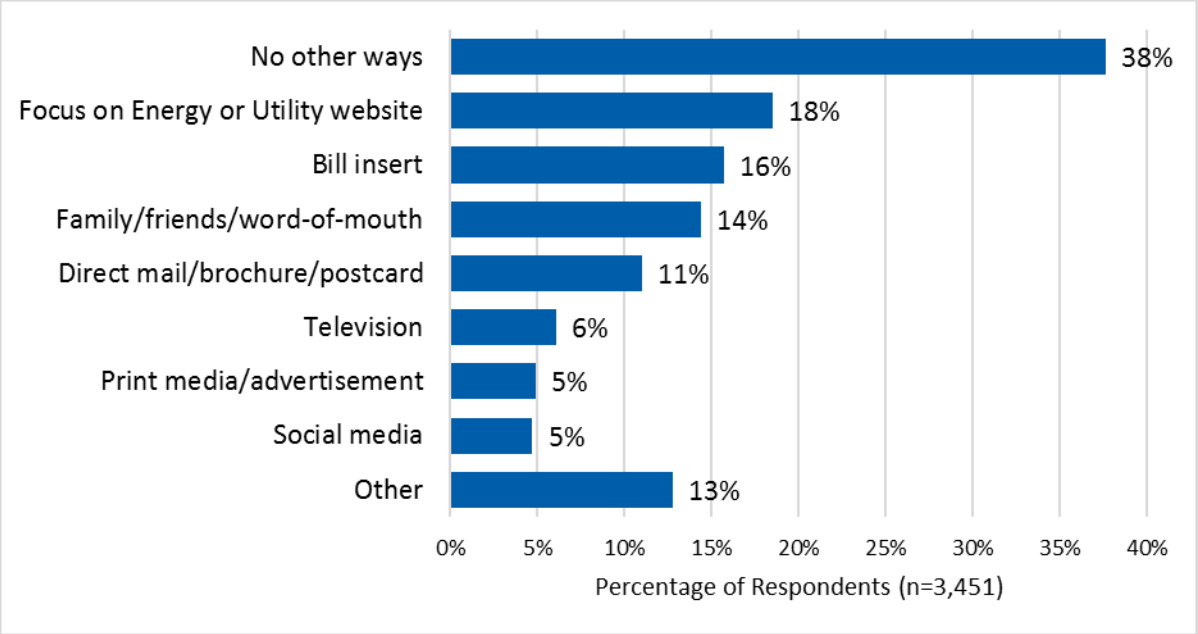
Figure 99. Sources of Simple Energy Efficiency Program Customer Awareness – Primary Channel



Source: CY 2017 Simple Energy Efficiency Program Tracking Data.

In a multiple-response follow-up question, 62% of respondents said they had heard about the Program from at least one other source (Figure 100). Most respondents did not recall hearing about the Program through other outreach channels. However, they did most frequently hear about the program through Focus on Energy's or their utility's website (18%), bill inserts (16%), word of mouth (14%), or direct mail (11%). These four channels were also mentioned most frequently as primary channels of outreach.

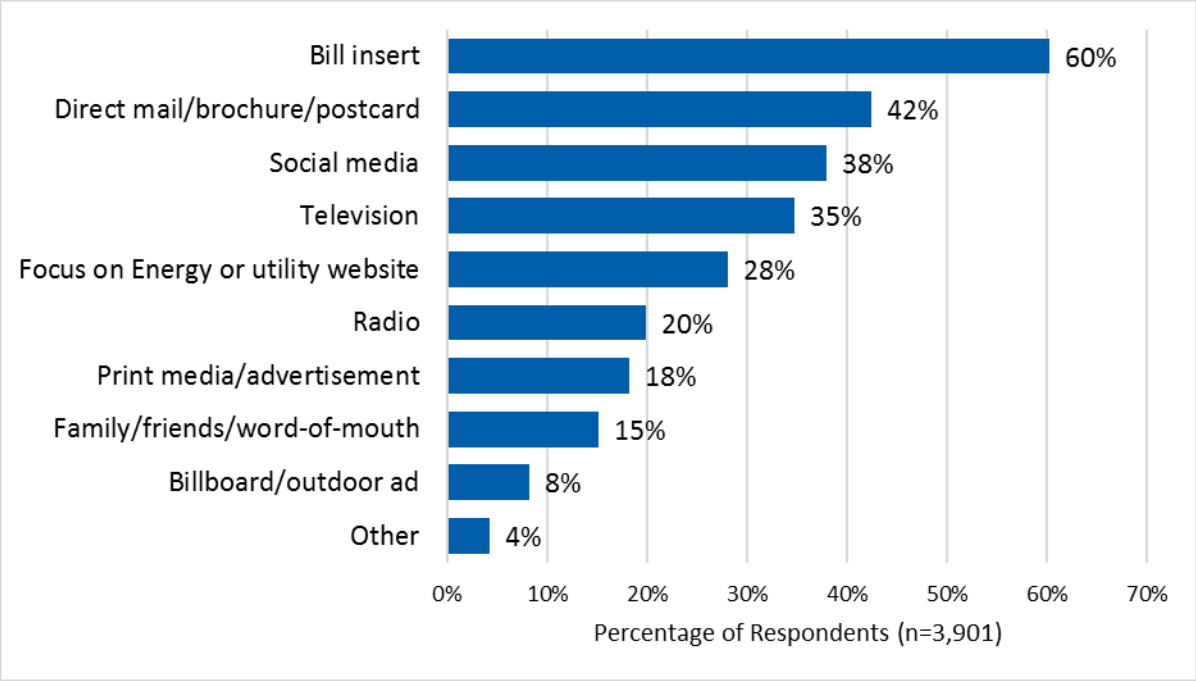
Figure 100. Simple Energy Efficiency Program Preferred Customer Awareness – Secondary Channels



Source: CY 2017 Simple Energy Efficiency Participant Survey Question B2. "Are there any other ways you heard about the program?" Multiple responses allowed.

Figure 101 shows respondents' preferred method(s) of contact to learn about Focus on Energy programs. Like how they learned about the Simple Energy Efficiency Program, respondents reportedly prefer to learn about energy efficiency programs via bill inserts (60%) and/or other direct mail such as brochures or postcards (42%). However, respondents showed a preference for learning about programs via advertising on television (38%) or through social media (35%), both of which reached respondents infrequently in CY 2017 relative to other outreach channels.

Figure 101. Simple Energy Efficiency Program Preferred Contact Methods



Source: CY 2017 Simple Energy Efficiency Participant Survey Question B3. "What do you think is the best way for Focus on Energy to inform the public about energy-efficiency programs?" Multiple responses allowed.

Connected Devices Kits Program

The Program Administrator has been marketing the Connected Devices Kits Program aggressively because of the reportedly slow uptake. The Program Administrator said it is time-intensive to work individually with the ISPs that are expected to recruit participants and it may recommend other distribution avenues to reach goals. The Evaluation Team confirmed with the Program Administrator it plans to partner with Focus on Energy utilities (in addition to ISPs) to promote the program in CY 2018.

Cross-Promotion of Other Focus on Energy Programs

The Program Administrator coordinates with the other Focus on Energy residential program implementers to determine the best ways to use existing marketing resources for cross-promotion. Each pack distributed by the Simple Energy Efficiency and Connected Devices Kit programs includes an insert promoting other Focus on Energy residential programs and listing other ways customers can save energy—from small changes like washing laundry in cold water to large changes that customers can supplement with other Focus on Energy rebates and services.

To assess the effectiveness of the cross-promotion strategy, the participant survey asked respondents to share their awareness of and participation in other Focus on Energy programs (as shown in Table 173). Overall, 53% of the respondents had heard of other Focus on Energy programs, almost double the percentage from CY 2016 (28%), and 29% had participated in other programs, up roughly 400% over CY 2016 (7%).

Table 173. Simple Energy Efficiency Program Customer Awareness of and Participation in Other Focus on Energy Programs

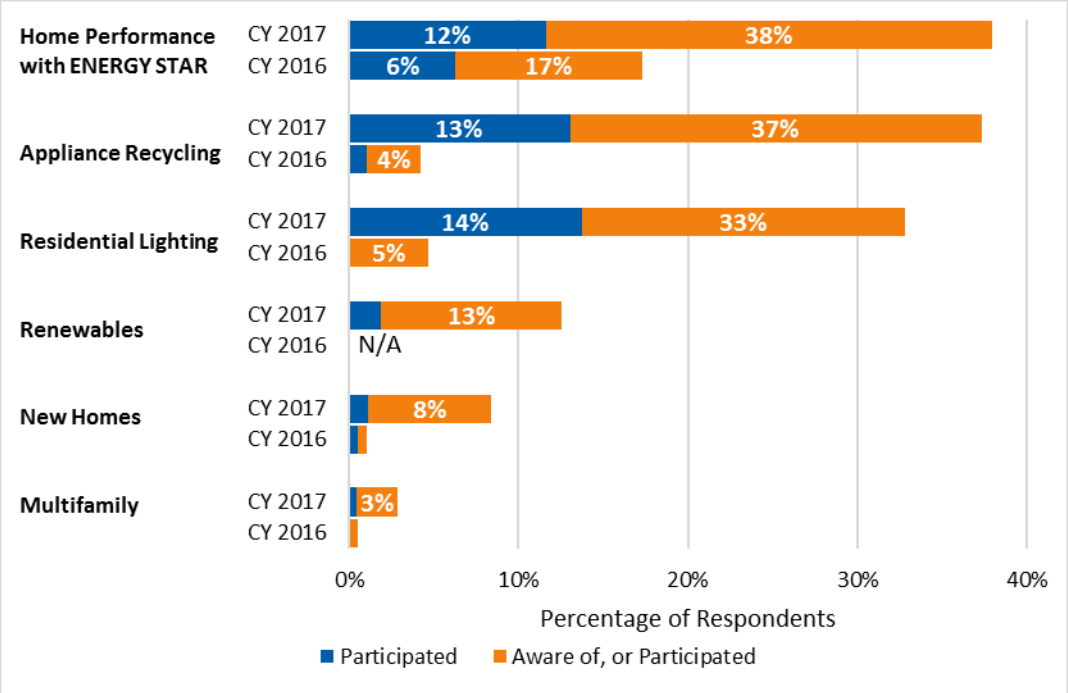
Program	Aware of Other Programs[1]	Participated in Other Programs[2]
Home Performance with ENERGY STAR	38%	12%
Appliance Recycling	37%	13%
Residential Lighting	33%	14%
Renewables	13%	2%
New Homes	8%	1%
Multifamily	3%	0.4%

[1] Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Program Participant Survey Question I2 (K2). "Which programs or rebates are you aware of?" Multiple responses allowed.

[2] Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Program Participant Survey Question I4 (K4). "Which programs, rebates, or projects have you participated in?" Multiple responses allowed.

Figure 102 shows how customer awareness of other Focus on Energy programs through cross-promotion improved from CY 2016 to CY 2017.

Figure 102. Simple Energy Efficiency Program Cross-Promotion Success, CY 2016 to CY 2017



"Participated" response frequencies are nested in "Aware of, or Participated" response frequencies, as depicted in Table 173.

Customer Experience

The Evaluation Team used the participant surveys and ongoing customer satisfaction surveys, supported by the Program Actor interviews, to assess customer experience of these Program components:

- Overall Program satisfaction
- Satisfaction with Program processes
- Measure satisfaction
- Reasons for removing or not installing measures
- Measure installation practices
- Energy-saving actions
- Barriers to participation

Annual Results from Ongoing Customer Satisfaction Survey

Throughout CY 2017, the Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Simple Energy Efficiency Program. Respondents answered satisfaction and likelihood questions on a scale of 0 to 10, where 10 indicates the highest satisfaction or likelihood and 0 the lowest.[109]

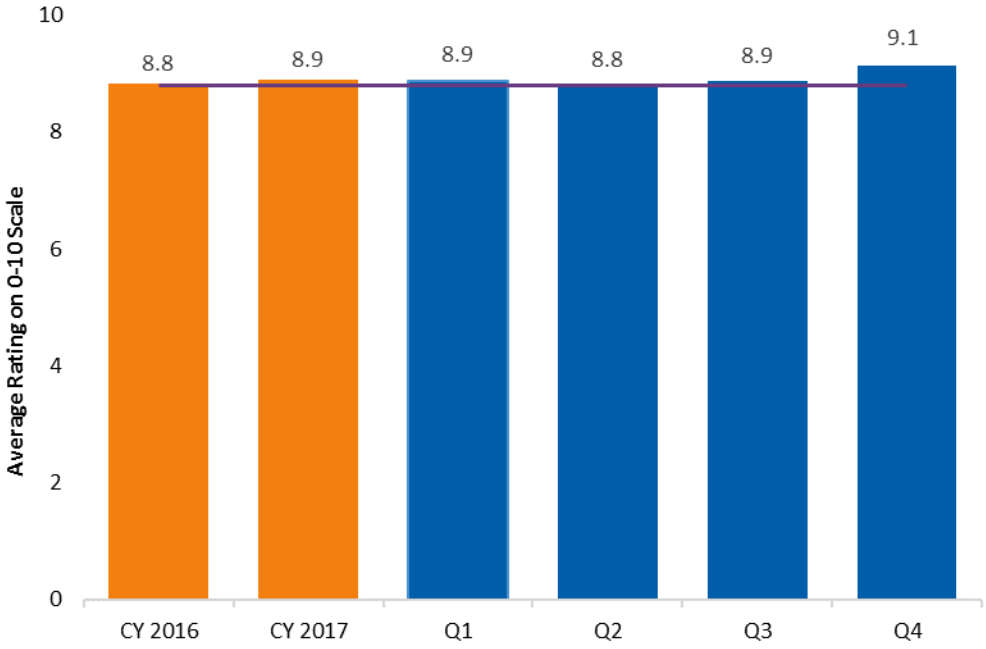
Figure 103 shows the average overall Program satisfaction rating of 8.9 among CY 2017 participants, which was statistically significantly higher than the portfolio baseline of 8.8 (indicated by the purple line).[110,111]

[109] The number of participants who completed a survey does not always match the number of responses for each question, as some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

[110] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[111] $p < 0.10$ using binomial t-test. The only quarter during the year that was above the baseline was Q4 ($p < 0.05$ using binomial t-test). This quarter was also statistically significantly higher than the CY 2016 rating ($p < 0.05$ using binomial t-test).

Figure 103. CY 2017 Satisfaction Ratings for the Simple Energy Efficiency Program

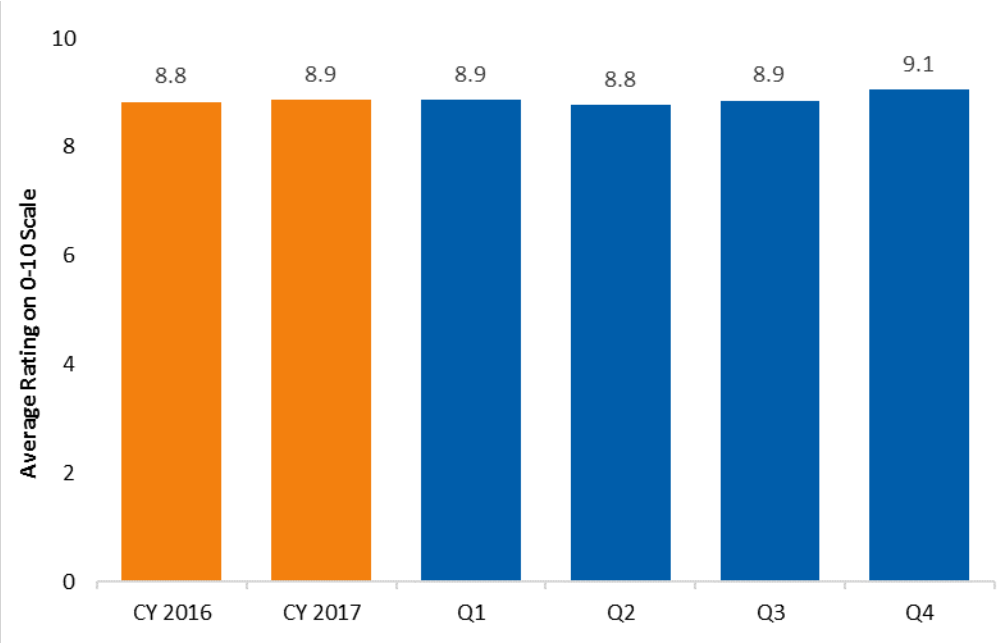


Source: Simple Energy Efficiency Program Ongoing Participant Satisfaction Survey Question: "Overall, how satisfied are you with the Simple Energy Efficiency program?" (CY 2016 n=881, CY 2017 n=921, Q1 n=284, Q2 n=167, Q3 n=336, Q4 n=134)

As shown in Figure 104, Program participant's average rating for satisfaction with the energy-efficiency packs in CY 2017 was 8.9, slightly higher than in CY 2016.[112]

[112] CY 2017 Q4 rating is statistically significantly higher than the CY 2016 total ($p < 0.05$ using a binomial t-test).

Figure 104. CY 2017 Satisfaction with the Energy-Efficiency Pack

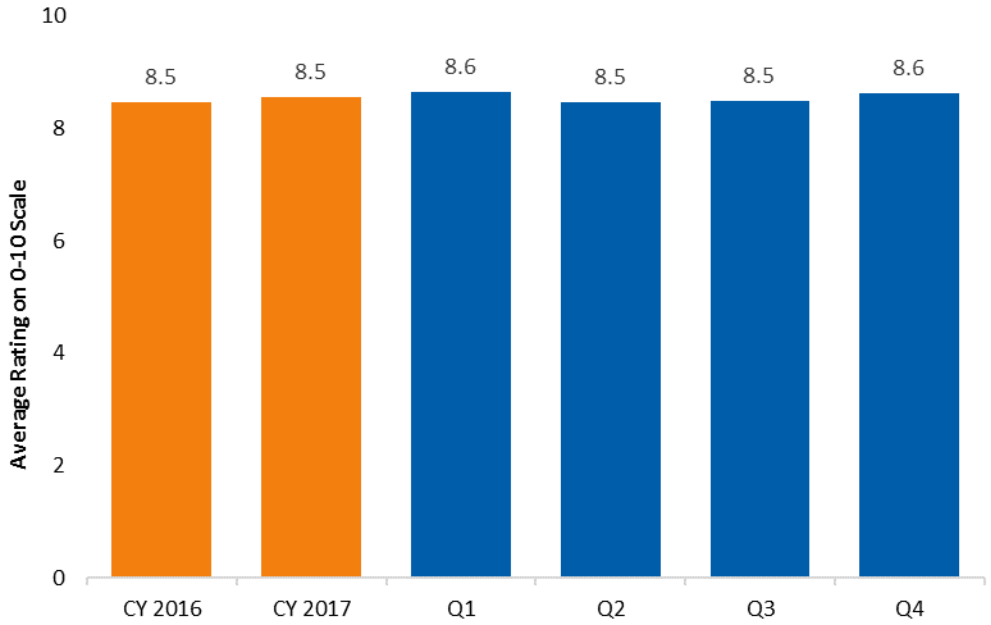


Source: Simple Energy Efficiency Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficiency pack you received?" (CY 2016 n=876, CY 2017 n=941, Q1 n=291, Q2 n=171, Q3 n=343, Q4 n=136)

Figure 105 shows the average rating for the likelihood that respondents will initiate another energy efficiency project in the next 12 months was 8.5.[113]

[113] Customers who said they already have recommended the Program were counted in mean ratings as a rating of 10 (most likely).

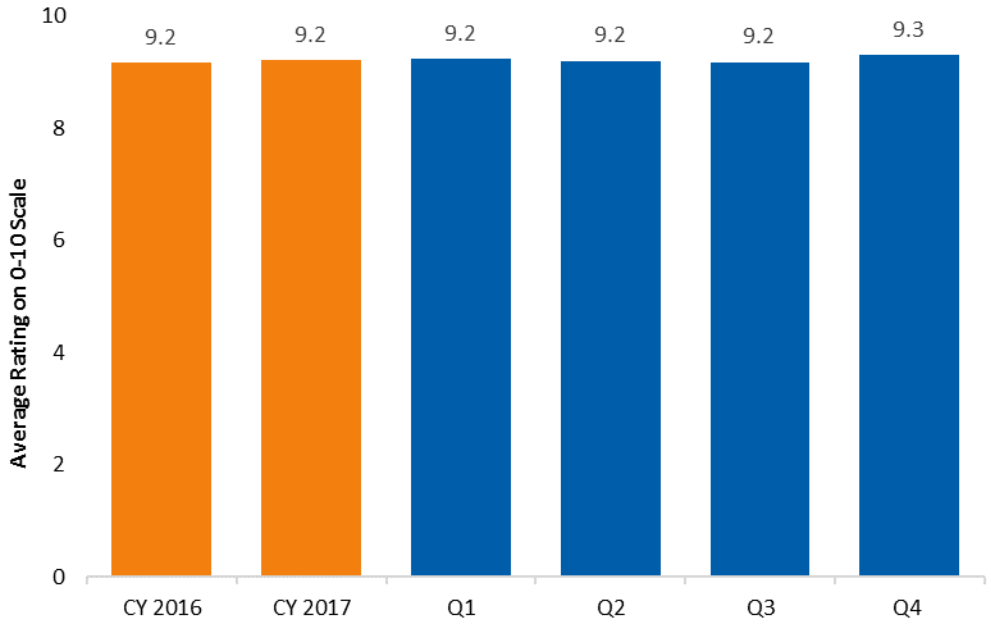
Figure 105. CY 2017 Likelihood of Initiating an Energy Efficiency Improvement



Source: Simple Energy Efficiency Program Ongoing Participant Satisfaction Survey Question: "How likely are you to initiate another energy-efficiency improvement in the next 12 months?" (CY 2016 n=818, CY 2017 n=896, Q1 n=279, Q2 n=163, Q3 n=324, Q4 n=130)

Figure 106 shows that respondents gave a rating of 9.2 for the likelihood they would recommend this Program. Using these survey data, the Evaluation Team calculated a net promoter score (NPS) based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6). The NPS for participants is +75.

Figure 106. CY 2017 Likelihood of Recommending the Simple Energy Efficiency Program

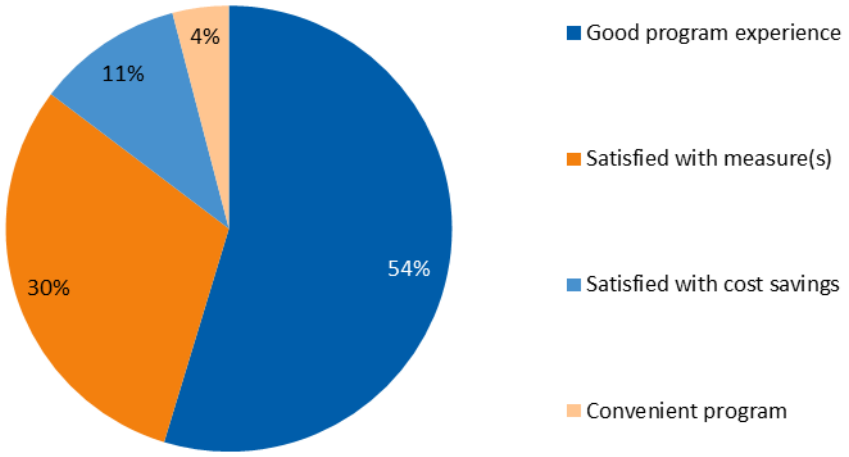


Source: Simple Energy Efficiency Program Ongoing Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to others?" (CY 2016 n=872, CY 2017 n=936, Q1 n=291, Q2 n=166, Q3 n=345, Q4 n=134)

Ongoing customer satisfaction survey respondents answered whether they had any comments or suggestions for improving the Program. Of the 958 participants selected for reporting, 331 provided open-ended feedback, which the Evaluation Team coded into a total of 421 mentions. Of these, 246 were positive or complimentary comments (58%), and 175 were suggestions for improvement (42%).

The positive responses are shown in Figure 107, with general satisfaction and satisfaction with measures dominating (54% and 30%, respectively).

Figure 107. CY 2017 Positive Comments About the Program

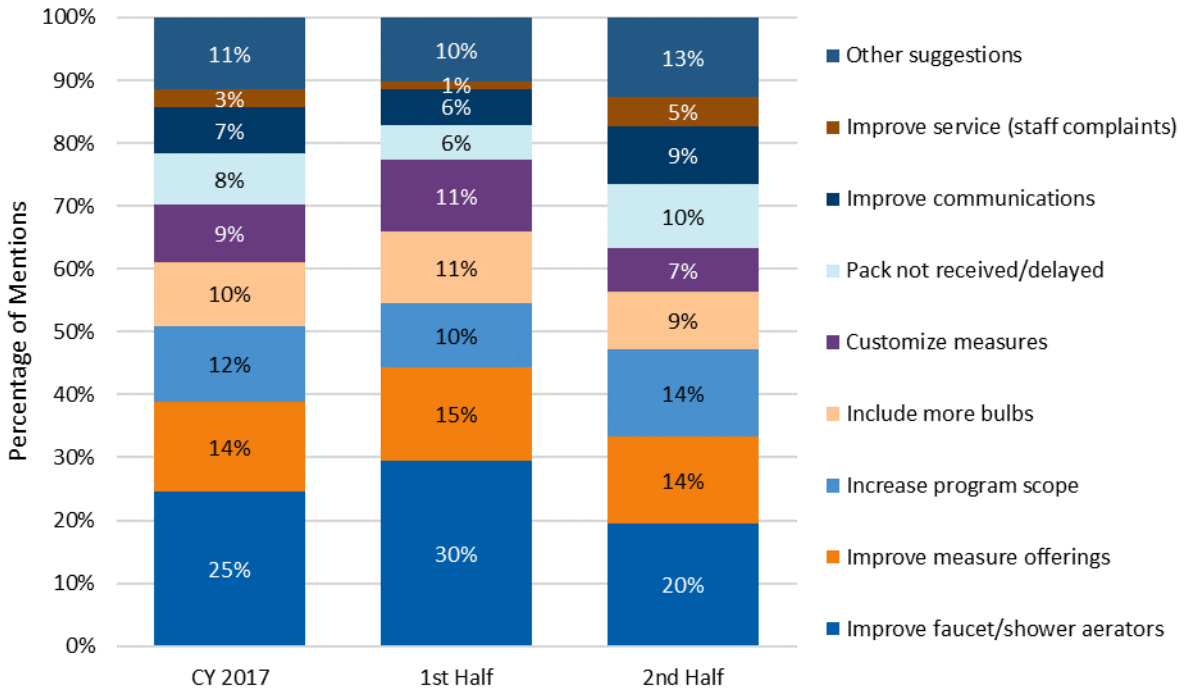


Source: Simple Energy Efficiency Program Ongoing Customer Satisfaction. Survey Question: "Please tell us more about your experience and any suggestions for improvement." (Total positive mentions: n=246)

Suggestions for improving the Program are shown in Figure 108. The most common suggestions involved improving faucet and shower aerators (25%), followed by improving measure offerings (14%) and increasing program scope (12%).

About 60% of the suggestions for improving the faucet or shower aerators stemmed from poor fit and over half of the suggestions for improving measure offerings centered around improving the advanced power strip. Most of the respondents who suggested increasing the Program scope commented on increasing the number of options and the frequency of offerings.

Figure 108. CY 2017 Suggestions for Improving the Program



Source: Simple Energy Efficiency Program Ongoing Customer Satisfaction Survey Question: "Please tell us more about your experience and any suggestions for improvement." (Total suggestions for improvement mentions: CY 2017 n=175, first half n=84 and second half n=87)

Satisfaction with Program Processes

Ninety-three percent of respondents signed up for the Program using the Focus on Energy website, up from 74% in CY 2016. Five percent called the Program Implementer customer call center, and less than 2% signed up using "other" channels.

More than 99% of the respondents who used the website to sign up for the Program said it was either *very easy* (90.5%) or *somewhat easy* (8.9%) to fill out the online request form. This result is consistent with the 98% of respondents in CY 2016.

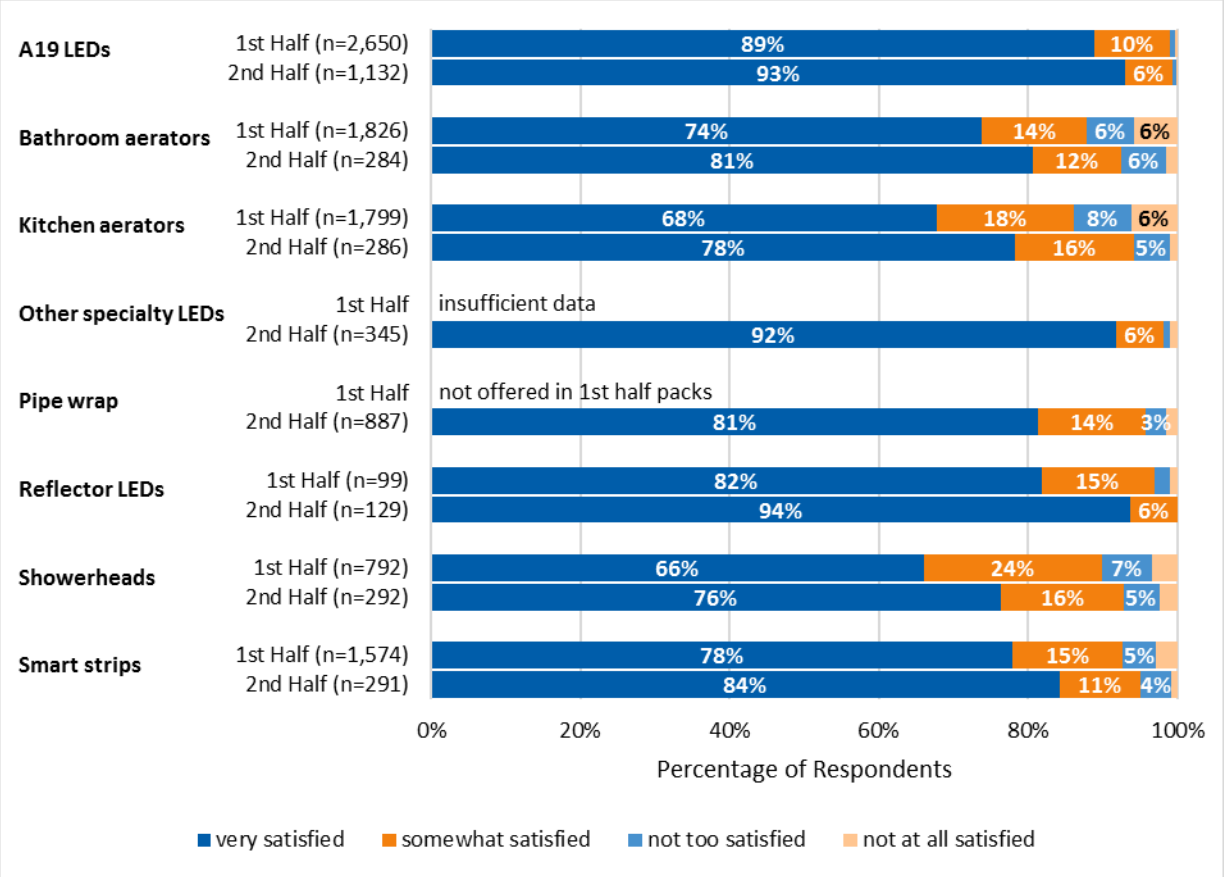
The Program Administrator and the Program Implementer aimed to mail each pack within four weeks of receiving the request, a tighter turnaround time of four to six weeks, the goal for CY 2016. When asked how long it took to receive their packs, 69% of respondents said it took less than four weeks (71% in first the half of CY 2017, 64% in the second half), down from 76% in CY 2016. Only 2% said it took longer than six weeks.

Ninety-seven percent of respondents said they were *very satisfied* (81%) or *somewhat satisfied* (16%) with how long it took to receive their packs, consistent with CY 2016.

Measure Satisfaction

Survey respondents rated their satisfaction with each measure in their packs, as shown in Figure 109, regardless of if they installed them. Participants reported high levels of satisfaction for all measures. Total satisfaction (measured by the total percentage of participants who reported they were either *very satisfied* or *somewhat satisfied*) ranged from 86% to 100%. The percentage of respondents who were *very satisfied* increased from the first half to the second half of CY 2017 for every measure. Satisfaction ratings for CY 2017 measures generally aligned with those for CY 2016 measures.

Figure 109. Simple Energy Efficiency Program Customer Satisfaction by Measure



Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Participant Survey Questions C6, C13, C20, C27, C34, D8, E7, F7, F15 (C5, C11, C17, C23, C29, C35, C41, D6, E5, F7, F15, G5). "How satisfied are you with the [measure] you received?"

The survey asked a follow-up multiple-response question of respondents who were less than *very satisfied* with any measures about the reasons for their satisfaction ratings.[114] Most respondents who received general purpose (standard A-lamp) LEDs (n=280) said the bulbs were not bright enough (42%) or they did not like the color (26%). Others expressed dissatisfaction because the bulb(s) burned out or

[114] Results based exclusively on first-half of the year surveys. Except for pipe wrap, second-half of the year surveys did not achieve large enough sample sizes to achieve confidence and precision targets for each measure and, thus, would be anecdotal.

stopped working (12%), did not work with dimmer or 3-way switches (11%), or did not fit properly in the fixture(s) (3%). Although anecdotal, survey results from surveys conducted in the second-half of the year were generally similar to those from the first half of the year.

Most respondents who were less than *very satisfied* with their advanced power strip (n=323) said there were not enough regular outlets (37%) or they did not like how equipment operated when plugged into it (30%). Slightly more than one-third of respondents said it was difficult to install (25%) or it broke or did not work (10%).

When asked why they were less than *very satisfied* with water-saving measures, most respondents did not like the water pressure, which was more prominent for showerheads (64%) than for bathroom faucet aerators (44%) or kitchen faucet aerators (39%).[115] However, faucet aerators were much more likely to be reported to not fit properly or be difficult to install (35%) than were showerheads (9%). Two percent of faucet aerators reportedly were broken or did not work compared to 0.4% of showerheads.

Most second-half survey respondents who were less than *very satisfied* with their pipe wrap had no interest in installing it (27%) or had difficulty installing it (19%). Seven percent said it was the wrong size.

It is not immediately clear why satisfaction increased from the first half of CY 2017 to the second half, but the increase could be the result of Focus on Energy configuring packs to be more thematic, and by eliminating co-pays (see *Program Design* section). These changes resulted in a more balanced distribution of pack types and suggests that participants picked packs based on their contents rather than their price. This would likely explain not only consistently higher satisfaction but also consistently higher installation rates (see *In-Service* section).

In CY 2017, respondents more frequently removed or did not install measures for reasons related to dissatisfaction with elements of each measure (for example, the brightness of LEDs or the water pressure of showerheads and faucet aerators). However, in CY 2016, respondents were more likely to report they already had measures they received through the Program "installed in every possible location." The Team did not provide this response option in CY 2017 surveys. In addition, some CY 2016 satisfaction results are not statistically significant due to small sample sizes and should be interpreted anecdotally. Considering these details as well as generally similar satisfaction ratings, it is difficult to determine how much, if at all, customer attitudes toward kit measures have changed from last year.

Reasons for Removing or Not Installing Measures

The Evaluation Team assessed the percentage of survey respondents who removed or did not install measures, as well as their reasons why. Table 174 shows that 0.5% to 10.9% of respondents removed measures they had previously installed, and 13.7% to 59.4% never installed certain measures. Note that removal and non-install rates generally behave inversely because they are calculated based on the pool

[115] Showerheads (n=256), bathroom faucet aerators (n=451), kitchen faucet aerators (n=547).

of respondents who did not have the measure *currently* installed. In other words, a higher percentage of non-installed measures tends to result in a lower percentage of removals.

Non-install rates for LEDs include respondents who installed some but not all the LEDs they received. For all other non-lighting measures, the in-service, removal, and non-install rates sum to 100% of respondents.

Table 174. Simple Energy Efficiency Program Measure Removal or Non-Install Rates

Measure	Percentage of Measures Removed[1]			Percentage of Measures Not Installed[2]			First-Year ISR
	First Half	Second Half	Total	First Half	Second Half	Total	
A19 LEDs	1%	<1%	**1%**	6%	21%	**15%**	**84%**[3]
Kitchen Faucet Aerators	5%	-	**5%**	48%	-	**49%**	**46%**
Bathroom Faucet Aerators	3%	3%	**3%**	50%	41%	**45%**	**53%**
Fixed Showerheads	6%	1%	**5%**	38%	35%	**37%**	**58%**
Hand-wand Showerheads	-	6%	**6%**	-	23%	**23%**	**71%**
Smart Strips	6%	4%	**5%**	13%	18%	**14%**	**80%**
Specialty LEDs	2%	1%	**1%**	19%	26%	**26%**	**73%**[3]
Pipe Wrap	-	<1%	**<1%**	-	58%	**58%**	**40%**

[1] Source: CY 2017 Simple Energy Efficiency Participant Survey Questions C2, C8, C16, C23, C30 (C2, C8, C14, C20, C26, C32, C38). "Of the [X] bulb(s) not currently installed, how many did you install but later remove?"/D2, E2, F2, F10 (D2, E2, F2, F10, G2). "Was the [measure] ever installed in your home and later removed?"

[2] Source: CY 2017 Simple Energy Efficiency Participant Survey Questions C1, C7, C15, C24, C29 (C1, C7, C13, C19, C25, C31, C37). "Our records show you received [X] LED light bulbs. How many of the LEDs are currently installed in your home?"/D1, E1, F1, F9 (D1, E1, F1, F9, G1). "Our records show you also received a showerhead. Is the showerhead you received currently installed in your home?"

[3] The first-year ISRs presented for A19 LEDs and Specialty LEDs do not account for the future installation of lamps placed in storage. Lifetime ISRs for these measures, which the Team used in the verified savings calculations, are provided in Table 160.

The majority of respondents who removed or did not install their measures stored them for future use (82%). Storage rates ranged from 70% (hand-wand showerheads) to 99% (reflector LEDs). Nine percent of respondents gave their unused measures to someone else, and only 3% of respondents recycled or discarded the measures. Second-half survey respondents stored their measures for future use more frequently than did first-half (87% to 80%, respectively) and recycled or discarded them less frequently (1% to 3%, respectively).

The Program Implementer and Program Administrator made an effort to reduce the number of customers who simply did not get around to installing measures by including messages in the pack to install items immediately to maximize savings. They also indicated they are collaborating to offer "opt-out" packs in CY 2018, in which customers can remove measures they do not want and know they will not install.

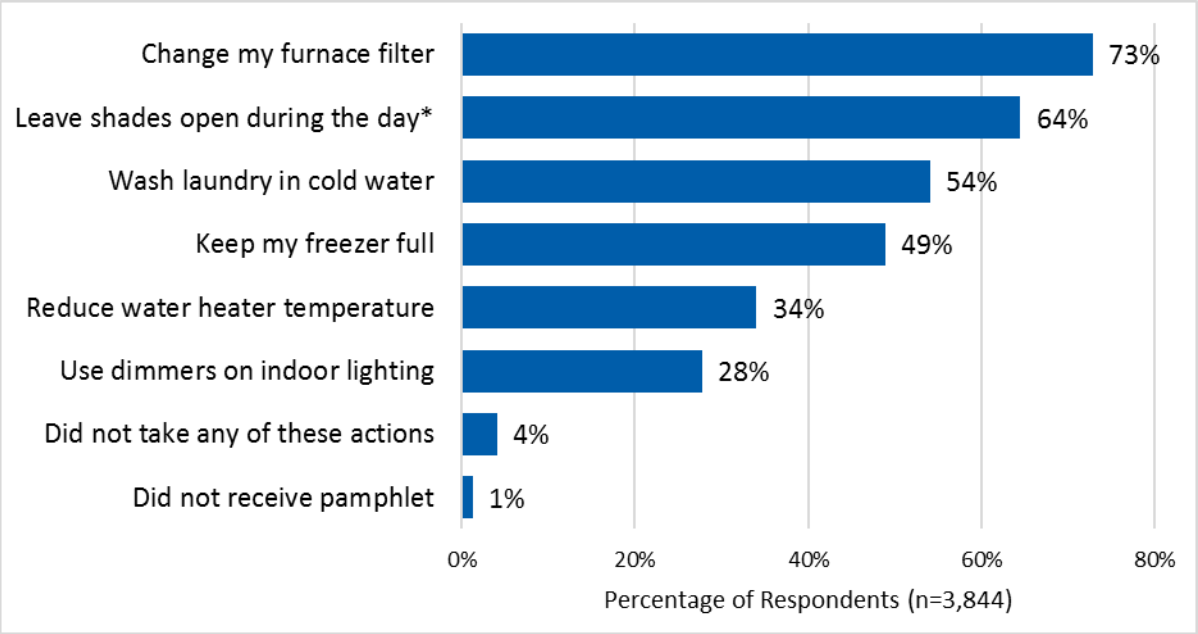
Energy-Saving Actions

As stated in the *Cross-Promotion of Other Focus on Energy Programs* section, each Simple Energy Efficiency Program pack and Connected Devices Kits Program kit includes an insert that lists other ways

customers can save energy such as washing laundry in cold water or changing their furnace filter. Ninety-two percent of the Simple Energy Efficiency survey respondents said they committed at least one of the listed energy-saving actions, a dramatic improvement from 23% in CY 2016. Only 4% of respondents did not take any energy-saving actions, and 1% did not recall receiving the pamphlet. Figure 110 shows the recommended actions respondents took to save energy.

On average, respondents took three of the energy-saving actions recommended in the pamphlet. The most- and least-common actions taken, respectively, were replacing furnace filters (73%) and using dimmers on indoor lights to lower light levels (28%). When asked to rate the importance of the Program on their decisions to take the energy-saving actions, 65% of respondents said the Program was either *very important* (25%) or *somewhat important* (40%). Ratings of importance ranged from 61% (*change furnace filter*) to 74% (*reduce water heater temperature to 120 degrees*).

Figure 110. Simple Energy Efficiency Program Recommended Energy-Saving Actions Taken



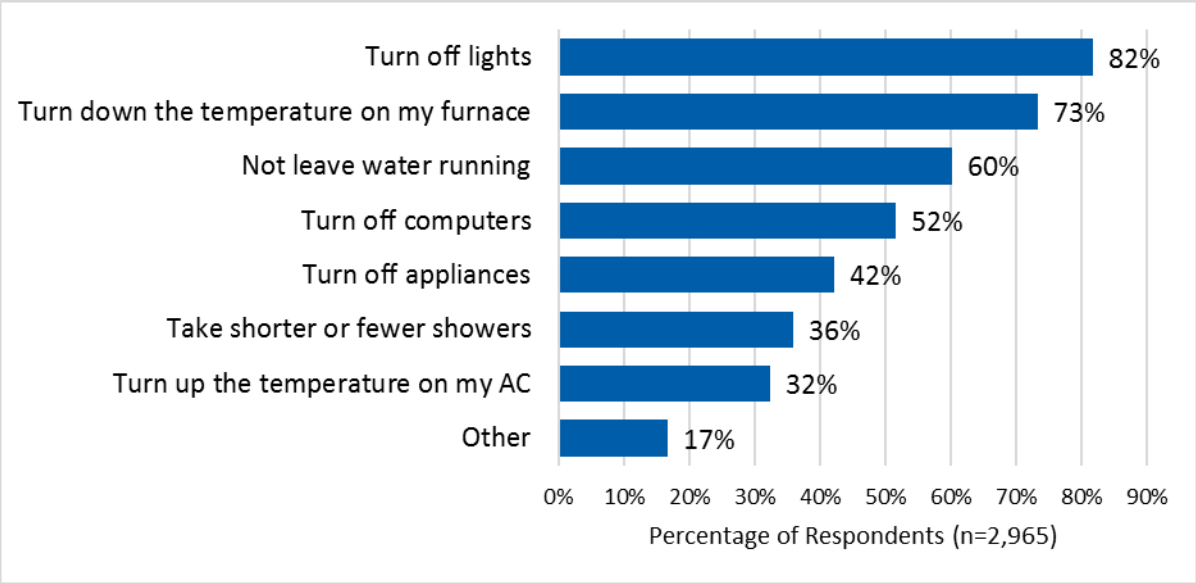
Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Participant Survey Question H1 (J1). "You should have received in your pack a pamphlet with information on actions you can take to save energy. Which of these actions have you taken? Select all that apply." Multiple responses allowed. *Winter activity.

Survey respondents were also asked if they had taken any other energy-saving actions since participating in the Program and, if so, which actions they took. Seventy-eight percent of respondents took energy-saving actions—on average for additional actions each—that were not listed in the pamphlet (80% in the first half, 74% in the second half). As shown in Figure 111, the most- and least-common actions respondents took, respectively, were turning off lights (82%) and turning up the temperature on their air conditioning units.

Again, the Team asked respondents how important the Program was in the respondents' decisions to take additional energy-saving actions. Similarly, 70% of respondents rated the Program as *very*

important (33%) or *somewhat important* (37%) to their decisions. Overall, 96% to 99% of respondents said they continued to perform the actions over time.

Figure 111. Simple Energy Efficiency Program Non-Recommended Energy-Saving Actions Taken



Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Participant Survey Question H3 (J3). "Specifically, what actions have you taken? Select all that apply." Multiple responses allowed.

Barriers to Participation

The Program Implementer said the biggest barrier to participation in the Program is collecting the necessary information (e.g., utility account number, contact information) for SPECTRUM because customers do not always have that information readily available. The Program Implementer said the best way to address this barrier would be to figure out ways to auto-populate the requisite customer information, which it has achieved in other similar successful programs it has run previously.

Connected Devices Kits Program

Collecting the necessary eligibility information from customers for SPECTRUM is an even greater barrier for the Connected Devices Kits Program, which has more eligibility requirements than the Simple Energy Efficiency Program:

- Must be a customer of a participating utility
- Must live in an eligible rural ZIP code
- For CY17, must have a participating ISP
- To earn $50 ISP bill credit:
  - Must have, or upgrade to 10 MBps service
  - Must add new or upgrade existing service from ISP

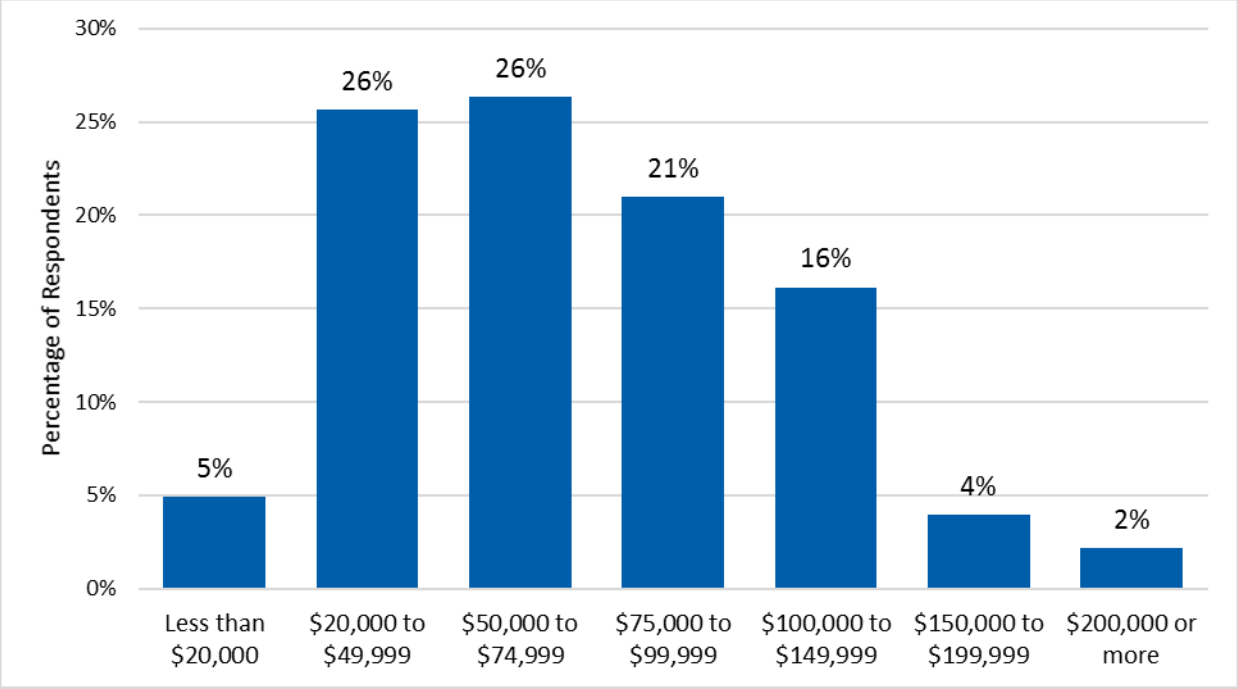
The requirement to add new or upgrade existing service presents an additional cost despite the kit being free, and broadband service is typically more expensive than dial-up or DSL service. The Program Administrator allocates the responsibility of verifying customer eligibility information to the ISPs.

Participant Demographics

The CY 2017 participant survey included questions to collect demographic information from each respondent. The survey revealed that most respondents (87%) live in a single-family, detached home, and 8% live in an attached home (townhouse, row house, or duplex). Four percent of respondents reportedly live in multifamily homes with four units or more, although the Program is designed specifically for one to three-unit homes.

Figure 112 shows participants' total household income in CY 2017. Program participants' median income was $50,000 to $75,000, which aligns with CY 2016 results and the U.S. Census Bureau's 2017 Wisconsin median household income of $54,610.[116]

Figure 112. Simple Energy Efficiency Program Total Household Income



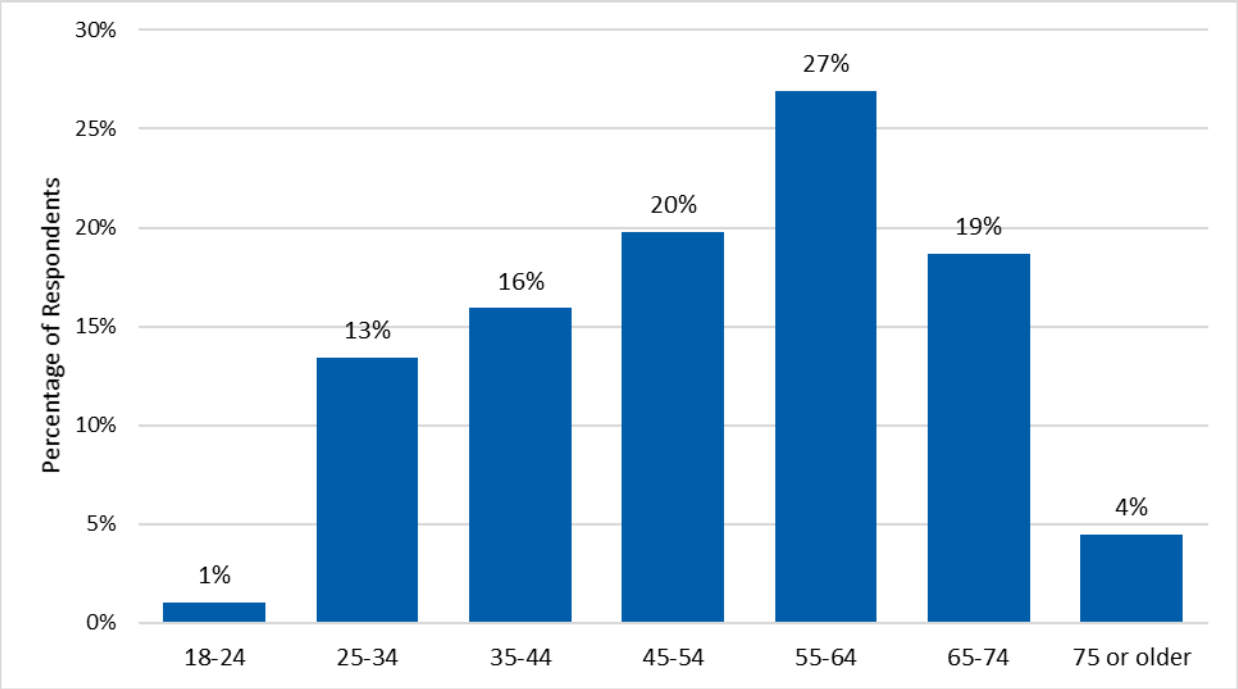
Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Participant Survey Question J6 (L6). "Which category best describes your total household income in 2015 before taxes?" (n=3,285)

Participants' median age was between 45 and 54 in CY 2017, as seen in Figure 113. The median age is younger than in CY 2016, when it was between 55 and 64. Twenty-three percent of Program participants

[116] U.S. Census Bureau. "QuickFacts Wisconsin." Available online: http://www.census.gov/quickfacts/table/PST045215/55

were 65 years old and over, higher than the U.S. Census Bureau's 2016 estimate that 16.1% of the Wisconsin population was 65 years old and over, but still 11 percentage points lower than in CY 2016.

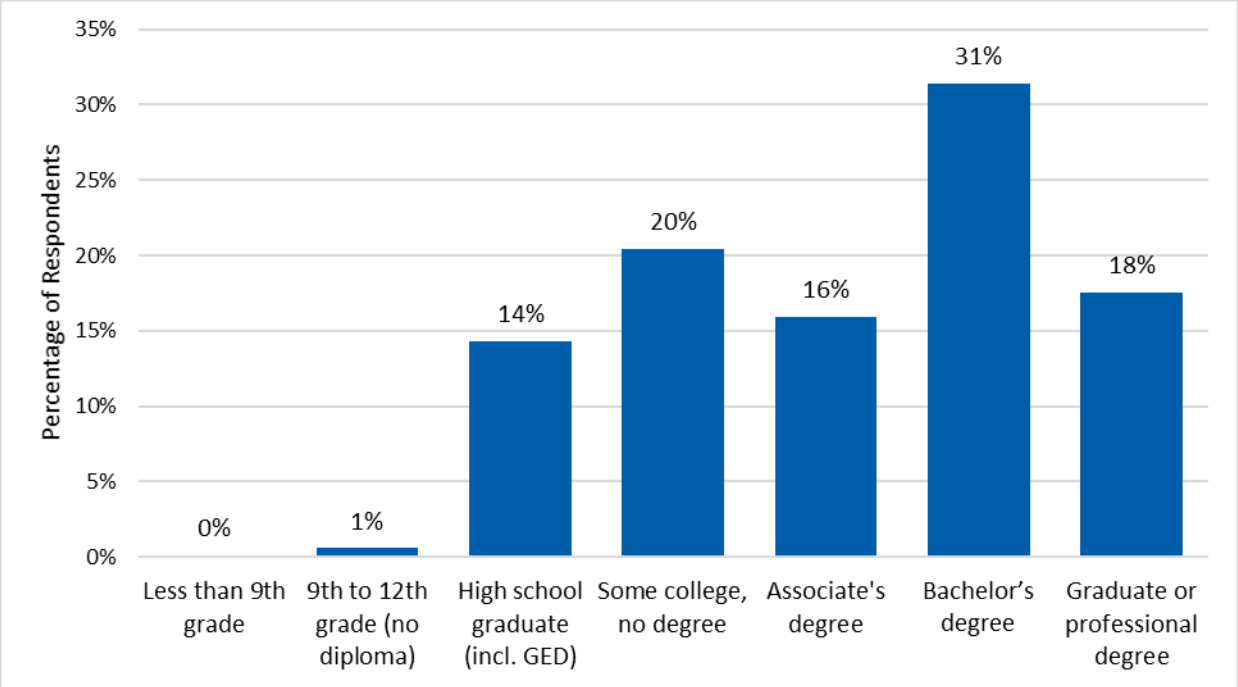
Figure 113. Simple Energy Efficiency Program Participant Age



Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Participant Survey Question J5 (L5). "Which of the following categories best represents your age?" (n=3,868)

The median education level for CY 2017 participants was an associate's degree, as shown in Figure 114, which is lower than the median education level in CY 2016 (a bachelor's degree). Forty-nine percent of Program participants held a bachelor's degree or higher, which is higher than the U.S. Census Bureau's 2012–2 016 estimate of 28.4% for the Wisconsin population, but slightly lower than in CY 2016 (51%).

Figure 114. Simple Energy Efficiency Program Highest Level of School Completed



Source: CY 2017 Simple Energy Efficiency First-Half (Second-Half) Participant Survey Question J4 (L4). "What is the highest level of school that you have completed?" (n=3,877)

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 175 lists the incentive costs for the Simple Energy Efficiency Program for CY 2016 and CY 2017.

Table 175. Simple Energy Efficiency Program Incentive Costs

	CY 2017	CY 2016
Incentive Costs	$1,536,983	$1,096,464

The Evaluation Team found the CY 2017 Program was cost-effective (5.68). Table 176 lists the evaluated costs and benefits.

Table 176. Simple Energy Efficiency Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016
Costs		
Administration Costs	$440,222	$458,265
Delivery Costs	$1,003,902	$1,045,049
Incremental Measure Costs	$1,477,862	$1,154,398
Total Non-Incentive Costs	**$2,921,986**	**$2,656,054**
Benefits		
Electric Benefits	$10,124,460	$8,697,039
Gas Benefits	$4,156,455	$4,950,201
Emissions Benefits	$2,330,372	$2,306,966
Total TRC Benefits	**$16,611,288**	**$15,954,206**
Net TRC Benefits	**$13,689,301**	**$13,298,152**
TRC B/C Ratio	**5.68**	**6.01**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Program.

Outcome 1. CY 2017 measure ISRs generally remained consistent with CY 2016 levels. From CY 2016 to CY 2017, first-year ISRs increased for general purpose LEDs (+2%), kitchen faucet aerators (+3%), bathroom faucet aerators (+4%), fixed showerheads (+1%), and smart strips (+9%) and decreased for hand-wand showerheads (-9%) and specialty LEDs (-8%). It is not immediately clear why the largest changes occurred. However, CY 2017 Program participants did not have to pay to upgrade to a hand-wand showerhead, providing less incentive to install and use it. Also, Focus on Energy provided more specialty LEDs in CY 2017 packs than in CY 2016 packs. Because each additional LED is more likely to be stored (i.e., the ISR for three bulbs is lower than for two bulbs, etc.), the more generous pack configurations in CY 2017 likely suppressed first-year ISRs relative to CY 2016 levels.

Recommendation 1: Because LED ISRs trail those of comparable kit programs, consider reducing the number of LEDs offered in each pack – or, if Focus on Energy intends to maintain the value of each pack, continue researching new self-install measures to include in place of additional LEDs – to improve LED first-year ISRs.

Outcome 2. After Focus on Energy reconfigured pack offerings, first-year ISRs increased for water-saving measures and decreased for lighting measures and smart strips. Focus on Energy offered different pack configurations in the first half of CY 2017 (January – June) and the second half (July – December). After listening to customer feedback, the Program Administrator intended to make packs more focused and thematic so participants could obtain a group of similar measures rather than several random energy-saving measures. The changes appear to support the outcomes that transpired, but, like

Outcome 1, it is not immediately clear why the ISRs changed so dramatically without aid of a treatment-control trial.

Recommendation 2: The Program Administrator should consider moving forward with the suggested plan of allowing participants to opt out of receiving certain measures in CY 2018. The proposed change would improve ISRs, reduce Program costs, and ensure that customers only received measures in which they are interested.

Outcome 3. More than half of CY 2017 survey respondents had heard of other Focus on Energy programs, roughly double the percentage of respondents from CY 2016. Additionally, 29% reported participating in other programs, up four-fold over CY 2016.

Recommendation 2. The Program Administrator and Implementer should maintain the cross-program promotion efforts that they implemented in CY 2017. The improving rate of customer awareness shows the Program Administrator's efforts to cultivate awareness of other Focus on Energy programs through the Simple Energy Efficiency Program were very effective.

Outcome 4. As found in research with multifamily property managers and owners, condominium property managers are receptive to changing the eligibility criteria to allow condo owners to order and install kits offered through the Simple Energy Efficiency Program, but property managers and owners of apartment buildings have reservations with kit components. In the Multifamily Program 2017 evaluation,[117] the Evaluation Team interviewed 12 multifamily property owners and managers for feedback on the upcoming CY 2018 Simple Energy Efficiency Program change, which will allow multifamily tenants and condo owners to request and install Program kits. In interviews, both condo property manager respondents welcomed the idea of residential condo owners installing all of the program's kit contents, but one needed to coordinate with the association to allow adjustment to the water heater and access to the domestic water piping. However, all property managers and owners of apartment buildings expressed apprehension with their tenants installing the water-related measures in the Simple Energy Efficiency Program kits. Most apartment owners/managers were concerned with property damage, and for the pipe insulation and water heater temperature card, said their tenants do not have access to their pipes and water heaters or the building provides hot water through a central system.

To address apartment owner and manager concerns, in early 2018 the Program Administrator created additional language for renters in its Simple Energy Efficiency kit order form, advising "renters should reference lease agreements as some products require landlord approval prior to installation."[118]

Recommendation 4: To assess program effectiveness, the Program Implementer should distinguish multifamily participation from single-family participation in the CY 2018 Simple Energy Efficiency

[117] Complete findings available in the Multifamily Programs chapter.

[118] https://www.energyfederation.org/focusonenergy/customer/account/create/

Program tracking data. The Administrator should set multifamily participant achievement goals to benchmark against the CY 2017 Multifamily Direct Install Program's 5,700 multifamily tenant unit goal.

Outcome 5. Multifamily property owners and managers of apartment buildings are interested in marketing and installing energy efficiency kit opportunities for Focus on Energy. As found in interviews with multifamily property managers and owners,[119] respondents had reservations with their apartment tenants installing portions of the Program kits. However, six of the 10 respondents were willing to promote the kits directly as an offer their facility staff would install. Two of these six expressed interest in a common area poster. Both condominium property managers were interested in promoting kits to residents.

Recommendation 5. Consider implementing strategies in CY 2018 to build awareness of eligibility changes to the Simple Energy Efficiency Program among multifamily tenants and condo owners by giving property managers and owners promotional materials such as email templates, common area posters, and flyers or registration forms for new tenant welcome packets, for which tenants could sign off the kit for the maintenance staff to install.

[119] Complete findings available in the Multifamily Programs chapter.

Direct-Mail Home Energy Assessment Pilot

Through the Direct-Mail Home Energy Assessment (DHEA) Pilot, Focus on Energy provided rural homeowners with a free home energy evaluation and customized recommendations to improve their homes' energy efficiency. In CY 2017, APTIM was the Pilot Administrator and EnergySavvy was the Pilot Implementer.

In 2016, the PSC identified that rural customers had been historically underserved by Focus on Energy programs and allocated funding to a package of programs to enhance service in 2017 and 2018. Focus on Energy launched the DHEA Pilot as one component of the rural package, designed to educate rural homeowners and increase their participation in Focus on Energy's residential program offerings.

In the DHEA Pilot, the Pilot Implementer mailed rural customers a 30-question Home Energy Savings Survey that was designed to assess characteristics and energy usage of the customers' home. In CY 2017, the Pilot Implementer mailed 100,000 surveys (in two batches of 50,000) to rural customers on June 19, 2017 and August 10, 2017. If customers completed and returned the survey, the Pilot Implementer mailed them a customized Home Energy Savings report that provided information about the home's energy consumption and recommendations to improve the home's efficiency through other Focus on Energy residential programs.

Impact Evaluation

Although the DHEA Pilot provided education about energy-saving opportunities, the Pilot alone did not claim energy savings. Therefore, the Evaluation Team provided only a process evaluation of the Pilot.

Process Evaluation

To track changes in participant satisfaction, educational effectiveness, and energy-saving actions, the Evaluation Team is conducting three longitudinal surveys between January 2018 and July 2018. This report incorporates the findings from the January 2018 participant survey; findings from the other two surveys will be analyzed in the CY 2018 annual report. Table 177 lists the specific evaluation activities and sample sizes used in the 2017 evaluation.

Table 177. DHEA Pilot Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Pilot Actor Interviews (Administrator and Implementer)	2
Participant Survey Batch 1	32
Participant Survey Batch 2	To be conducted in April 2018
Participant Survey Batch 3	To be conducted in July 2018

Pilot Design, Delivery, and Goals

To increase rural customer participation in Focus on Energy Residential programs, the Implementer mailed the DHEA survey to 100,000 randomly selected rural customers.[120] If the customer completed and returned the Home Energy Savings Survey, the Pilot Implementer mailed a report detailing the home's energy efficiency as well as offering up to four recommendations (as applicable) to improve its efficiency.[121]

Participant Survey

The Evaluation Team is surveying CY 2017 participants over the course of seven months. The first survey was conducted in January 2018 and the remaining two surveys will be conducted in April and July 2018. The surveys are being conducted longitudinally with a discontinuous sample (i.e., different respondents in each survey) to track changes in key outcomes. Survey topics target these key evaluation areas:

- Participant satisfaction with the Pilot
- Educational effectiveness of the Pilot
- Energy-saving actions that have been taken or will be taken in the near future

Methods

The Pilot Implementer provided the Evaluation Team a sample frame of 9,080 participants who had completed and returned the Home Energy Savings Survey by December 2017. The sample frame excluded participants who had already been contacted by the Pilot Implementer in a separate follow-up survey (n=500).[122] From this sample frame, the Evaluation Team is inviting (via postcard) 1,500 randomly selected participants (500 per survey batch) to take this follow-up survey in three different batches:

- January 2018 (three months after customers received their energy efficiency report)
- April 2018 (six months after customers received their energy efficiency report)
- July 2018 (nine months after customers received their energy efficiency report)

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[120] Focus on Energy designated rural ZIP codes according to U.S. Census Bureau data. See Appendix K for a complete list of designated rural ZIP codes. Customers were eligible to receive a Home Energy Savings Survey only if they had a participating Focus on Energy electric and/or gas utility service provider.

[121] The Pilot Implementer encountered an issue with roughly 8,000 customized home energy savings reports (in the first batch of 50,000). Because of an error in the annual energy savings algorithm, 8,000 customers received estimated annual savings that were greater than what they pay for utilities in an average year (these participants saw their three-year savings estimate). The Pilot Implementer mailed these customers a letter of apology as well as free LED nightlights. These participants were not included in the sample frame for this evaluation. To avoid a similar error in the second batch of 50,000, this estimated savings calculation was removed entirely from the Home Energy Savings report.

[122] This follow-up survey conducted by the Pilot Implementer was not related to the evaluation.

To encourage participation in the survey, respondents in each batch can enter a contest to win a $100 gift card. Table 178 lists the survey data collection activities and sample sizes to date.

Table 178. CY 2017 DHEA Data Collection Activities and Sample Sizes

Activity	Fielded Date	Invitations Sent	Started Survey	Screened from Survey [1]	CY 2017 Sample Size (n)
Participant Survey Batch 1	January 2018	500	44	12	32
Participant Survey Batch 2	April 2018	500	In progress	In progress	In progress
Participant Survey Batch 3	July 2018	N/A	N/A	N/A	N/A

[1] Respondents were screened from the survey if they did not remember the DHEA Pilot or if they said they did not participate in the Pilot.

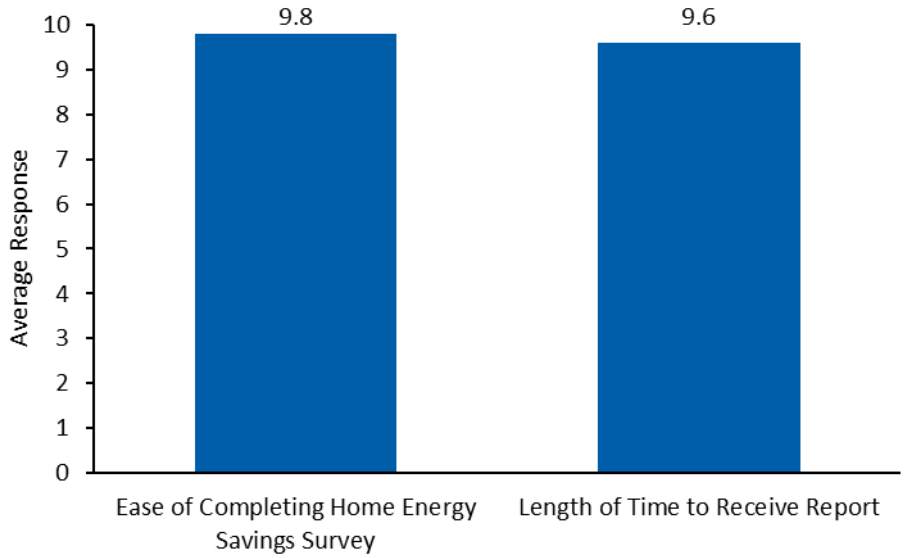
This report presents results from the first batch of the follow-up survey. Additional survey responses will be provided in a separate memo and included in the CY 2018 evaluation report.

Perceptions of the Pilot

The participant survey assessed respondents' satisfaction with various aspects of the DHEA Pilot. Respondents answered questions on a scale of 0 to 10, where 10 indicated the highest satisfaction or likelihood and 0 the lowest.

As shown in Figure 115, respondents said it was very easy to complete the Home Energy Savings Survey (average rating of 9.8) and they were highly satisfied with the length of time it took to receive the report after mailing in the completed survey (average rating of 9.6).

Figure 115. Ease of Completing the Survey and Satisfaction with the Processing Time of the Report



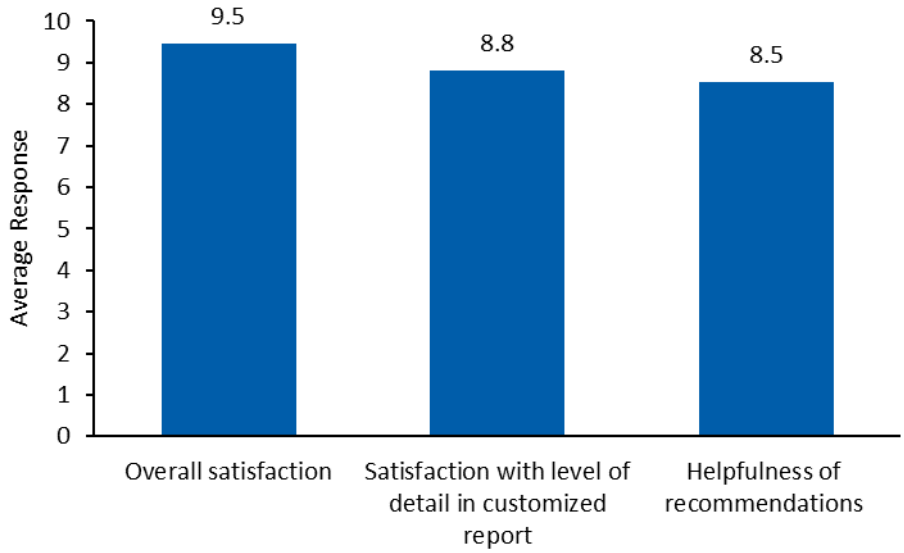
Source: C1. "How easy was it to complete the Energy Savings Survey?"/C6. "Were you satisfied with the length of time it took to receive your customized Home Energy Savings report after submitting the survey?" Responses on 11-point scales ranging from 0 (*not at all easy/satisfied*) to 10 (very *easy*/satisfied). (ns=27-30)

When asked what could be done to improve the survey process, 84% (26 out of 31) of respondents said there was nothing that could be improved with the Pilot. Of the five respondents who said something could be improved, only two made suggestions. One respondent requested that the survey be online and the other said that the survey should be faster to complete.

Respondents were also asked to rate the helpfulness of the recommendations in the customized Home Energy Savings report, their satisfaction with the level of detail in the report, and their overall satisfaction with the Pilot. As shown in Figure 116, respondents were highly satisfied with the Pilot overall and with the level of detail in the report. Respondents also thought the recommendations provided in the report were very helpful.

When asked if any changes could be made to the Pilot that would improve their satisfaction, only three respondents provided feedback. One respondent suggested increasing the speed of the turnaround on the report (i.e., time from returning the survey to receiving the report), one said some questions could be clearer, and one said that he/she never received a customized report with recommendations.

Figure 116. Participant Satisfaction and Perceived Helpfulness of the Customized Report



Source: C7. "How would you rate your overall satisfaction with the Energy Savings Survey program?"/C6. "How would you rate your satisfaction with the level of detail provided in your customized Home Energy Savings report?"/C5. "How helpful was the information provided in your customized Home Energy Savings report about how you can save energy and money?" Responses on 11-point scales ranging from 0 (*not at all helpful/satisfied*) to 10 (*very helpful/satisfied*). (ns=26-28)

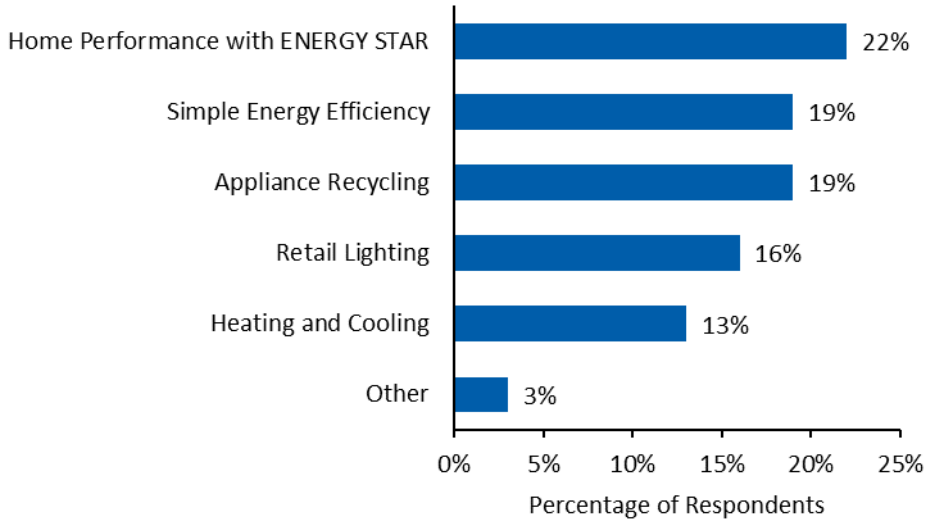
Educational Effectiveness

To determine whether the DHEA Pilot was meeting the goal of educating rural customers about Focus on Energy's program offerings, the follow-up survey asked about respondents' awareness of Program offerings *before* and *after* participating. The survey also assessed if respondents had investigated energy-saving opportunities after participating in the DHEA Pilot.

Respondents' awareness of Focus on Energy program offerings was moderate *before* participating in the DHEA Pilot (46%). This is comparable to results of the 2015 General Population Survey, which found that 45% of single-family homeowners were aware of Focus on Energy.[123]

As shown in Figure 117, respondents' awareness of specific Focus on Energy programs was relatively low *after* receiving the Home Energy Savings report. Program awareness was highest for the Home Performance with ENERGY STAR Program, followed by the Simple Energy Efficiency and Appliance Recycling programs.

Figure 117. Percentage of Respondents Aware of Each Program After Participating in DHEA Pilot



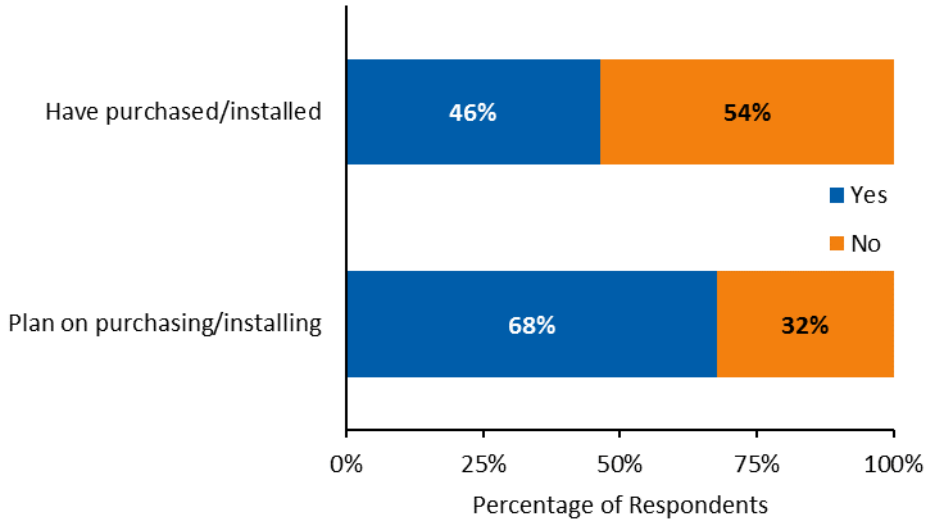
Source: E2. "Which programs are you aware of now that you have participated? (Select all that apply)" (n=13)

Energy Saving Actions

The follow-up survey also measured energy-saving actions that participants had taken at the time of the survey and additional actions they planned to take in the future. Notably, all but four respondents (86%, n=28) reported purchasing and/or intending to purchase energy-saving products. As shown in Figure 118 below, roughly half of respondents (46%) purchased or installed energy-saving products after receiving the customized Home Energy Savings report. Additionally, most respondents (68%) intended to purchase or install energy-saving products in the six months following their completion of the Home Energy Savings survey.

[123] Cadmus. *Focus on Energy Calendar Year 2015 Evaluation Report, Volume I*. May 20, 2016. Available online: https://focusonenergy.com/sites/default/files/WI%20FOE%20CY%202015%20Volume%20I.pdf

Figure 118. Percentage of Respondents that Have Purchased/Installed or Plan on Purchasing/Installing Energy Efficient Products

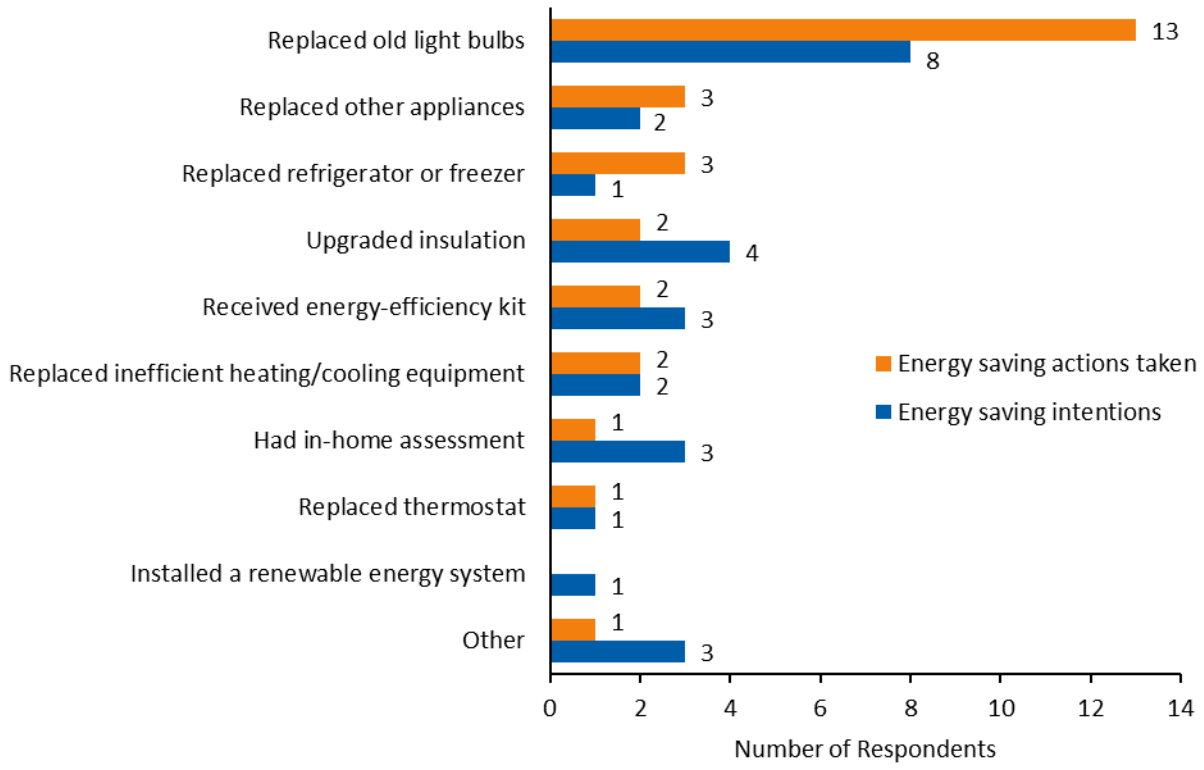


Source: D1. Due to the information you received in the customized Home Energy Savings report, have you purchased or installed any energy-efficient products since you received your report?" D2. "Do you plan to purchase or install any energy-efficient products in the next 6 months?" (ns=28)

Of the respondents who purchased or installed an energy-saving product after participating in the DHEA Pilot, most reported replacing old light bulbs with energy-efficient LEDs, followed by replacing refrigerators, freezers, and other appliances with energy-efficient alternatives (Figure 119).[124] The respondents who intended to purchase or install energy-saving products in the next six months most frequently intended to replace old light bulbs with energy-efficient LEDs, followed by upgrading insulation. Notably, when respondents were asked how important the DHEA Pilot was in their decision or intention to purchase/install the energy-saving measure(s), respondents, on average, said the Pilot was very important (average rating of 8.1).

[124] Few respondents received rebates for these energy-saving actions. One respondent received a rebate for recycling an old refrigerator/freezer and one respondent received a rebate for replacing inefficient heating/cooling equipment.

Figure 119. Energy-Saving Actions Taken and Intentions to Take since Participating in DHEA Pilot



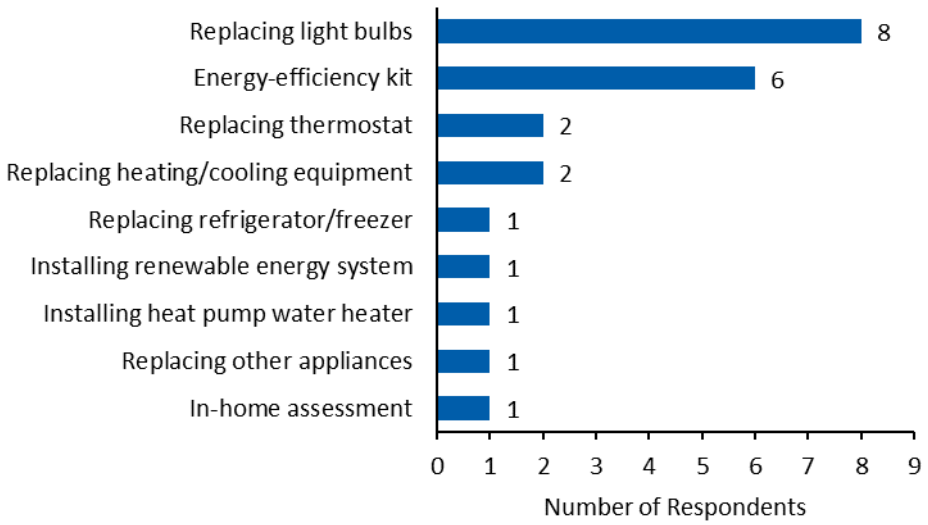
Source: D3. "Which energy-efficient products have you purchased/installed? (Select all that apply)"
D4. "Which energy-efficient products do you plan to purchase/install in the next 6 months? (Select all that apply)" (n=32)

Four respondents in did not take an energy-saving action *and* did not plan to purchase or install an energy-saving product in the next six months and cited the following reasons:

- Energy-saving products are too expensive (three respondents).
- The potential savings was uncertain (one respondent).
- The report said the home does not need upgrades (one respondent).

Although many surveyed respondents took energy saving-actions, most did not investigate energy-saving opportunities after they received their DHEA Pilot report (60%, n=15). All respondents who did inquire about energy-saving opportunities did so online (40%, n=10). Of the respondents who further investigated energy-saving opportunities, respondents most frequently explored replacing light bulbs with more efficient LEDs, followed by the energy efficiency kits (Figure 120).

Figure 120. Number of Respondents that Investigated Energy-Saving Opportunities



Source: E4. "Which energy-saving opportunities did you investigate? (Select all that apply)" (ns=1-8)

Respondent Characteristics

Through the follow-up survey, The Team gathered demographic characteristics to understand respondents' characteristics. Table 179 summarizes respondent demographic characteristics by batch.

Table 179. CY 2017 Respondent Characteristics

Survey Batch	Average Age	Percentage in Single-Family, Detached Residence	Percentage who Own Residence	Percentage with Bachelor's Degree	Percentage with Income Greater than $90,000
Batch 1	53.3	89%	100%	67% [1]	48%

[1] The 2015 U.S. census showed that 19% of rural Americans have a bachelor's degree education or higher, suggesting that this sample is not representative of the Wisconsin rural population (https://www.ers.usda.gov/topics/rural-economy-population/employment-education/rural-education/).

Evaluation Outcomes

The Evaluation Team identified the following outcomes.

Outcome 1. Rural customers in the DHEA Pilot have moderate awareness of Focus on Energy, although they are less aware of specific programs. Roughly half of the respondents said they were aware of current Focus on Energy residential programs. This is consistent with findings from the 2015 general population survey (45%). Few CY 2017 respondents were aware of the programs listed in the survey (e.g., Simple Energy Efficiency Program). This finding suggests that the DHEA Pilot is not necessarily increasing awareness of specific programs. However, it is important to note that unaware respondents still took energy-saving actions. In fact, there was no statistical difference in energy-saving intentions or actions between aware respondents and unaware respondents.

Outcome 2. The DHEA Pilot is viewed favorably by Pilot participants. Respondents report high satisfaction with the DHEA Pilot. In addition to reporting high overall satisfaction, respondents said that the Home Energy Savings Survey was quick, that the customized report was detailed, and that the recommendations were helpful. Together, these findings indicate that the DHEA Pilot was received positively by participants.

Outcome 3. The DHEA Pilot appears to be facilitating energy-saving actions. Nearly half of the respondents reported that they had already purchased or installed an energy-saving product by the time they completed the follow-up survey. Similarly, most respondents planned on purchasing or installing energy-saving products in the months following the survey. Although most of these energy-saving actions were low-cost (e.g., replacing light bulbs), it is notable that respondents were also choosing to invest in energy-efficient options if they were installing larger, higher-cost measures (e.g., replacing appliances). Respondents frequently said the DHEA Pilot was very important in their decisions to purchase or install energy-saving measures. Although it was not possible to quantify spillover findings since the Pilot alone did not directly claim energy savings, these results suggest that the DHEA Pilot is positively influencing energy-saving actions.

Nonresidential Programs

Small Business Program

Through the Small Business Program, Focus on Energy encourages commercial and industrial customers with an average monthly consumption of 40,000 kWh or less in July and August to install energy-efficient products at their facilities. The Program assists customers in finding a trained Trade Ally who can present options for upgrading equipment and install the energy-efficient products. The Program offers the highest incentives among Focus on Energy's business programs. To help reduce cost barriers and payback periods, the customer is either paid directly for the products installed or Trade Allies can choose to receive these incentives on behalf of their customers by applying instant discounts to the invoice.

In CY 2017, Focus on Energy moved the Program to a new implementer, and components of the Program were redesigned to better align with the market and other Focus on Energy programs. As part of this alignment, Focus on Energy introduced a prescriptive incentive program strategy to align with the Business Incentive Program.

To support the PSC's initiative to provide rural customers with energy-efficient technologies and benefits, Focus on Energy also developed and launched the Community Small Business Offering in CY 2017. This offering provides extensive, community-based outreach activities and additional incentives for rural customers. These incentives are 30% to 70% higher than those offered to nonrural customers and are intended to help rural customers overcome the cost barriers of participation. The rural offering launched in the second half of CY 2017 and focused its first campaign and outreach on the community of Cross Plains, just outside Madison.

The Program will continue to ramp up in CY 2018, and a complete evaluation of the Community Small Business Offering will be included in the CY 2018 annual evaluation report.

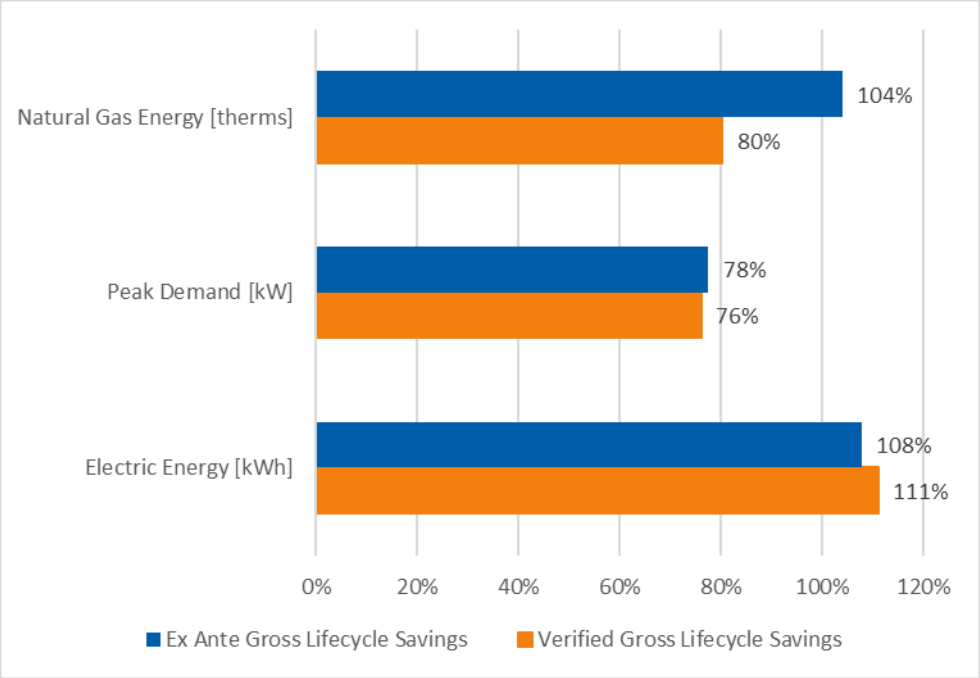
Table 180 contains the Small Business Program's CY 2017 verified impacts.

Table 180. Small Business Program Summary

Item	Units	CY 2017	CY 2016	CY 2015
Incentive Spending	$	$2,344,213	$4,142,650	$3,759,992
Participation	Number of Participants	1,333	1,608	1,980
Verified Gross Lifecycle Savings	kWh	360,410,945	479,711,634	392,972,035
	kW	2,673	6,155	5,184
	therms	1,026,102	214,446	248,114
Verified Gross Lifecycle Realization Rate	MMBtu	100%	105%	100%
Annual Net-to-Gross Ratio	MMBtu	91%	95%	88%
Net Annual Savings	kWh/yr	19,882,116	30,138,409	24,702,720
	kW	2,423	5,847	4,536
	therms/yr	50,225	20,567	20,907
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	3.83	2.99	2.82

Figure 121 shows the percentage of gross lifecycle savings goals achieved by the Small Business Program in CY 2017. The Program exceeded its CY 2017 electric goals for both *ex ante* and verified gross savings but fell short of its goals for peak demand reduction. The Program exceeded its CY 2017 natural gas *ex ante* gross saving goals but fell short of its verified gross natural gas savings goals.

Figure 121. Small Business Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1] The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations of the CY 2017 Small Business Program. The Team designed its EM&V approach to integrate multiple perspectives in assessing the Program's performance. Table 181 lists the specific data collection activities and sample sizes used in the evaluations.

Table 181. CY 2017 Small Business Program Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Program Actor Interviews	2
Tracking Database Review	Census
Ongoing Customer Satisfaction Surveys	255
Engineering Desk Reviews	54
Verification Site Visits	43

Program Actor Interviews

In July 2017, the Evaluation Team interviewed the Program Administrator and the Program Implementer to learn about the current state of the Small Business Program and assess its objectives, performance, and any implementation challenges and solutions. The Evaluation Team also asked interviewees about their marketing and outreach efforts for engaging Trade Allies and customers.

Tracking Database Review

The Evaluation Team reviewed a census of the Small Business Program's records in the Focus on Energy database, SPECTRUM. The review included the following tasks:

- Ensure that the totals in SPECTRUM matched the totals reported by the Program Administrator
- Reassign savings from a number of database adjustment measures to the corresponding program measures
- Check for complete and consistent application of information across data fields (measure names, application of annual savings, application of EUL, etc.)

Ongoing Customer Satisfaction Surveys

PSC staff requested that the Evaluation Team conduct satisfaction surveys beginning in CY 2015 for the 2015–2018 quadrennial. These surveys are intended to give recent Program participants the opportunity to offer feedback quickly and easily, ensure that this feedback is close in time to the participation experience, identify problems at any time of year, and discover energy efficiency opportunities for delivering follow-up information to interested participants. The Program Implementer used data during ongoing customer satisfaction surveys to assess performance and help meet contractual obligations related to satisfaction KPIs.

Within two weeks of receiving the incentive payment, the Program Administrator deployed online surveys to all CY 2017 participants with email addresses in SPECTRUM and mail surveys to participants without email addresses. The Evaluation Team combined the online survey and mail survey results for quarterly and annual reporting.

In CY 2017, 255 Small Business Program participants responded to the ongoing customer satisfaction survey.

Desk Reviews

The Evaluation Team conducted a detailed review of all available project documentation in SPECTRUM for a sample of 54 program measures. This review included an assessment of the savings calculations and methodology applied by the Program Implementer. The Team referred to applicable Focus on Energy TRMs (2017 TRM and 2017 TRM Update) and associated workpapers to determine methodology and data for all the sampled Small Business Program measures. The evaluation sample for these reviews was selected using a weighted, random stratified sampling approach known as PPS (Probability Proportional to Size, here lifecycle total energy savings).

Verification Site Visits

The Evaluation Team conducted 43 verification site visits for the Small Business Program in CY 2017. Site visits involved verifying the type and quantity of equipment installed, determining how the installed equipment is controlled, and documenting the operating hours of the installed equipment. The Team selected the sites to visit as a subset of the evaluation sample of desk reviews and made the selection based upon measure type (custom and hybrid measures are targeted for site visits more often than prescriptive), savings share of the evaluation sample and program (very large measures are often targeted for site visits), and field logistics (not all chosen sites may be able to support site visits at a given time). No on-site metering was performed for the Small Business Program in CY 2017.

Impact Evaluation

The Evaluation Team used the following methods to conduct an impact evaluation of the Program:

- Tracking database review
- Engineering desk reviews
- Verification site visits

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data to identify reported installations then applied the results from the engineering desk reviews (n=54) and verification site visits (n=43) to calculate verified gross savings.

As a part of the tracking database review, the Team evaluated the census of the CY 2017 Small Business Program data contained in SPECTRUM to check for the appropriate and consistent application of unit-level savings and EUL values in alignment with the applicable TRM (2017 TRM and 2017 TRM

Update). For measures not explicitly captured in the TRM, the Team referred to secondary sources (deemed savings reports, workpapers, other relevant TRMs, and published studies).

The Team found that the overall accounting of demand and energy savings in the SPECTRUM database was generally accurate and adhered to industry best practices. SPECTRUM offers the typical date fields, such as "Paid Date" and "Application Received Date," and offers several additional fields that help users track projects in greater detail. SPECTRUM also employs unique customer identifier numbers, a best practice not followed in many other jurisdictions, so that account numbers and customer contact information can be used to easily classify unique customers.

The Evaluation Team identified one measure type that lacked a current, accepted workpaper in the 2017 TRM. To calculate verified savings for MMID #3491 (Furnace with ECM, 95%+ AFUE, NG), the Team used the savings algorithm with default inputs for MMID #1981 (Natural Gas Furnace with ECM, 95%+ AFUE, Existing) from the 2015 TRM.

The Evaluation Team and Program Administrator identified a SPECTRUM error for MMID #3107 (LED Fixture, Replacing 400 Watt HID, Exterior). The deemed savings for this measure in the 2017 TRM are 8% higher than the deemed savings from SPECTRUM.

The Team identified one misapplication of the measure ID in SPECTRUM, where MMID #3108 (LED Fixture, Replacing 70-100 Watt HID, Exterior) was used to calculate reported savings but MMID #3105 (LED Fixture. Replacing 320 Watt HID, Exterior) should have been used, based on the installed equipment. The project involved the installation of 90-watt exterior wall pack LED fixtures.

The Evaluation Team and Program Administrator also identified an inconsistency with the reported equipment quantity unit used in SPECTRUM for MMID #2456 (LED, Reach-In Refrigerated Case, Replaces T12 or T8). The quantity reported in SPECTRUM was the number of case doors, but the TRM deemed savings are based on the number of fixtures. According to the Program Administrator, the door versus fixture inconsistency was recognized and corrected in SPECTRUM in February 2018. The Team also found that when the 2017 TRM defaults (base fixture watts, efficient fixture watts, and refrigeration system performance) are used in the algorithm for MMID #2456, the calculated savings do not match the 2017 TRM deemed savings for peak demand reduction or annual energy savings. This issue appears to be outstanding and the Team will work with the Program Administrator to correct the deemed savings for this measure.

Site visits generally confirmed that program measures were installed and operating as planned. Any deviations observed were minor and captured in the realization rates for the program. As is customary, the Team has also shared anecdotal observations and recommendations that might serve to improve program offerings and implementation. Two verification site visits identified a number of light fixtures that were not installed at the time of the visit, and the resulting impact on savings and realization rates are reflected in the final program values.

In-Service Rates

The ISR represents the percentage of measures still installed, in use, and operating as planned following installation by the Program Implementer. The Evaluation Team did not conduct participant surveys in CY 2017 but instead applied a combined ISR from CY 2015 and CY 2016 to estimate CY 2017 ISRs at the measure level.

The Evaluation Team applied this combined, weighted ISR of 95.8% from CY 2015 and CY 2016 to all engineering desk reviews (no site visit). The Team applied a site-specific ISR to all measures where verification site visits were performed.

Verified Gross Savings Results

Table 182 lists the annual and lifecycle realization rates. Overall, the Program achieved a first-year evaluated realization rate of 99%, weighted by total (MMBtu) energy savings.[125] Realization rates are generally the same for a given savings type. These results represent weighted average realization rates for the entire Program.

Table 182. CY 2017 Small Business Program Annual and Lifecycle Realization Rates

Measure	Annual Realization Rate				Lifecycle Realization Rate		
	kWh	kW	therms	MMBtu	kWh	therms	MMBtu
Total	102%	98%	76%	99%	103%	77%	100%

The Chain Stores and Franchises Program was absorbed into the Small Business and Business Incentive programs in CY 2017. For comparison with CY 2015 and CY 2016, the Evaluation Team broke out the chain stores and franchises project results for the Small Business Program and combined them with the chain stores and franchises project results for the Business Incentive Program. The CY 2017 evaluation results for all chain stores and franchises projects are included in the Business Incentive Program report chapter.

Table 183 lists the total *ex ante* and verified annual gross savings for the CY 2017 Small Business Program by measure category.

[125] The Evaluation Team calculated realization rates by dividing annual verified gross savings by *ex ante* savings.

Table 183. CY 2017 Small Business Program First Year Gross Savings Summary

Measure	*Ex Ante* Gross Annual Savings			Verified Gross Annual Savings		
	kWh	kW	therms	kWh	kW	therms
Boiler	0	0	33,844	0	0	25,707
Controls	2,444,999	122	0	2,487,651	120	0
Delamping	816,625	166	0	830,871	163	0
Fluorescent, Linear	321,463	58	0	327,071	57	0
Furnace	77,850	0	33,924	79,208	0	25,768
Insulation	0	0	37	0	0	28
Light Emitting Diode (LED)	16,287,395	2,160	0	16,571,523	2,121	0
Motor	1,537,618	176	0	1,564,441	173	0
Rooftop Unit/Split System AC	18,195	29	0	18,512	29	0
Strip Curtain	3,780	0	0	3,846	0	0
Tune-up/Repair/ Commissioning	5,435	9	1,022	5,530	9	776
Water Heater	43,903	1	4,117	44,669	1	3,127
Total First Year	**21,557,262**	**2,723**	**72,944**	**21,933,322**	**2,673**	**55,407**

Table 184 lists the *ex ante* and verified gross lifecycle savings by measure category for the CY 2017 Program.

Table 184. CY 2017 Small Business Program Lifecycle Gross Savings Summary

Measure	*Ex Ante* Gross Lifecycle Savings			Verified Gross Lifecycle Savings		
	kWh	kW	therms	kWh	kW	therms
Boiler	0	0	676,602	0	0	522,145
Controls	28,748,054	122	0	29,618,514	120	0
Delamping	8,180,978	166	0	8,428,689	163	0
Fluorescent, Linear	4,502,336	58	0	4,638,662	57	0
Furnace	1,400,975	0	610,476	1,443,395	0	471,115
Insulation	0	0	366	0	0	282
Light Emitting Diode (LED)	281,328,398	2,160	0	289,846,715	2,121	0
Motor	24,687,888	176	0	25,435,410	173	0
Rooftop Unit/Split System AC	272,925	29	0	281,189	29	0
Strip Curtain	15,120	0	0	15,578	0	0
Tune-up/Repair/ Commissioning	23,593	9	1,022	24,307	9	789
Water Heater	658,545	1	41,170	678,485	1	31,772
Total Lifecycle	**349,818,812**	**2,723**	**1,329,636**	**360,410,945**	**2,673**	**1,026,102**

CY 2017 Verified Net Savings Results

The Evaluation Team did not perform Small Business Program participant surveys in CY 2017 and therefore did not calculate new freeridership or spillover estimates. The Team determined the overall Program NTG for CY 2017 using the CY 2015 and CY 2016 net savings data (sum of net savings from

CY 2015 and CY 2016, divided by the sum of the gross savings from CY 2015 and CY 2016), which was based on participant surveys. This calculation also included a small portion (roughly 2%) of the savings from the CY 2015 and CY 2016 Chain Stores and Franchises Program (which was absorbed into the Small Business and Business Incentive programs). This yielded an overall NTG estimate of 91% for the Program in CY 2017. Table 185 shows total first year gross and net savings in MMBtu as well as the overall Program NTG.

Table 185. CY 2017 Small Business Program Annual Net Savings and NTG Ratio

Total Annual Gross Verified Savings (MMBtu)	Total Annual Net Savings (MMBtu)	Program NTG Ratio
80,377	72,860	91%

Table 186 shows the annual Program net demand and energy impacts (kWh, kW, and therms) by measure category. The Evaluation Team attributed these savings as net of what would have occurred naturally without the presence of the Program.

Table 186. CY 2017 Small Business Program First Year Net Savings

Measure Category	First Year Net		
	kWh	kW	therms
Boiler	0	0	23,303
Controls	2,255,006	108	0
Delamping	753,168	148	0
Fluorescent, Linear	296,483	52	0
Furnace	71,800	0	23,358
Insulation	0	0	25
Light Emitting Diode (LED)	15,021,753	1,923	0
Motor	1,418,135	157	0
Rooftop Unit/Split System AC	16,781	26	0
Strip Curtain	3,486	0	0
Tune-up/Repair/Commissioning	5,013	8	704
Water Heater	40,491	1	2,835
Total First Year	**19,882,116**	**2,423**	**50,225**

Table 187 lists the lifecycle Program net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 187. CY 2017 Small Business Program Lifecycle Net Savings

Measure Category	Lifecycle Net		
	kWh	kW	therms
Boiler	0	0	473,314
Controls	26,848,589	108	0
Delamping	7,640,438	148	0
Fluorescent, Linear	4,204,854	52	0
Furnace	1,308,409	0	427,056
Insulation	0	0	256
Light Emitting Diode (LED)	262,740,235	1,923	0
Motor	23,056,689	157	0
Rooftop Unit/Split System AC	254,892	26	0
Strip Curtain	14,121	0	0
Tune-up/Repair/Commissioning	22,034	8	715
Water Heater	615,033	1	28,800
Total Lifecycle	**326,705,293**	**2,423**	**930,141**

Process Evaluation

In CY 2017, the Evaluation Team focused its process evaluation on these research questions for the Small Business Program:

- How have the program design and product offerings changed in CY 2017 under a new Program Implementer?
- How have these changes impacted Trade Ally and customer participation?
- How has the rural customer component been incorporated into the program design, marketing, and implementation?
- What are the program marketing and participation barriers of this customer segment?

Program Design, Delivery, and Goals

The Evaluation Team interviewed key Program Administrator and Program Implementer staff to get an overview of the Program design, delivery process, and any program changes or challenges. The Team also reviewed Program materials that document program objectives, operations, and workflow.

Program Design

Through the CY 2017 Small Business Program, Focus on Energy offered customers the following to offset cost barriers to participation, and encourage customers to be more energy-efficient:

- A variety of energy-efficient products selected by the customer
- Incentives that are 30% or more above other Focus on Energy business programs

- Complementary products and services with additional incentives
- Installation of the products by a trained Trade Ally

With assistance from a Trade Ally, customers can select any number of the energy-efficient products (not to exceed $10,000 per site) from the four categories shown in Table 188. The Program can directly pay the customer for the dollar amount of the products installed, or Trade Allies have the option to receive incentive payments on behalf of the customer and pass along the savings through an instant discount at the time of invoicing.

Table 188. Small Business Program CY 2017 Products

Product Category	Specific Product
Lighting	Interior fixtures and lamps
	Exterior fixtures and lamps
	Lighting controls
HVAC/Plumbing	Heating systems: boilers, outside air reset/cutout controls, and furnaces
	Cooling systems: direct expansion systems
	Programmable thermostats
	Water heaters
Refrigeration	Non-self-contained equipment: ECM, LED case lighting, retrofit/replace open cases, and night/strip curtains
	Refrigeration controls: anti-sweat heater controls, fan speed controls, case lighting occupancy sensors, and vending machine controls
Process Systems	Compressed air leak survey and repairs

To familiarize customers with energy efficiency and to prompt them to take action, the Program launched the Complementary Products and Services Offering in April 2017. This differs from the main Small Business Program offering by providing additional incentives on certain products and services and by using a maximum pricing structure, which sets a ceiling on the dollar amount that can be charged for a product or service. The offering features low- and no-cost products and services in lighting, refrigeration, domestic hot water, and tune-ups. Incentives cover 30% to 100% of the cost of these products and services and can be paid to either the customer or the Trade Ally.

Program Management and Delivery Structure

APTIM serves as the Program Administrator. The Program Administrator manages the overall Program and Program design.

In CY 2017, Franklin Energy became the Program Implementer and its staff also serve as Energy Advisors. The Program Implementer executes day-to-day Program operations, such as marketing and outreach activities, data management, and incentive processing.

Utility Partners also contribute to Program marketing and outreach activities and provide support to Trade Allies.

Trade Allies, as the Program's main marketing channel, are responsible for educating and promoting the Program to customers, setting up projects, and installing products. Energy Advisors review the work completed by Trade Allies for quality assurance and provide technical support to Trade Allies and Utility Partners.

Program Changes

The Program Administrator and Program Implementer introduced four major changes in CY 2017:

- **Overhaul of program design and implementation.** The Program Implementer aligned the Small Business Program with other Focus on Energy business programs by incorporating the same prescriptive incentive program model. The Small Business Program now targets overlapping market sectors (restaurants, offices, etc.), uses similar Trade Allies, and goes through the same processes as the Business Incentive Program.
- **Customer eligibility requirements.** The customer eligibility requirements changed to increase participation opportunities and help customers more easily understand those requirements. The Program previously required that customers have a monthly peak demand of less than 100 kW, but in CY 2017 this was changed to an average monthly usage of 40,000 kWh or less in July and August, as customers may not be able to report their kW peak demand but can access kWh usage data. The CY 2017 Program also requires that customers have nine or fewer locations; customers with 10 or more locations may be eligible for the Business Incentive Program.
- **Elimination of Energy Snapshot.** The Program no longer uses the tablet-based Energy Snapshot tool to collect and submit customer data. As part of redesigning the Small Business Program and aligning it with the Business Incentive Program, all applications, supporting documents, inspection reports, and invoicing are prepared on paper before being generated as PDFs and uploaded online to SPECTRUM. The Program Administrator and Program Implementer helped Trade Allies make the transition from using Energy Snapshot and reported that adopting new invoicing practices has been a learning curve for some Trade Allies.
- **Community Small Business Offering.** As part of the PSC's initiative to provide rural customers with energy-efficient technologies and benefits, the Program Administrator and Program Implementer developed the Community Small Business Offering. This offering provides extensive, community-based outreach activities and additional incentives targeted specifically to customers from 14 rural communities throughout the state.[126] Rural customers can select from the same product offerings and must meet the same eligibility requirements as regular Small Business Program customers but can receive incentives that are 30% to 70% higher to hep them overcome the cost barriers of participation. The rural offering, which launched in the second half of CY 2017, focused its first campaign on the community of Cross Plains, just outside Madison. The Evaluation Team found that one rural customer from Cross Plains participated and

[126] Though offered to 14 communities, in CY 2017, Program Implementers reported focusing on marketing and outreach in just one community to-date.

completed a lighting project. This project is excluded from participation and savings for the CY 2017 Small Business Program. The Evaluation Team will conduct a thorough process evaluation of the Community Small Business Offering in CY 2018.

Program Goals

The overall Program objective is to encourage small businesses to use more energy-efficient products. The CY 2017 Program goals were these:

- Demand reduction goal of 3,512 kW
- Electric lifecycle savings goal of 324,241,240 kWh
- Natural gas lifecycle savings goal of 1,277,788 therms

The Program exceeded its electric savings goal (111%) but did not meet its demand reduction and natural gas savings goals (76% and 80%, respectively). As mentioned in the Impact Evaluation section of the chapter, that the Program did not meet its demand reduction and natural gas savings may be partly because certain measures were not accounted for because their savings algorithms were not included in the TRM.

The Program Implementer also noted that changes to the LED incentive amounts may have reduced uptake, which reduced demand savings compared to past years. Moreover, the number of participants decreased to 1,333 in CY 2017 from 1,608 in CY 2016, probably because of the transition to a new program implementer and the focus on the Community Small Business Offering. During a transition, a new program implementer encounters a startup period and may lose time that could have been used to do marketing and to process applications.

The Program Administrator and Program Implementer also tracked six KPIs, which differ from the CY 2016 KPIs because of changes in the program design. Table 189 shows the KPIs and their CY 2017 results based on Program actor interviews, SPECTRUM data, and ongoing customer satisfaction surveys. The Program achieved all six KPI goals.

Table 189. Small Business Program CY 2017 Key Performance Indicators

KPI	Goal	CY 2017 Result	CY 2017 Result Source
Maintain Customer Participation from Small Franchise Organizations	Receive 50 projects (applications) from franchise operators	Met goal. Garnered 81 projects from 62 unique franchise operators.	Reported by Program Implementer
Expand Customer Participation	50% of projects come from customers with an average consumption of 20,000 kWh or less for July and August	Met goal. 88% of projects met the criteria.	Reported by Program Implementer
Trade Ally Participation	Increase number of Trade Allies in hardest-to-reach territories (identified as territories 1, 2, and 3) by combined total of 10% from CY 2016	Met goal. Number of Trade Allies increased from 24 in CY 2016 to 83 in CY 2017, a 346% increase.	Reported by Program Implementer
Trade Ally Satisfaction	Have at least one project completed by 20 of the top 25 Trade Allies under previous program structure	Met goal. Out of the top 25 Trade Allies from CY 2016, 21 completed a project in CY 2017.	Confirmed by final CY 2017 SPECTRUM data
Customer Satisfaction	Achieve a customer satisfaction score of 8.8 or higher	Met goal. Achieved a score of 9.2 for overall satisfaction with the Program in CY 2017. CY 2017's score was significantly higher than the portfolio baseline of 8.8 and significantly higher than the Program's CY 2016 score (8.9).	Confirmed by Ongoing Customer Satisfaction Surveys
Days Incentive Outstanding	Program Implementer shall average 28 calendar days for Days Incentive Outstanding on complete incentive applications	Met goal. Achieved average Days Incentive Outstanding of 26.9 days. Achieved a median of 24 days.	Confirmed by final CY 2017 SPECTRUM data

Data Management and Reporting

With the elimination of the Energy Snapshot tool, the Program Administrator and Program Implementer now track and manage nearly all Program data in SPECTRUM. Only post-inspection data are collected in external spreadsheets, and these data are uploaded into SPECTRUM. The Program Administrator and Program Implementer said SPECTRUM works well, and they had no issues to report.

Customer Marketing and Outreach

In CY 2017, the Small Business Program partnered with the Business Incentive Program on customer marketing and outreach. The Program Implementer targeted different industries and markets in the following quarterly and year-long marketing campaigns:

- Q1 marketing to hospitality and restaurant businesses
- Q2 marketing to healthcare facilities and franchises
- Q3 marketing to taverns, breweries, and distilleries
- Year-long marketing to commercial real estate businesses

Each marketing focus used Trade Allies, direct mail, newsletters, social media, associations, and events as channels to promote the Program. The Program Implementer considers Trade Allies the most effective means of attracting customers to the Program.

For the Community Small Business Offering, the Program Implementer launched six marketing campaigns in CY 2017, including the first one with the community of Cross Plains.

Trade Ally Outreach and Engagement

At the end of CY 2016, the new Program Implementer hosted a webinar to alert Trade Allies about upcoming program changes in implementer, program design, eligibility requirements, and incentives. During CY 2017 Q1, the new Program Implementer continued to recruit and educate Trade Allies about program changes to ensure successful rollout. Outreach generally remained the same as the previous year, using emailed newsletters, Energy Advisors, meetings, and training session to inform Trade Allies about the latest Program updates.

The Small Business Program adopted the Trade Ally ranking system from the Business Incentive Program to track and encourage engagement (though the systems differ slightly because their incentives differ). Trade Allies are graded A, B, or C (or platinum, gold, or silver status) based on their total points earned in the following categories:

- History with Focus on Energy
- Savings delivered
- Markets served
- Consecutive years of participation
- Business sector emphasis
- Historical small business participation
- Region/location

Annual Results from Ongoing Customer Satisfaction Survey

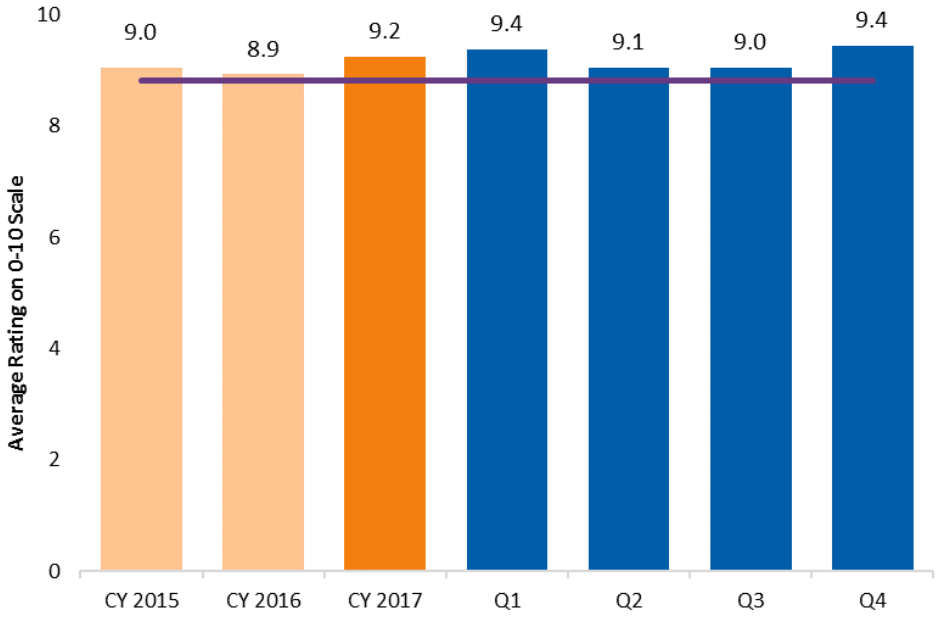
Throughout CY 2017, the Program Administrator and Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Small Business Program.[127] Respondents answered satisfaction and likelihood questions on a scale of 0 to 10, where 10 indicated the highest satisfaction or likelihood and 0 the lowest. [128]

[127] The Evaluation Team found that some surveys did not include identifying information to allow it to match survey responses to program participation dates. Survey responses without participation dates were included in the year-end total but not the quarterly breakdown.

[128] The number of participants who completed a survey does not always match the number of responses for each question because some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

Figure 122 shows that the average overall satisfaction rating with the Program was 9.2 among CY 2017 participants, which is significantly higher than the portfolio baseline of 8.8 and significantly higher than the average rating in CY 2016 (8.9).[129,130] The average ratings during Q1 and Q4 (both 9.4) were significantly higher than the baseline and the average rating from CY 2016,[131] but Q2 and Q3 ratings were equivalent to CY 2016 and the baseline.

Figure 122. CY 2017 Overall Satisfaction with the Small Business Program



Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "Overall, how satisfied are you with the program?" (CY 2015 n=256, CY 2016 n=198, CY 2017 n=255, Q1 n=16, Q2 n=59, Q3 n=73, Q4 n=99).
The portfolio baseline (8.8) is indicated by a purple line.

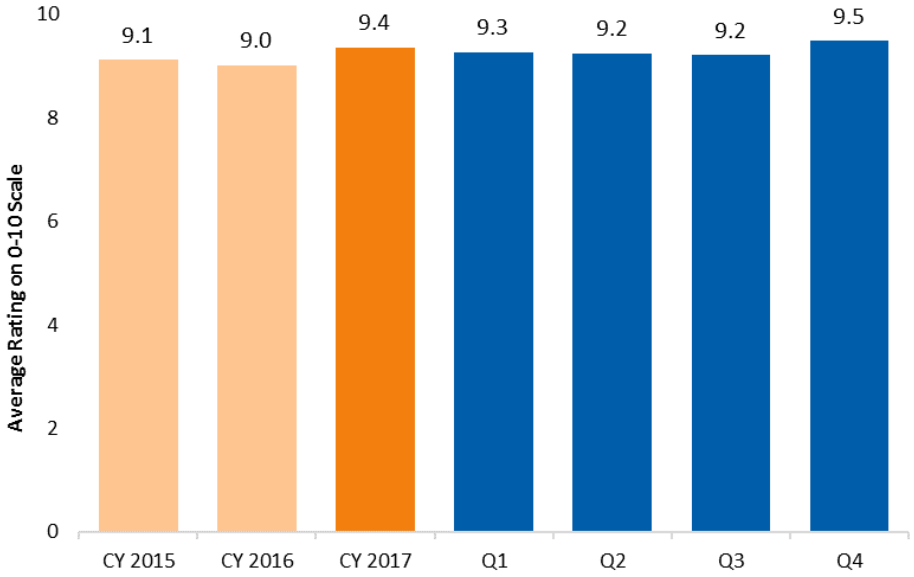
As shown in Figure 123, respondents gave an average rating of 9.4 for their satisfaction with the upgrades they received through the Program, which was significantly higher from the average rating in CY 2016 (9.0). The only quarter of CY 2017 with ratings significantly higher than CY 2016 was Q4, which was also the quarter with the highest participation.

[129] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[130] $p < 0.05$ using a binomial t-test.

[131] Q1 is significantly higher than CY 2016 at $p < 0.10$, and the rest of the differences are significant at $p < 0.05$, using binomial t-tests.

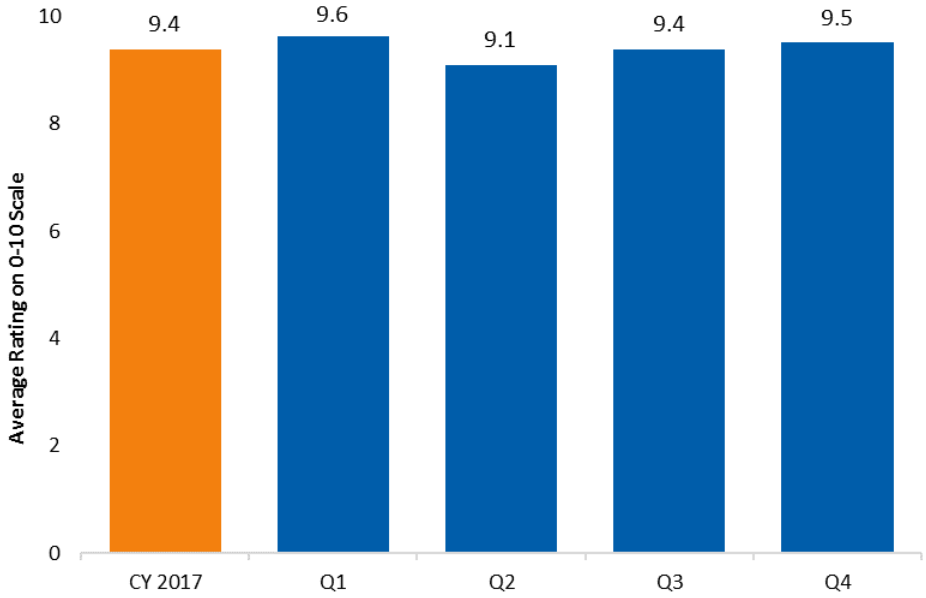
Figure 123. CY 2017 Satisfaction with Small Business Program Upgrades



Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient upgrades you received?" (CY 2015 n=254, CY 2016 n=192, CY 2017 n=240, Q1 n=15, Q2 n=57, Q3 n=63, Q4 n=98)

Respondents gave an average rating of 9.4 for their satisfaction with the Energy Advisors and Focus on Energy staff who assisted them (Figure 124). This survey question was not asked prior to 2017.

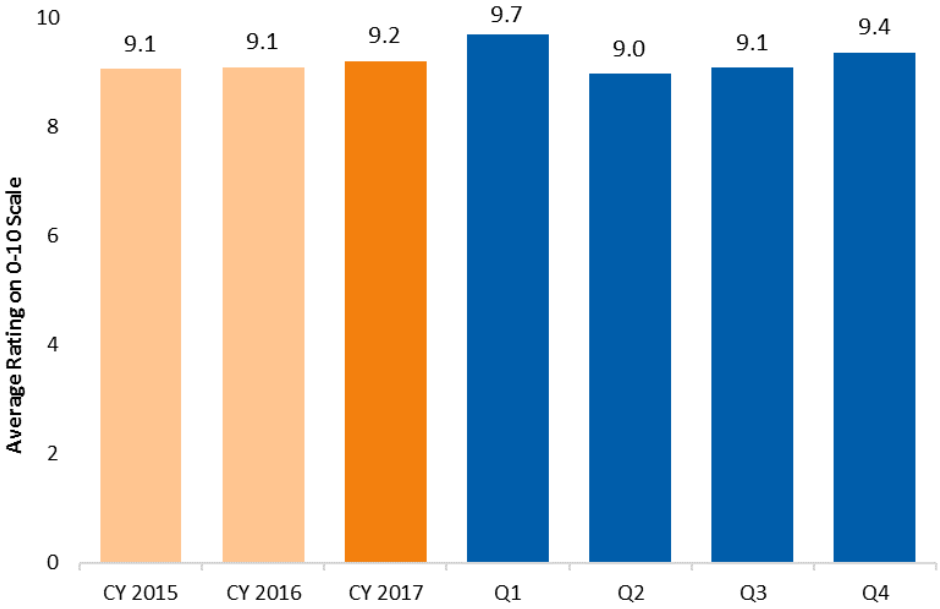
Figure 124. CY 2017 Satisfaction with Focus on Energy Staff



Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the Energy Advisor or Focus on Energy staff member who assisted you with your project?" (CY 2017 n=181 Q1 n=11, Q2 n=46, Q3 n=47, Q4 n=71)

Respondents gave an average rating of 9.2 for their satisfaction with their contractor (Figure 125), which was not significantly different from the average rating of 9.1 in CY 2016.[132]

Figure 125. CY 2017 Satisfaction with Small Business Program Contractors

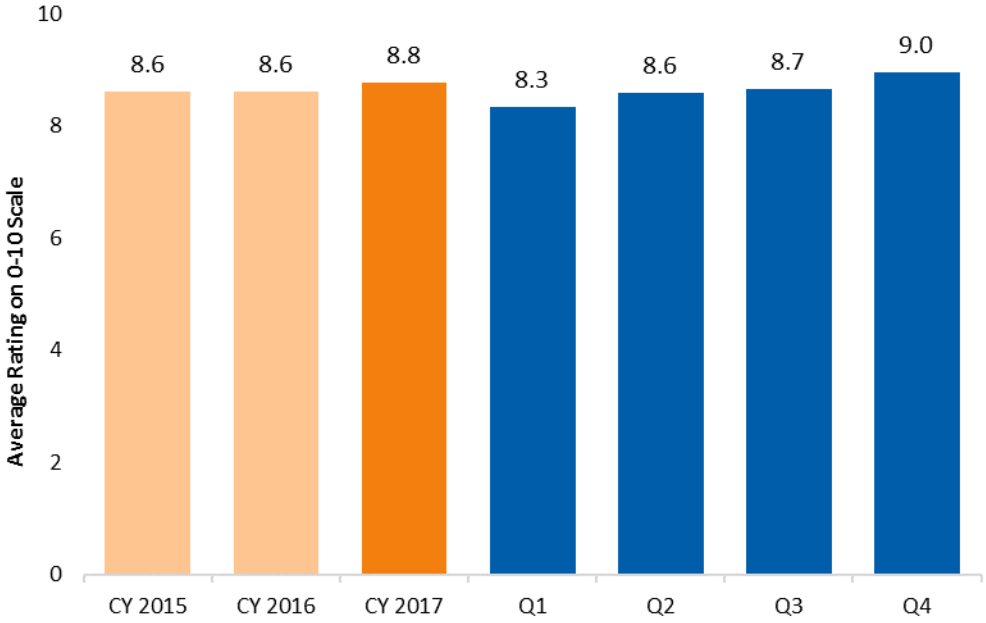


Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the contractor who provided the service?" (CY 2015 n=256, CY 2016 n=200, CY 2017 n=231, Q1 n=13, Q2 n=51, Q3 n=67, Q4 n=93)

[132] Q1 is significantly higher than CY 2016 at $p < 0.05$ using a binomial t-test, though the Q1 result is based on 13 survey responses.

Respondents gave an average rating of 8.8 for their satisfaction with the incentive they received (Figure 126), which is not significantly different from the average rating in CY 2016.

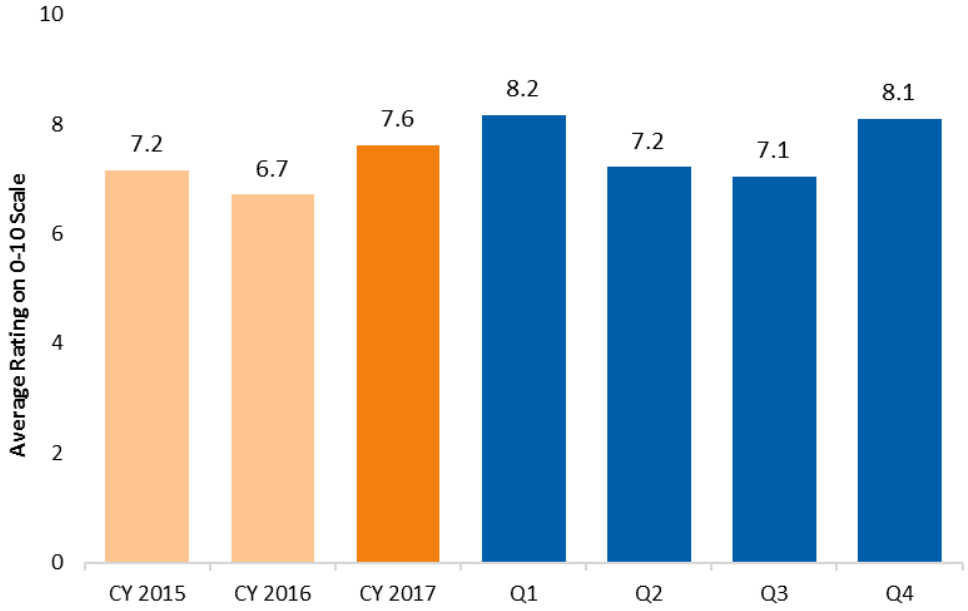
Figure 126. CY 2017 Satisfaction with Small Business Program Discounts



Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the amount of discount you received?" (CY 2015 n=256, CY 2016 n=184, CY 2017 n=252, Q1 n=15, Q2 n=58, Q3 n=72, Q4 n=99)

Figure 127 shows that respondents' average rating for the likelihood they will initiate another energy efficiency project in the next 12 months was 7.6, a significant increase from CY 2016 (6.7).[133] Ratings in Q1 and Q4 were also significantly higher than CY 2016, though Q2 and Q3 ratings were statistically similar to CY 2017.[134]

Figure 127. CY 2017 Likelihood of Initiating Another Energy Efficiency Improvement



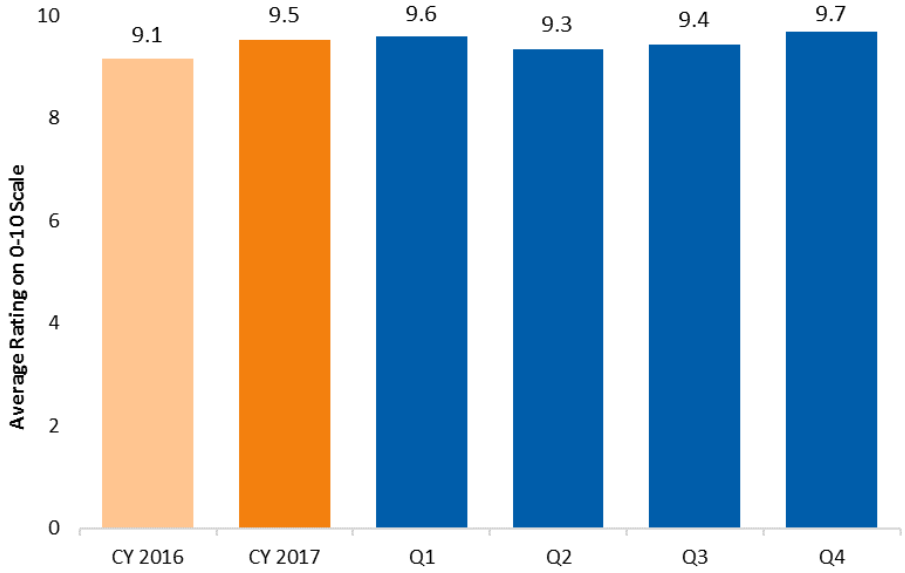
Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (CY 2015 n=206, CY 2016 n=158, CY 2017 n=198, Q1 n=13, Q2 n=42, Q3 n=60, Q4 n=78)

[133] $p < 0.05$ using a binomial t-test.

[134] Q1 is significantly higher than CY 2016 at $p < 0.10$, and Q4 is significantly higher than CY 2016 at $p < 0.05$, using binomial t-tests.

Figure 128 shows that respondents' average rating for the likelihood they would recommend this Program to other small businesses was 9.5,[135] which was significantly higher than CY 2016 (9.1).[136] Ratings in Q1 and Q4 were also significantly higher than CY 2016, though Q2 and Q3 ratings were statistically similar to CY 2017.[137]

Figure 128. CY 2017 Likelihood of Recommending the Small Business Program



Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to other small businesses?" (CY 2016 n=190, CY 2017 n=253, Q1 n=15, Q2 n=58, Q3 n=73, Q4 n=99)

Using these survey data, the Evaluation Team calculated a net promoter score (NPS) based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6). The Small Business Program NPS is +85 for CY 2017, representing an increase from +74 in CY 2016.

At the conclusion of the ongoing customer satisfaction survey, respondents answered whether they had any additional comments or suggestions for improving the Program. Of the 257 participants who responded to the survey, 78 (or 30%) provided open-ended feedback, which the Evaluation Team coded

[135] Customers who said they have already recommended the Program were counted in mean ratings as a rating of 10 (most likely).

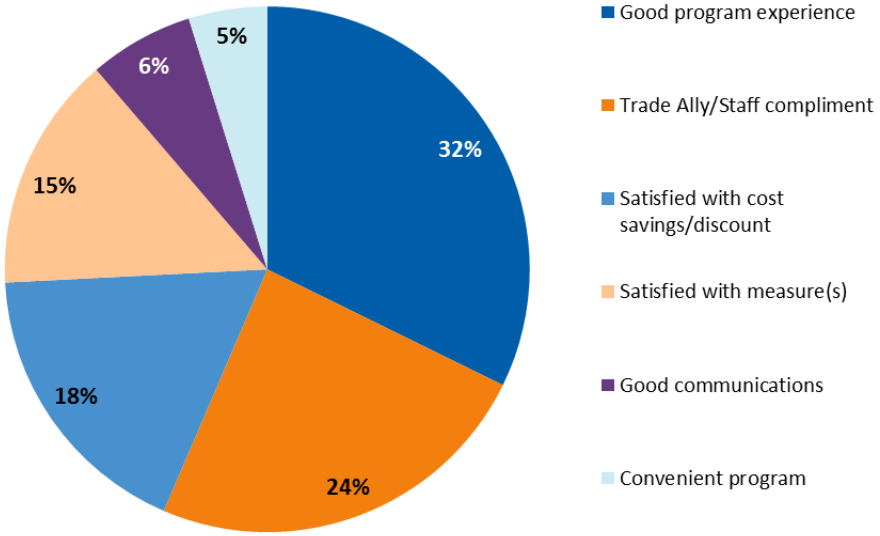
[136] $p < 0.05$ using a binomial t-test.

[137] Q1 is significantly higher than CY 2016 at $p < 0.10$, and Q4 is significantly higher than CY 2016 at $p < 0.05$, using binomial t-tests.

into a total of 99 mentions. Of these mentions, 62 were positive or complimentary comments (63%), and 37 were suggestions for improvement (37%).

The positive responses are shown in Figure 129. Most of these comments reflect a generally positive experience (32%) or compliments about Trade Allies, Energy Advisors and Focus on Energy staff (24%), which were also the two most common categories of comments in CY 2016 and CY 2015.

Figure 129. CY 2017 Positive Comments About the Small Business Program

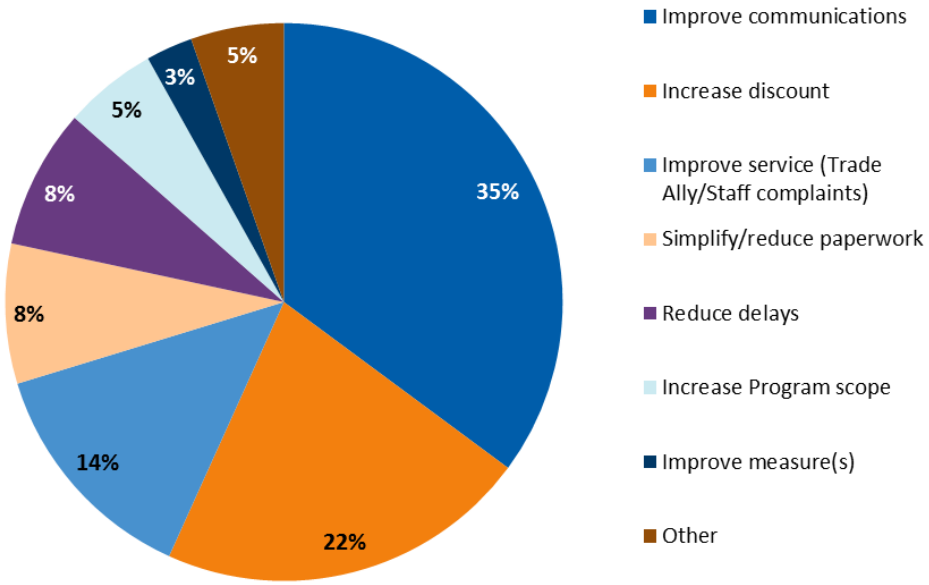


Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions: n=62)

Suggestions for improvement are shown in Figure 130. The most frequent of these suggestions were to improve communications (35%), increase incentive amounts (22%), and improve customer service (14%).

Participant suggestions to improve communications focused on increasing awareness for the Program through more outreach and marketing, making information on which measures qualify for discounts more readily available, and avoiding miscommunications about incentive amounts. All of the suggestions to improve customer service referred to issues with Trade Allies, who were sometimes blamed for poor record keeping, delays, and overly-optimistic estimates of available incentive amounts per project.

Figure 130. CY 2017 Suggestions for Improving the Small Business Program



Source: Small Business Program Ongoing Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: n=37)

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 190 lists the CY 2015, CY 2016 and CY 2017 incentive costs for the Small Business Program.

Table 190. Small Business Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$2,344,328	$4,142,650	$3,759,992

The Evaluation Team found the CY 2017 Program was cost-effective (3.83). Table 191 lists the evaluated costs and benefits.

Table 191. Small Business Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$297,595	$313,672	$337,049
Delivery Costs	$1,215,203	$1,280,855	$1,376,311
Incremental Measure Costs	$4,896,648	$10,818,975	$8,398,051
Total Non-Incentive Costs	**$6,409,446**	**$12,413,501**	**$10,111,411**
Benefits			
Electric Benefits	$20,301,742	$31,802,438	$24,317,163
Gas Benefits	$678,361	$179,719	$162,637
Emissions Benefits	$3,553,473	$5,193,825	$3,992,762
Total TRC Benefits	**$24,533,576**	**$37,175,982**	**$28,472,561**
Net TRC Benefits	**$18,124,130**	**$24,762,480**	**$18,361,150**
TRC B/C Ratio	**3.83**	**2.99**	**2.82**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Program.

Outcome 1. The Small Business Program exceeded its energy savings goal in CY 2017 but did not meet its demand reduction and natural gas savings goals, probably because TRM algorithms were missing for certain measures and because of the change in incentive amounts.

The Program achieved 111% of its electric savings goal but only 76% of its demand reduction goal and 80% of its natural gas savings goal.

One of the contributing factors to the low natural gas savings was a missing 2017 TRM algorithm for MMID #3491 (Furnace with ECM, 95%+ AFUE, NG). The Evaluation Team referred to a different algorithm from the 2015 TRM to calculate evaluated energy savings for this measure, which resulted in a low realization rate.

Factors for the missed demand reduction goal achievement may also be due to measures that do not account for demand savings and changes to the LED incentive amounts, which reduced demand savings compared to past years.

Recommendations. Increase the measure management process rigor to mitigate the effects of old or insufficient documentation on current program savings. Consider employing sunset dates on measures in SPECTRUM to restrict how long a measure savings can persist in the database. Also consider creating

an opt-in process where only measures with current, approved methodology are listed for use in the current program year database.

Consider including the monthly kW requirement along with the kWh requirement as part of the Program's customer eligibility requirements. Rather than replacing the kW requirement with a kWh requirement, provide both as a reminder to Trade Allies that the Program has a demand reduction goal.

Outcome 2. Despite the lower participation in CY 2017, the Small Business Program significantly improved customer satisfaction under a new program implementer.

Participation decreased to 1,333 in CY 2017 from 1,608 in CY 2016, probably because of the transition to a new program implementer. Typically, during a transition, a new program implementer encounters a startup period and often loses time that could have been used for marketing and to process applications. Nevertheless, the CY 2017 Program achieved its customer satisfaction KPI goal, which significantly increased from a score of 8.9 in CY 2016 to 9.2 in CY 2017 for overall program satisfaction.

Outcome 3. The Evaluation Team found the lighting fixture installation rates were less than 100% at a few sampled sites. This reduced the energy savings and peak demand realization rates.

Some of the purchased lighting fixtures were still in storage and some of the lamps that were reported to be de-lamped were still installed. Energy savings cannot be claimed for fixtures that are not installed.

Recommendation. Consider additional tactics to ensure that lighting measures are installed and operational by the time of inspection. Provide additional training materials to customers/contractors.

Renewable Energy Competitive Incentive Program

Through the Renewable Energy Competitive Incentive Program (RECIP), Focus on Energy offers financial incentives for eligible cost-effective, renewable energy projects to Wisconsin business customers. The Program Administrator issues a request for proposals (RFP) and selects winning proposals through a competitive bid process. The Program Implementers (Franklin Energy, CESA, and Leidos) process the awarded projects, similar to the custom program path requirements of the Business Incentive, Agriculture, Schools, and Government, and Large Energy Users programs.

In Calendar Year (CY) 2016, Focus on Energy did not release any new Program RFPs due to uncertainties regarding future funding. In CY 2017, the Program was administered much like in CY 2015 and two RFPs were issued: one in the spring and one in the fall.

Table 192 lists the actual Program spending, savings, participation, and cost-effectiveness in CY 2017.

Table 192. Renewable Energy Competitive Incentive Program Summary

Item	Units	CY 2017	CY 2016
Incentive Spending	$	$1,398,442	$2,042,803
Participation	Number of Participants	32	13
Verified Gross Lifecycle Savings	kWh	131,662,896	175,759,964
	kW	1,803	1,543
	therms	0	4,688,080
Verified Gross Lifecycle Realization Rate	% (MMBtu)	100%	100%
First Year Net-to-Gross Ratio	% (MMBtu)	94%	100%
Net Annual Savings	kWh	4,624,644	8,782,106
	kW	1,695	1,543
	therms	0	245,238
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	1.87	1.00

Goals were not set for the RECIP offerings in CY 2017.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations for the RECIP in CY 2017 and designed an EM&V approach that integrates multiple perspectives in assessing the Program's performance. Table 193 lists the specific data collection activities and sample sizes used in the evaluations.

Table 193. Renewable Energy Competitive Incentive Program Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Program Actor Interviews	1
Tracking Database Review	Census
Participant Surveys	8
Engineering Desk Review	0
Verification Site Visits	0

Program Actor Interviews

The Evaluation Team interviewed the Program Administrator in August 2017 to learn about the status of the Program and assess its objectives, program performance, and implementation challenges and solutions.

Tracking Database Review

The Evaluation Team conducted a review of the RECIP tracking database, SPECTRUM, for program reported values. The review involved several tasks:

- Thoroughly review the data to ensure that the totals in SPECTRUM matched the totals reported by the Program Administrator
- Reassign savings from numerous database adjustment measures to the corresponding program measures
- Check for complete and consistent application of information across data fields (measure names, application of lifetime savings, application of effective useful lives [EUL], etc.)

Participant Surveys

In October 2017, the Evaluation Team conducted telephone surveys with eight of the 10 participants who were in the sample frame at the time of data collection. Five of eight respondents came from the commercial sector, one from the agriculture sector, one from the schools and government sector, and one from the industrial sector. All respondents said they were the primary contacts for the project and confirmed the accuracy of the contact information recorded in Focus on Energy's SPECTRUM database. All respondents had executed solar photovoltaic (PV) projects through the Program.

The Evaluation Team developed the survey guide to explore customer awareness and communication preferences, project costs and sources of funding, participation benefits and barriers, program satisfaction, and suggested improvements. The survey also collected data to inform freeridership and spillover estimates.

Engineering Desk Reviews

The Evaluation Team did not perform any engineering desk reviews in CY 2017.

Verification Site Visits

The Evaluation Team did not perform any verification site visits in CY 2017.

Impact Evaluation

This section provides impact evaluation findings for RECIP based on the following methods:

- Tracking database review

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data and applied historic realization rates from the CY 2016 evaluation.

Tracking Database Review

As a part of the tracking database review, the Evaluation Team assessed the census of CY 2017 RECIP data contained in SPECTRUM. The Team reviewed data for appropriate and consistent application of unit-level savings and EUL values in alignment with the applicable Wisconsin TRM. If the measures were not explicitly captured in the Wisconsin TRM, the Team referenced secondary sources (deemed savings reports, work papers, other relevant TRMs, and published studies).

The Evaluation Team found no discrepancies or data issues for the Program as part of the review.

CY 2017 Verified Gross Savings Results

Because the Evaluation Team did not perform any engineering desk reviews or verification site visits in CY 2017, the Team applied the CY 2016 realization rates to the CY 2017 program data. Overall in CY 2016, the RECIP achieved an evaluated realization rate of 100%, weighted by total (MMBtu) energy savings. Realization rates are shown in Table 194.[138]

Table 194. CY 2017 Renewable Energy Competitive Incentive Program
First Year and Lifecycle Realization Rates

Measure	First Year Realization Rate				Lifecycle Realization Rate		
	kWh	kW	therms	MMBtu	kWh	therms	MMBtu
Total	100%	117%	100%	100%	100%	100%	100%

In CY 2016, the Evaluation Team found that for solar PV, although the *ex ante* and evaluated values were generally similar, the evaluated systems were generating both more energy savings and more peak demand reduction on an annual basis. This similarity in *ex ante* and evaluated values was driven by the RECIP requirement that the participant provide site-specific energy savings calculations, which were generally the same as those completed by the Evaluation Team. To the extent these calculations differed, they were generally from minor differences in modeling assumptions.

Notably, the Evaluation Team found a high realization rate for PV peak demand reduction. In examining the RECIP applications in more detail, this rate was driven by three submissions (all from the same Trade Ally) that had very low estimated peak demand reduction. Although the applications and supporting

[138] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

materials did not contain any detail regarding this calculation, they were much less than the capacity peak demand calculation stipulated in the RECIP RFP.[139] The realization rates (based on kilowatts) for these three projects ranged from 281% to 351%.

Aside from the three notably high outliers, the Evaluation Team found a 101% median realization rate for peak demand reduction, with a range of 70% to 158%, which indicates that most applicants were able to provide a reasonably close estimate.

Table 195 lists the *ex ante* and verified annual gross savings for RECIP for CY 2017.

Table 195. CY 2017 Renewable Energy Competitive Incentive Program Annual Gross Savings Summary by Measure Type

Measure	*Ex Ante* Gross First Year			Verified Gross First Year		
	kWh	kW	therms	kWh	kW	therms
Photovoltaics - Agriculture, Schools, and Government	638,552	270	0	638,552	315	0
Photovoltaics – Business Incentive	2,547,969	992	0	2,547,969	1,160	0
Photovoltaics – Large Energy Users	1,733,313	280	0	1,733,313	328	0
Total Annual	**4,919,834**	**1,541**	**0**	**4,919,834**	**1,803**	**0**

Table 196 lists the *ex ante* and verified gross lifecycle savings by measure type for RECIP in CY 2017.

Table 196. CY 2017 Renewable Energy Competitive Incentive Program Lifecycle Gross Savings Summary by Measure Type

Measure	*Ex Ante* Gross Lifecycle			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
Photovoltaics - Agriculture, Schools and Government	15,963,800	270	0	15,963,800	315	0
Photovoltaics – Business Incentive	63,699,706	992	0	63,699,706	1,160	0
Photovoltaics – Large Energy Users	51,999,390	280	0	51,999,390	328	0
Total Lifecycle	**131,662,896**	**1,541**	**0**	**131,662,896**	**1,803**	**0**

Evaluation of Net Savings

The Evaluation Team used participant surveys to assess net savings for RECIP and calculated a NTG ratio of 94% for the CY 2017 Program.

[139] The calculation for capacity peak demand is: 0.5 * kW.

Freeridership

The Evaluation Team used the self-report survey method to determine the Program's freeridership for CY 2017. The Team estimated an average self-reported freeridership of 6%, weighted by evaluated savings, from surveys conducted with CY 2017 Program participants. In CY 2017, one surveyed participant was estimated as a 50% freerider and represented 11% of the total analysis sample's gross energy savings. All other CY 2017 survey respondents were estimated as non-freeriders.

RECIP self-reported freeridership estimates for CY 2015, CY 2016, and CY 2017 are shown in Table 197.

Table 197. Historical RECIP Self-Reported Freeridership

Year	Survey Respondents	Percentage of Freeridership
CY 2015	32	0%[1]
CY 2016	3	0%
CY 2017	7	6%

[1] Actual value is 0.1%. Value was rounded to the nearest whole percent.

Spillover

The Evaluation Team determined there was no participant spillover for the Program based on self-report survey data. No survey respondents attributed additional energy-efficient equipment purchases for which they did not receive an incentive to their participation in the Program.

CY 2017 Verified Net Savings Results

To calculate the Program NTG ratio, the Evaluation Team combined the self-reported freeridership and spillover results using the following equation:

$$NTG = 1 - Freeridership\ Ratio + Participant\ Spillover\ Ratio$$

This yielded an overall NTG ratio estimate of 94% for the Program. Table 198 shows total net-of-freeridership savings, participant spillover savings, and total net savings in MMBtu by Program component and overall NTG ratio for the Program.

Table 198. CY 2017 RECIP Annual Net Savings and NTG Ratio

Net-of-Freeridership Savings (MMBtu)	Participant Spillover (MMBtu)	Total Annual Net Savings (MMBtu)	Total Annual Gross Verified Savings (MMBtu)	Program NTG Ratio
15,779	0	16,786	15,779	94%

Table 199 shows the annual net energy impacts (kWh, kW, and therms) by measure for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 199. CY 2017 RECIP Annual Net Savings

Measure	Annual Net		
	kWh	kW	therms
Photovoltaics - Agriculture, Schools and Government	600,239	296	0
Photovoltaics – Business Incentive	2,395,091	1,090	0
Photovoltaics – Large Energy Users	1,629,314	308	0
Total Annual	**4,624,644**	**1,695**	**0**

Table 200 shows the lifecycle net energy impacts (kWh, kW, and therms) by measure for the Program.

Table 200. CY 2017 RECIP Lifecycle Net Savings

Measure	Lifecycle Net		
	kWh	kW	therms
Photovoltaics - Agriculture, Schools and Government	15,005,972	296	0
Photovoltaics – Business Incentive	59,877,724	1,090	0
Photovoltaics – Large Energy Users	48,879,427	308	0
Total Lifecycle	**123,763,122**	**1,695**	**0**

Process Evaluation

In CY 2017, the Evaluation Team conducted interviews and surveys as part of the process evaluation activities. The Team focused the process evaluation on these key topics for the Program:

- Program design
- Program management and delivery structure including key program actors, roles, and processes
- Program changes

Program Design, Delivery, and Goals

Focus on Energy launched the Program in 2012 to offer financial incentives to Wisconsin business customers for eligible cost-effective, renewable energy projects through a competitive bid process. Through the Program, Focus on Energy solicits proposals from eligible business customers for six renewable energy technologies: solar photovoltaic, solar thermal, wind, geothermal, biogas, and biomass. In CY 2017, solar PV was the only technology that participants implemented under the Program.

Program Design

Focus on Energy issued two RFPs in 2017, one in the spring and one in the fall, awarded a total of 127 projects in CY 2017, and completed a total of 32 of those projects. The remaining projects will be funded throughout CY 2018, and the Program will not issue any RFPs in CY 2018. The Program Administrator

scored and awarded projects based on a set of criteria listed in the RFP. The scoring criteria was similar to those used in CY 2015. Projects were required to meet these criteria:

- Cost-effective
- Priority given for completion date during CY 2017 (First 2017 RFP only)
- Reasonability of savings estimate
- System optimization (e.g., optimization of engineering design to store excess energy or system production alignment with peak demand schedule)
- Commitment to an incentive reduction (up to 25% in funding reduction) as motivation to complete project by proposed completion date (New criteria in CY 2017)

The Program calculated incentive amounts based on the project's first-year net energy production (or offset). Customers proposed a $/kWh and/or $/therm incentive amount up to $0.50 per kWh produced or up to $1.00 per therm, not to exceed 50% of total project costs. In addition, Focus on Energy capped the maximum total incentives per customer (including energy efficiency and renewable energy incentives) at $400,000.

Program Management and Delivery Structure

The Program Administrator is responsible for issuing RFPs for the Program's renewable energy incentives, reviewing and scoring project proposals (including a technical review conducted by an internal engineering team), selecting winning projects, and signing award letters. The Program Administrator then gives the Program Implementers a list of customer projects and supporting information that includes customer type, the Focus on Energy program for which the customer is eligible (Large Energy User, Agriculture, Schools and Government, or Business Incentive), approved energy savings, annual energy cost, and incentive award.

A Program Implementer is assigned according to the specific program for which the customer is eligible. The Program Implementer is responsible for ensuring proper installation of the renewable projects, verifying installed equipment, and, in some cases, verifying the accuracy of energy savings estimates. Focus on Energy relies heavily on Trade Allies to inform customers about the Program, help them complete project proposals, then work with them to complete awarded projects.

Program Changes

CY 2017 was the first time the Program conducted two rounds of funding in one year. The Program Administrator said the second offer was because of the backlog of proposals that could otherwise have submitted to the Program in CY 2016.

New to CY 2017, the Program also began giving customers whose proposal was not selected feedback about their score (at the customer's request). This change was because prior evaluations found that Trade Allies asked for more transparency and feedback about the scoring.

Program Goals

The Program Administrator set no specific energy-savings goals for CY 2017 beyond allocating funds to cost-effective renewable energy projects that did not fit into program measure offerings.

Table 201 shows the distribution of renewable energy technology and Program funding in CY 2017. The Program received 104 proposals in the spring and awarded 61 projects. In the autumn, the program received 111 proposals and awarded 66 projects. In total, the Program received proposals for just over $11.4M requested across 215 proposals. The Program ultimately awarded 134 projects worth almost $7.8M, but only 127 of those customers continued with their participation and accepted their awarded funds. The Program awarded $6.7M in CY 2017, though a portion of the funding will continue to be dispersed to projects that are completed in CY 2018. Any projects awarded funds in CY 2017 are required to complete by CY 2018 due to the end of the quadrennial period.

All but one of the projects in CY 2017 were solar PV (126 of 127). The Program awarded two biogas projects as well, one of which they funded, and one of which withdrew from the Program. At the end of CY 2017, participants had completed 32 projects.

Table 201. Renewable Energy Competitive Incentive Program CY 2017 Project Summary

Renewable Energy Technology	Total Applicants	Total Amount Requested	Total Awarded	Total Amount Awarded	Total Awarded & Accepted	Total Awarded & Accepted
Spring 2017						
Biogas	2	$800,000.00	1	$334,021.00	0	-
Geothermal	1	$47,238.00	0	-	0	-
Solar PV	101	$5,624,069.00	61	$4,028,691.00	61	$4,028,691.00
Spring 2017 Total	104	$6,471,307.00	62	$4,362,712.00	61	$4,028,691.00
Fall 2017						
Biogas	2	$791,669.00	1	$364,403.00	1	$364,403.00
Solar PV	109	$4,170,694.00	71	$3,068,412.00	65	$2,364,512.00
Fall 2017 Total	111	$4,962,363.00	72	$3,432,815.00	66	$2,728,915.00
CY 2017 Total	215	$11,433,670.00	134	$7,795,527.00	127	$6,757,606.00

Data Management and Reporting

The Program Implementer tracks projects in SPECTRUM using procedures similar to those used to track custom projects. Once proposals are received from the customer or Trade Ally, the Program Implementer uploads all documents (e.g., workbooks, applications, agreements) into SPECTRUM for the Program Administrator to review. The Program Administrator plans to implement a procedure for this step starting in CY 2018 to ensure consistency in what documents are uploaded for review.

Although all data needs are currently being met for Program operations, the Program Administrator anticipates requiring more granular data on potential project size and customer trends in the future.

Marketing and Outreach

The Program Administrator primarily assigns marketing and outreach activities to Trade Allies. The Program does little direct customer outreach, but general information about the Program is publicly accessible on the Focus on Energy website. Community advocacy groups, such as RENEW Wisconsin, work independently to convey information about available programs. This section describes marketing and outreach to Trade Allies and customers, the sources they use for program information, and their communication preferences.

The Program Administrator expressed concern about overmarketing the Program, stating that there are more applicants than funds. However, the Program continued to accept qualified proposals.

Focus on Energy relies on Trade Allies to be the main liaisons between customers and the Program. Trade Allies inform customers about the Program, help them complete project proposals, then work with them to complete awarded projects. Although the Program's outreach strategy focuses primarily on Trade Allies, customers can also attend pre-bid webinars, view pre-recorded webinars on the internet, attend conference calls, and access FAQs posted on the website.

Similar to findings in CY 2015, the majority (6 of 8) respondents said they learned about the Program and the RFP through a contractor. Of the other two respondents, one had previously participated in a similar program in 2011, and the other frequently followed Focus on Energy programs on the website.

All but one respondent preferred to stay informed about Focus on Energy incentive offerings through email, with one preferring the Focus on Energy website. Other preferences to learn about Focus on Energy offerings were internet websites, radio, or the respondent's contractor.

Customer Experience

This section provides findings gathered from the customer survey about customer experiences with the program, including project costs and financing, participant benefits and barriers, customer satisfaction, and suggested improvements.

Project Costs and Outside Funding Sources

Project costs eligible for the Program incentive include these:

- Renewable energy generating equipment and materials
- Additional improvements required to construct the renewable energy system
- Installation labor

Additional costs, such as feasibility studies, purchase of property, expenses for internal personnel and labor, and equipment purchases or down payments made prior to the incentive payment, are not eligible for incentives through the Program.

Four of eight survey respondents said there were at least some additional unforeseen costs for their projects that were not eligible for incentive funding. These included the following:

- Hiring an electrician for supplemental wiring not directly associated with the solar installation
- Purchasing extra insurance costs to cover solar installation specifics that were not expected and not covered by the organization's insurance contract before the project began
- Hiring a different or more expensive solar installation contractor than the one identified in the application
- Replacing a transformer linking the facility to the grid that the contractor initially did not consider when bidding on the work (in this case, the contractor split the costs with the participant)

Participants estimated that the Program incentive covered between 10% and 30% (with an average estimate across respondents of 23%) of their total project costs.[140]

To pay for the remaining project costs, two respondents said they used both cash and a loan (either a business loan or a line of credit), and three said they used only cash. One respondent used only a line of credit, and two did not know how the remaining costs were paid.

All three respondents who paid for remaining project costs with a loan said they were satisfied with the financing options they used. Only one respondent knew the loan's interest rate (4%). Two knew if the loan required a down payment (none was required for either loan). All but one respondent said they plan to use the Federal Investment Tax Incentive Credit when filing their 2017 taxes. One respondent cannot do so because of the organization's tax filing status (e.g., 501c3 or religious entity).

The Evaluation Team also asked respondents about the extra funding sources specified in their proposal. Five of eight said the funding sources identified on their proposal were the same they actually used to complete the project. The other three respondents did not know. Table 202 provides further details on the percentage of each project paid for by the RECIP incentive.

[140] These costs include costs not considered eligible in the project applications

Table 202. Funding Sources

Project Cost[1]	Participant Recollection of Actual Project Cost	RECIP Incentive Amount	Percent of Final Project Costs Paid for by Incentive[2]
$18,117	$18,000	$5,023	28%
$46,815	$40,000	$10,000	21%
$39,950	$39,095	$8,477	21%
$32,750	$32,000	$8,642	26%
$17,900	$18,000	$5,151	29%
$64,000	$64,000	$7854	12%
$60,900	Don't know	$17,496	29%
$256,000	$256,000	$72,593	28%

[1] Data from Spectrum

[2] Note: Final project cost include ineligible expenses (e.g. feasibility studies, property expenses, internal labor, etc.)

Barriers

All but one respondent said they experienced challenges when initiating their renewable energy project. The respondents identified these barriers:[141]

- Long payback periods
- Paperwork overly complicated and time-consuming
- High initial costs
- Upgrades affecting business operations
- Finding the right contractor able to "jump through all of the hoops with engineering"
- Conveying the value of the project to other stakeholders who lacked technical knowledge

All but one respondent said Focus on Energy was "very helpful" or "somewhat helpful" in assisting them with overcoming those challenges. The respondent who did not find Focus on Energy helpful with their specific challenge referred to a project barrier that required more cost and significantly more work with the local utility. This participant was required to upgrade a transformer to integrate the solar PV system to the grid, an unforeseen challenge and not part of this participant's initial proposal.

[141] Multiple responses allowed.

Four of eight respondents offered suggestions on how Focus on Energy could help customers overcome future challenges to installing renewable energy projects:

- Consider allowing eligible projects to include the addition of more panels to existing arrays through the Program[142]
- Recommend qualified contractors and set up a rating system so previous participants can provide feedback on contractors
- Provide a variety of grant funding options appropriate for governmental and nonprofit organizations that cannot access the same tax incentives as for-profit entities
- Create an application instead of requiring proposals. Applications are easier to complete, and are more applicant-friendly

The Program Administrator said smaller businesses are a more difficult segment to reach, in that the time and resources required to respond to the RFP and implement a project take resources that small business may not readily have available.

Participation Motivations and Renewable Energy Benefits

All but one respondent described financial considerations as the primary reason to apply for the grant opportunity and install a renewable energy project. The one respondent who did not cite financial motivations simply stated it was part of the organization's five-year goal to be carbon neutral. Respondents listed these financial considerations:

- Saving money by using less energy
- Program incentive would meet the organization's return on investment (ROI) expectations
- Financial incentives provided through the Program in general

The Evaluation Team also asked about the non-energy benefits participants experienced because of the project. All but two respondents said they had experienced non-energy benefits, including these:

- Being seen as a good community partner and steward of the environment
- Demonstrating that the organization is "green"
- Producing less pollution, helping the environment, and taking part in the fight against climate change (i.e., altruistic benefits, with or without an associated image boost)
- Improving competitive edge in the industry as a part of the organization's long-term strategy
- Generating interest and goodwill among customers, which helps the organization market its services and product

[142] NOTE: Expansion of existing renewable energy systems such as solar arrays are eligible for funding under the program, however, the additional savings from this type of project are competing with proposals for new installations, and are often much smaller.

Satisfaction with Focus on Energy and with Program Components

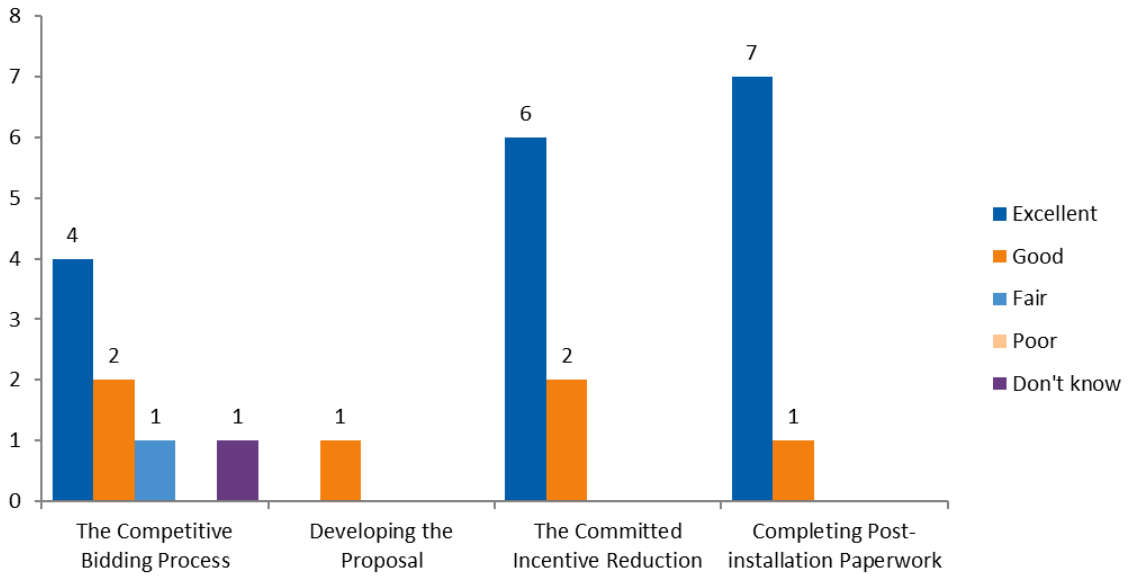
Respondents reported high satisfaction with Focus on Energy overall. On a scale of zero to 10 where zero meant "not at all satisfied" and 10 meant "very satisfied," customers gave Focus on Energy an average rating of 9.5 (n=8).

The Evaluation Team also asked respondents to rate their experience with these Program elements:

- Competitive bidding process
- Developing the proposal application
- Committed incentive reduction
- Completing post-installation paperwork
- Communication with Focus on Energy representatives

Figure 131 shows how customers rated their experience (excellent, good, fair, or poor) for each Program aspect. All but one respondent rated their experience with each aspect as *excellent* or *good*. One respondent rated the competitive bidding process *fair* and said the reason was the lack of clarity on the grading process and criteria to be a winner. Notably, this respondent was also the only one who developed the proposal without using a contractor.

Figure 131. Customer Rating of Program Aspects



Source: CY 2017 RECIP, Participant Survey: E1. "Would you say your experience has been excellent, good, fair, or poor with …?" (n=8). The program component of "Developing the Proposal" was rated by only one participant. Seven of the eight respondents did not have enough information to rate this aspect because they relied on a Trade Ally, and skipped this interview question.

The Evaluation Team asked respondents what Focus on Energy could do to improve their experience with the Program and to help future customers install renewable energy projects. One respondent

provided a recommendation for Program improvements, which was that the Program offer greater incentive amounts.

Trade Ally Involvement

The Program Administrator promotes the Program by conducting direct outreach via email to a targeted group of renewable energy Trade Allies. These emails include periodic reminders during the RFP process. The Program Administrator also posts the RFP on the Focus on Energy website and holds a pre-bid webinar to introduce the Program, explain the RFP process, and answer applicant questions. The webinar is recorded and uploaded to the website.

Participant Demographics

The organizations of survey respondents ranged in size from one to 70 employees with an average of 20 employees at the locations in which the renewable energy projects were installed. All but one respondent said their organization owned the property where the renewable energy project was installed. The Program awarded incentives to participants from a variety of industries ranging from agriculture, entertainment, manufacturing, transportation, and commercial companies, as shown in Table 203.

Table 203. Survey Respondent Industry

Industry	Number of Project Awardees
Entertainment	2
Agriculture	1
Manufacturing	1
Insurance	1
Construction	1
Transportation	1
Nonprofit	1

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 204 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the RECIP Program.

Table 204. RECIP Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$1,398,442	$2,042,803	$4,122,150

The Evaluation Team found the CY 2017 Program was cost-effective (1.87). Table 205 lists the evaluated costs and benefits.

Table 205. RECIP Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$24,635	$2,547	$36,371
Delivery Costs	$100,595	$10,400	$148,518
Incremental Measure Costs	$6,103,314	$17,797,612	$16,911,818
Total Non-Incentive Costs	**$6,228,544**	**$17,810,559**	**$17,096,707**
Benefits			
Electric Benefits	$10,417,835	$11,996,471	$19,740,127
Gas Benefits	$0	$3,464,752	$2,890,415
Emissions Benefits	$1,215,274	$2,292,591	$3,562,607
Total TRC Benefits	**$11,633,109**	**$17,753,814**	**$26,193,149**
Net TRC Benefits	**$5,404,565**	**($56,745)**	**$9,096,443**
TRC B/C Ratio	**1.87**	**1.00**	**1.53**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcome and recommendation to improve the Program.

Outcome 1. RECIP is operating very smoothly from a customer perspective, and participants are highly satisfied.

The surveyed participants had few suggestions for improvement. Though Focus on Energy implemented a key Program improvement over past years in communicating specific feedback for projects that were not selected to receive incentives, one participant still felt the program could be more transparent in the project evaluation criteria (this person did not use a Trade Ally to submit their proposal). As most customers rely heavily on Trade Allies to guide them through the Program process, the positive feedback reflected in the CY 2017 evaluation may highlight positive experiences with the Trade Allies who assisted with the project.

Recommendation 1: In CY 2018 or CY 2019, consider interviewing RECIP Trade Allies to understand if the improvements that the Program instituted have been effective from their perspective. The Evaluation Plan for CY 2018 does not currently include Trade Ally interviews; though it could be structured to include them in CY 2019. Program staff could also conduct this outreach to solicit Trade Ally feedback on its own outside of the evaluation activities in CY 2018. For example, the Program Administrator stated it is planning to conduct some Trade Ally interviews for a separate initiative (the EERD Renewable Characterization project), which will likely include some cross-over with Trade Allies

who have participated in RECIP and these interviews could assess general satisfaction and potentially solicit feedback that could be used for CY 2019 planning.

Design Assistance Program

Through the Design Assistance Program, Focus on Energy provides incentives to participating customers and their design teams to design and build new energy-efficient buildings or to complete substantial renovations of existing buildings. The Program, launched in January 2013, targets nonresidential and multifamily buildings as well as major renovation projects that are 5,000 square feet or greater. The Program Implementer, The Weidt Group, with support from the Program Administrator, APTIM, conducts direct outreach to design professionals such as architects, engineers, and design contractors.

Table 206 lists the actual Program spending, savings, participation, and cost-effectiveness.

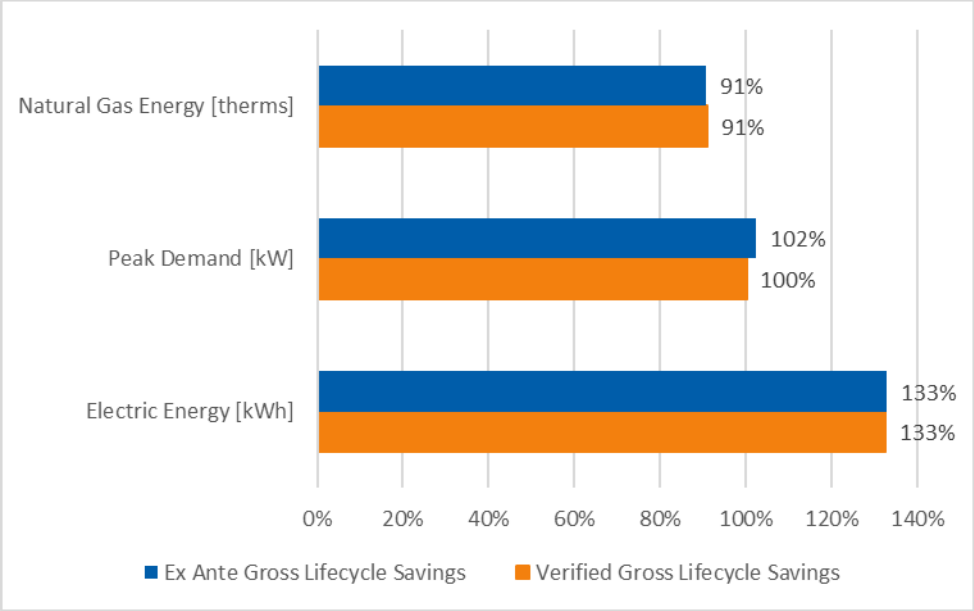
Table 206. Design Assistance Program Summary[1]

Item	Units	CY 2017	CY 2016	CY 2015
Incentive Spending	$	$3,940,402	$4,012,333	$3,181,680
Participation	Number of Participants	63	77	54
Verified Gross Lifecycle Savings	kWh	751,682,968	640,629,077	640,975,264
	kW	5,832	4,572	4,766
	therms	24,882,665	32,410,595	24,698,071
Verified Gross Lifecycle Realization Rate	MMBtu	100%	100%	100%
Annual Net-to-Gross Ratio	MMBtu	53%	93%	68%
Net Annual Savings	kWh	19,918,003	29,789,252	21,793,159
	kW	3,091	4,252	3,241
	therms	659,391	1,507,093	850,469
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	4.35	4.47	2.89

[1]Values are inclusive of both offerings: Design Assistance and Design Assistance – Residential.

Figure 132 shows the percentage of gross lifecycle savings goals achieved by the Design Assistance Program in CY 2017. The Program exceeded CY 2017 goals for *ex ante* and verified electric energy savings, met the CY 2017 goals for *ex ante* and verified peak demand savings, but fell short of CY 2017 goals for *ex ante* and verified natural gas energy savings.

Figure 132. Design Assistance Program Achievement of CY 2017 Gross Lifecycle Savings Goals[1]



[1] The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals. Values are inclusive of both offerings: Design Assistance and Design Assistance – Residential.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations for the Program in CY 2017. It designed its EM&V approach to integrate multiple perspectives in assessing Program performance. Table 207 lists the specific data collection activities and sample sizes used in the evaluations.

Table 207. Design Assistance Program Data Collection Activities and Sample Sizes[1]

Activity	CY 2017 Sample Size (n)
Program Actor Interviews	2
Tracking Database Review	Census
Participant and Design Team Joint Interviews	5 interviews that encompassed 5 participants and 5 design contractors
Participant (Building Owner) Only Interviews	8
Design Team Representative Only Interviews	1
Engineering Desk Review	42
Verification Site Visits	10

[1] Values are inclusive of both offerings: Design Assistance and Design Assistance – Residential.

Program Actor Interviews

In July 2017, the Evaluation Team interviewed the Program Administrator and the Program Implementer (defined as program actors) to learn about the current state of the Design Assistance Program and to assess its objectives, performance, and implementation challenges and solutions. Interview topics addressed Program design and implementation, goals, marketing and outreach, building owner and

design team engagement, data tracking, and Program barriers. Data from the interviews informed Program Implementer contractual obligations surrounding satisfaction key performance indicators (KPIs).

Tracking Database Review

The Evaluation Team reviewed a census of the Design Assistance Program records in the Focus on Energy database, SPECTRUM, which involved the following tasks:

- Conducting a thorough review of the data to ensure the SPECTRUM totals matched the totals that the Program Administrator reported
- Reassigning savings from any database adjustment measures to the corresponding program measures (if applicable)
- Checking for complete and consistent application of data fields (measure names, application of first-year savings, application of effective useful lives, etc.)

Participant Building Owners and Design Team Interviews

The Evaluation Team initially intended to complete joint phone interviews with representatives from the building owners and design teams, but introduced an online survey option to gather more responses when scheduling phone interviews presented difficulties for participants. The team completed interviews with 19 participants in the Program, representing 14 projects. Nine participants' responses were gathered online, and 10 were gathered over the phone. For some interviews, more than one project representative contributed responses. Interviews assessed participants' experience with the Program and gathered data to inform net-to-gross (NTG) calculations. The interviews with the 19 participants about 14 projects were as follows:

- Five joint interviews involving a building owner and a design team representative
- Four interviews involving the building owner who was the chief decision-maker for the project and also the contact listed in SPECTRUM
- One interview with a design representative only
- Four interviews with building owner representatives only

The Evaluation Team selected a random sample from 83 projects for which the Program processed and distributed incentive checks as of September 2017. It attempted to contact the full sample frame before ultimately reaching representatives from 14 nonresidential building projects.

The Evaluation Team conducted 42 detailed reviews of project documentation, primarily the Project Savings Verification reports and the energy model output reports, and when available, the energy models. For each project, the verification report created by the Program Implementer described the energy savings strategies that were implemented in the project design. The Evaluation Team investigated the energy model and/or model output report to ensure the model accurately reflected the identified strategies. The Team also compared the energy consumption between the model output

reports from the baseline and proposed design to ensure that the reported savings were calculated correctly.

Verification Site Visits

The Evaluation Team conducted site visits to 10 building projects—eight nonresidential and two multifamily residential—to verify that reported energy-saving strategies were incorporated in the building design and operating in a manner consistent with the claimed savings estimates. While at the site, the Team observed light fixture counts, wattages, and control types, and verified that the installed lighting was consistent with the lighting plans and lighting power densities included in the project documentation. The Team also observed all HVAC and domestic water heating equipment and collected nameplate data and verified consistency with the efficiency and performance data from the project documentation.

As in the engineering desk review process, the Team then investigated the models to ensure that the identified strategies and conditions observed on the site were represented appropriately in the models. When available, the Evaluation Team obtained and verified the actual model files to verify that the input parameters accurately reflected the building design. For any discrepancies between the models and field observations, the Team updated and reran the models to obtain new results. Even if no discrepancies were identified, the Team still reran the models to verify that the reported results could be reproduced. If the actual model files could not be obtained, the Team conducted a thorough review of the model output reports, as it did in the engineering desk reviews.

Impact Evaluation

The Evaluation Team used the following methods to conduct an impact evaluation of the Program:

- Tracking database review
- Participant interviews
- Engineering desk reviews
- Verification site visits

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data to determine the reported completed projects, then applied the results from participant interviews (n=9), engineering desk reviews (n=42), and verification site visits (n=10) to calculate verified gross savings. Through the engineering desk reviews and site visits, the Evaluation Team found that the verified savings of nearly all evaluated projects were very close to their claimed savings.

During site visits, the Evaluation Team identified a few evaluated projects for which it had to make minor adjustments to the *ex ante* gross savings to determine the verified gross savings:

- The largest adjustment was for a project at which an additional storage outbuilding, shown in the project design, was not constructed because of budget constraints. The Evaluation Team

removed the energy savings associated with the energy conservation strategies in this space, which accounted for 8%of total savings initially claimed for the project.

- Two projects reported energy conservation strategies that were not implemented—daylighting controls at one site and variable-frequency drive (VFD) control of the chilled water pump at the other site.

During engineering desk reviews, the Evaluation Team made other minor adjustments to correct modeled interior lighting power densities, exterior lighting power, lighting occupancy control credit, and heat recovery system effectiveness.

The Evaluation Team also identified a few documentation errors that resulted in savings adjustments—these included correcting an error with unit conversion from MMBtu to kWh and resolving a mismatch between the energy model output reports and the *ex ante* values in the project verification report.

In-Service Rates

The ISR represents the percentage of measures still installed, in use, and operating properly following installation by the Program Implementer. In CY 2017, the Evaluation Team conducted participant interviews to verify the installed measures and estimate the ISR at the measure level and calculated a 100% ISR. The Evaluation Team confirmed this ISR finding through on-site verifications and findings from CY 2017 interviews. Because each measure for this program comprises multiple energy conservation strategies, although not all strategies were implemented at each project, the 100% ISR reflects the total number of completed projects.

Verified Gross Savings Results

Table 208 lists the annual and lifecycle realization rates for the CY 2017 Program. Overall, the Program achieved an annual evaluated realization rate of 99%, weighted by total (MMBtu) energy savings.[143]

Table 208. CY 2017 Design Assistance Program Annual and Lifecycle Realization Rates[1]

Annual Realization Rate				Lifecycle Realization Rate		
kWh	kW	therms	MMBtu	kWh	therms	MMBtu
100%	98%	100%	100%	100%	100%	100%

[1] Values are inclusive of both offerings: Design Assistance and Design Assistance – Residential.

Table 209 lists the *ex ante* and verified annual gross savings for the CY 2017 Program. Design measures consist of two types of measures that represent the initial and final phases of each project—initial Design and Modeling Assistance and final Project Savings Verification. Each project is initiated with the Design and Modeling Assistance measure, in which potential energy-saving design strategies are evaluated and a bundle of strategies is selected for inclusion in the project's design. After the building design is completed, the implementation of the energy-saving strategies are verified and all savings are booked in association with the subsequent Project Savings Verification measure. Design and Modeling

[143] The Evaluation Team calculated realization rates by dividing annual verified gross savings by *ex ante* savings.

Assistance measures are effectively excluded from the impact evaluation because they do not have associated energy savings.

Table 209. CY 2017 Design Assistance Program Annual Gross Savings Summary

Measure Category	*Ex Ante* Gross Annual Savings			Verified Gross Annual Savings		
	kWh	kW	therms	kWh	kW	therms
Design	33,124,797	5,313	744,645	33,059,843	5,200	747,264
Design – Residential	4,530,178	646	495,128	4,521,295	632	496,869
Total Annual	**37,654,975**	**5,959**	**1,239,773**	**37,581,138**	**5,832**	**1,244,133**

Table 210 lists the *ex ante* and verified gross lifecycle savings by measure category for the CY 2017 Program.

Table 210. CY 2017 Design Assistance Program Lifecycle Gross Savings Summary

Measure Category	*Ex Ante* Gross Lifecycle Savings			Verified Gross Lifecycle Savings		
	kWh	kW	therms	kWh	kW	therms
Design	662,495,940	5,313	14,892,900	661,249,828	5,200	14,945,278
Design – Residential	90,603,560	646	9,902,560	90,433,141	632	9,937,387
Total Lifecycle	**753,099,500**	**5,959**	**24,795,460**	**751,682,968**	**5,832**	**24,882,665**

Evaluation of Net Savings

The Evaluation Team used participant surveys to assess net savings for the Design Assistance Program and calculated an NTG percentage of 53% for the CY 2017 Program.

Freeridership

The Evaluation Team used the self-report survey method to determine an average self-reported freeridership of 47%, weighted by evaluated savings for the CY 2017 Program.

As in CY 2015 and CY 2016, the Evaluation Team considered two factors—modeling assistance and incentives offered through the Program—in assessing the Program's net savings for CY 2017. The analysis estimated two intention-based freeridership scores, one addressing the modeling assistance and one addressing the incentives. It also included an influence-based freeridership score that was

combined with the average of the modeling assistance and incentive intention-based freeridership scores.[144]

Freeridership was 47% in CY 2017, 12% in CY 2016, and 32% in CY 2015. An aspect contributing to the change is that small analysis sample sizes with large variations in evaluated Program savings between program sites create the potential for large swings in weighted freeridership estimates.

In CY 2017, of the 14 sites in the analysis, the two with the highest savings represented 50% of the analysis sample's Program savings and both were estimated as 75% freeriders. In CY 2016, the site with the highest savings was estimated as a 0% freerider and represented 46% of the total analysis sample's gross savings. In CY 2015, one site was estimated as a 37.5% freerider and also represented 46% of the total analysis sample's gross savings. If the sites that represent 46% or more of the analysis sample savings are removed from the CY 2015, CY 2016, and CY 2017 analyses, the weighted freeridership estimates are 27% for CY 2015, 21% for CY 2016, and 19% for CY 2017.

Table 211 shows the Program-level, savings-weighted freeridership estimates for CY 2015, CY 2016, and CY 2017.

Table 211. CY 2015, CY 2016, and CY 2017 Self-Reported Freeridership

Year	Number of Sites	Percentage of Freeridership
CY 2015	8	32%
CY 2016	9	12%
CY 2017	14	47%

Spillover

The Evaluation Team determined that there was no spillover for the Program based on self-report survey data. No surveyed participants attributed additional energy-efficient equipment purchases or energy modeling (for which they did not receive an incentive) to their participation in the Program.

[144] For seven of the 14 sites in the analysis, the Evaluation Team could not schedule interviews with the design team, so the incentive-focused intention-based freeridership score (derived from the interview with the building owner) equaled the final intention-based freeridership score, which was averaged with the influence-based freeridership score to arrive at the site's final freeridership score. For one of the 14 sites, the Evaluation Team could not complete an interview with the building owner, so the modeling assistance-focused intention-based freeridership score (derived from the design team interview) equaled the final intention-based freeridership score, which was averaged with the influence-based freeridership score to arrive at the site's final freeridership score. Except for these sites, the net savings analysis approach used in CY 2017 was the same as the approach used in CY 2015 and CY 2016.

Verified Net Savings Results

To calculate the Program's NTG, the Evaluation Team combined the self-reported freeridership and spillover results using the following equation:

$$NTG = 1 - Freeridership\ Ratio + Participant\ Spillover\ Ratio$$

This yielded an overall NTG estimate of 53% for the Program. Table 212 shows total savings net of freeridership, participant spillover, and total annual gross and net savings in MMBtu as well as the overall Program NTG.

Table 212. CY 2017 Design Assistance Program Annual Net Savings and NTG Ratio

Net of Freeridership (MMBtu)	Participant Spillover (MMBtu)	Total Annual Gross Verified Savings (MMBtu)	Total Annual Net Savings (MMBtu)	Program NTG Ratio
133,899	0	252,640	133,899	53%

Table 213 shows the annual Program net demand and energy impacts (kWh, kW, and therms) by measure category. The Evaluation Team attributed these savings as net of what would have occurred naturally without the presence of the Program.

Table 213. CY 2017 Design Assistance Program Annual Net Savings

Measure Category	Annual Net Savings		
	kWh	kW	therms
Design – Nonresidential	17,521,717	2,756	396,050
Design – Residential	2,396,286	335	263,341
Total Annual	**19,918,003**	**3,091**	**659,391**

Table 214 lists the lifecycle Program net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 214. CY 2017 Design Assistance Program Lifecycle Net Savings

Measure Category	Lifecycle Net		
	kWh	kW	therms
Design – Nonresidential	350,462,409	2,756	7,920,997
Design – Residential	47,929,564	335	5,266,815
Total Lifecycle	**398,391,973**	**3,091**	**13,187,812**

Process Evaluation

In CY 2017, the Evaluation Team conducted interviews as part of the process evaluation, which focused on these key topics for the Design Assistance Program:

- Program design, delivery, and goals
- Program awareness, marketing, and outreach

- Customer and design team experience, including decision-making influences and Program benefits, barriers, and satisfaction

Program Design, Delivery, and Goals

The Design Assistance Program uses a custom incentive design that relies on savings per kWh or therm and offers two incentives—one for customers and one for design teams—to influence them to design and construct high-efficiency nonresidential and residential (multifamily) buildings. Table 215 shows the CY 2017 incentives.

Table 215. Design Assistance Program Incentive Structure in CY 2017

Incentive	Reward
Design Team Incentive	$0.012/kWh if the Program Implementer completes whole-building energy modeling $0.015/kWh if the customer completes whole-building energy modeling
Customer/Building Owner Incentive	$0.09/kWh and $0.55/therm

Focus on Energy requires that Program projects include whole-building energy modeling to inform and influence design teams and customers about the energy-related decisions they could make. Customers and their design teams can opt to complete building modeling and receive an incentive of $0.015/kWh or have the Program Implementer complete building modeling for an incentive of $0.012/kWh.

Using the results of the modeling, the Program Implementer offers several energy-efficient building design options, or bundles, with a range of forecasted savings and designs to implement and underscores the point that more savings will lead to a higher incentive. Customers select the bundle that best represents their proposed design and adheres to their available budget. The Program Implementer then provides the customer with a document that summarizes the selected strategies and details the key design parameters that need to be confirmed before the project can receive credit for the energy-saving strategies. Customers then proceed with project construction and are awarded incentives based on verified (post-construction) building performance.

The Program Implementer works directly with building owners and project design teams and is responsible for Program marketing and outreach, project verification, and incentive processing. The Program Implementer also performs whole-building energy modeling for participants who opt not to perform modeling themselves.

The Program Administrator is primarily responsible for Program management, including processing applications, approving incentives, and tracking data, and conducts some Program marketing and outreach.

Design teams also play a substantial role by helping to identify new opportunities and customers, providing energy model inputs, and working with building owners to implement building design recommendations.

Program Changes

Focus on Energy made no substantial changes to Program design or delivery in CY 2017. Limited changes involved ongoing user-experience enhancements to the Program Implementer's net energy optimizer (NEO) energy modeling tool, which helps customers view the impacts of various efficiency upgrades. The Enrollment Wizard online application on Focus on Energy's website also underwent back-end security upgrades, including being moved to a secure server. These changes did not affect customer experience.

The Evaluation Team asked building owners and design teams if the enrollment process has become easier, more difficult, or stayed the same over the course of their participation in the Program. Of those who could recall the experience, three building owners and two design team representatives said the process had become easier, explaining that it was more streamlined and that information was easier to input into the Enrollment Wizard. Six building owners and two design team representatives said the process had stayed the same. One building owner and one design team representative said that participation in the program had become more difficult because more projects had not qualified for the Program. They also reported confusion stemming from having to interact with numerous Program staff rather than having one contact.

Program Goals

In CY 2017, the Design Assistance Program had these savings goals:

- Demand reduction of 5,449 kW (nonresidential) and 375 kW (residential)
- Lifecycle electric savings of 520,007,480 kWh (nonresidential) and 47,000,000 kWh (residential)
- Lifecycle natural gas savings of 19,374,544 therms (nonresidential) and 8,000,000 therms (residential)

The CY 2017 Program achieved 127% of its nonresidential verified electric savings goal, 95% of its nonresidential verified demand reduction goal, and 77% of its nonresidential verified therms goal.

The Program has typically exceeded its electric savings goals but has not achieved its therms savings goals. This achievement reflects the fact that lighting measures are the most cost-effective and commonly needed project measure, the fact that low natural gas prices have made it more difficult to identify therms-saving measures with sufficiently short payback periods, and that lighting projects frequently result in therm-based heating penalties within program models. In addition, because projects have long lead times, generally over a year, the Program experiences some challenges to adjusting Program delivery in response to changes in its annual goals. The Program Administrator maintains fuel-specific targets for the Program but adjusts the balance between the two based on Program performance and projections.

In CY 2017, the Program Implementer had four key performance indicators (KPIs) that are intended to improve customer satisfaction and increase participation. Table 216 presents these KPIs and their results. The Program achieved its customer satisfaction KPI and two of its KPIs regarding increased participation.

Table 216. Design Assistance Program CY 2017 Key Performance Indicators

KPI	Goal	CY 2017 Result	CY 2017 Result Source
Customer Satisfaction	Increase or maintain the baseline customer satisfaction score. 2016 baseline score was a 9.0; continue to meet or exceed the baseline.	Reached goal (average satisfaction rating of 9.2 out of 10 for the program overall).	Reported through the Evaluation Team's building owner interviews.
	Target 30 business days as the upper limit of days between bundle selection and incentive agreements are sent	Did not reach goal; average of 38 days	Reported by Program Implementer.
Participation	Enroll at least 7 new projects per month, adjusted for pipeline capacity, to achieve annual enrollment of 85 new projects per year.	Fell short of monthly enrollment goal; enrolled below 7 new projects for 5 months in CY 2017. Reached annual enrollment goal; enrolled 86 new projects.	Reported by Program Administrator.
	Leverage software enhancements to continue to improve program results. Seek to have 80% of projects served using the NEO tool.	Reached goal; 81% of projects served using the NEO tool.	Reported by Program Administrator.

The Program Implementer said it was considering modifying the KPI which measures the number of days between final preapproval and posting of the signed incentive agreement. Process timelines for signing the agreement vary greatly by project. The City of Madison, for example, requires that City Council approve the agreement before it is finalized, and 15 days is an unrealistic requirement for this type of project. According to the Program Implementer, a more meaningful and accurate metric would be to track days from the receipt of bundle selection to the uploading of the signed agreement.

The Program Implementer increased participation in CY 2017 by successfully enrolling 86 new projects and reported no challenges in recruiting. However, the program allocated all available incentive dollars in the spring and had to start turning away projects or referring them to other Programs. Working collaboratively with the Program Administrator, the Program Implementer referred 102 project applications to other programs in CY 2017.[145] A challenge then is maintaining a pipeline of projects for future program years by not discouraging potential participants.

Data Management and Reporting

For the Design Assistance Program, like other Focus on Energy programs, the Program Implementer uses SPECTRUM. In the DAP program, SPECTRUM contains data transferred from the NEO tool, the comprehensive energy modeling software that helps customers view the impacts of various energy-savings strategies. The Program Implementer uploads the customers' completed applications from the Enrollment Wizard and bundle requirements from the NEO tool to SPECTRUM.

[145] Source: Documentation provided to the Evaluation Team from the Program Implementer

The Program Administrator reviews and approves these documents, then the Program Implementer sends an incentive agreement to the customer. The customer signs and returns the agreement. The Program Implementer then uploads the agreement to SPECTRUM and distributes the incentive to the design team. Customers receive their incentive once their project is completed. For a limited number of projects, the Program Implementer verifies savings by reviewing building documentation (drawings and specifications) to confirm they align with the strategies and specifications described in the bundle requirements document, or by conducting site visits to confirm whether measures have been installed. Project teams do not know ahead of time if they will be subject to on-site verification.

The Program Administrator and the Program Implementer reported no difficulties in managing data and tracking processes through SPECTRUM in CY 2017 and said the reliability of the database continues to improve.

Marketing and Outreach

The Program Administrator and Program Implementer focus primarily on building relationships through face-to-face interaction with building owners and their design teams to increase awareness and engagement with the Program. They limit additional outreach to social media, email to their existing contacts, and utility bill inserts. They said the Program targets specific trade groups and professional groups, such as the Wisconsin branch of the American Institute of Architects (AIA), Wisconsin Healthcare Engineering Association, Wisconsin Economic Development Corporation, and the Wisconsin chapters of ASHRAE. The Program Implementer also maintains engagement through lunch-and-learn sessions with design teams by introducing the Program and providing updates.

The Program Administrator said the Program has strong existing relationships with architectural and engineering firms that are sufficiently mature not to require additional investment. This frees up marketing and promotional resources for other, newer Focus on Energy programs.

Program Awareness

The Evaluation Team asked interview respondents how they first learned of the incentives available through the Design Assistance Program. Four building owners said they had an existing relationship with the Design Assistance Program. One found out about it through another Focus on Energy program, one through the local utility, and one through a trade group or professional organization. The only design team representative who could recall where he learned about the Program thought it was through a conference or AIA convention.

Customer and Design Team Experience

The Evaluation Team interviewed a sample of participating building owners and design teams about their experiences with the Program, motivations for participation, benefits and barriers to designing and building efficient buildings and to participating in the Program, and satisfaction.

Decision-Making Process and Influences

During the interviews, the Evaluation Team asked building owners (n=12) if they chose to pursue the program independently or were motivated by the design team. Four recalled the design team encouraging them to pursue Program incentives, six made the decision to apply for the Program themselves, and one was motivated by a utility representative. The remaining respondent did not recall what encouraged him to pursue the Program.

Asked about the primary reasons for constructing buildings to energy-efficient design specifications and features, eight building owners said saving operation and maintenance costs. Other responses were to offset energy costs over the long term, obtain the brand enhancement and public relations benefits of pursuing sustainability, receive design support and guidance, and take advantage of all available incentives to reduce energy costs.

The Evaluation Team asked building owners whether they owned other buildings, and if so, if they took advantage of the Design Assistance Program or other Focus on Energy incentives in making energy efficient retrofits at these properties. Of 10 building owner representatives who had other buildings, eight had used Focus on Energy incentives. No building owners reported interest in building to more aggressive energy goals, such as carbon neutrality or zero net energy.

Program Benefits

Building owners and design teams identified several benefits of participating in the Program. In addition to financial incentives and reduced energy costs, they mentioned these Program benefits:

- **Assistance with identifying and prioritizing energy-saving strategies**. In CY 2016 interviews, building owners and design teams said that balancing energy efficiency with other priorities was one of their main challenges to designing and building energy-efficient buildings. In CY 2017, respondents reiterated the value of the Program in helping to assess many energy efficiency options up front and weigh short-term versus long-terms benefits and costs. Eight building owners and five design team representatives said an important benefit was the Program's help with these:
  - Identifying energy-saving opportunities
  - Evaluating these options through the Program energy modeling
  - Prioritizing the energy-saving opportunities that had the greatest impact for their project

  One design team respondent particularly appreciated the modeling assistance. He said, "The open conversations [regarding modeling] were helpful for systems that could not be directly modeled in the software." He added that Program staff's extensive years of experience with many types of projects helped his firm better understand the software and navigate the limitations of the models.

  Another design team respondent said the education assistance the Program offered his firm could upsell energy-efficient features and equipment. Being able to show clients that payback periods for efficient systems are shorter than they might expect encourages them to pursue

upgrades that save energy and result in higher-quality construction. One design team representative said that showing a client a payback period of under five years, for example, presented "a pretty tremendous opportunity to upsell."

Three design teams and one building owner said they changed the way they implement projects because their participation in the Program and the training they received added another level of scrutiny and technical awareness to their processes. The Program equipped them to better assess different energy efficiency options up front and introduced a system of checks, such as evaluating payback periods for insulation. One design team said it has adopted many of the Program recommendations as standard practice.

- **Third-party validation and increased confidence.** One building owner and four design team respondents said that validation of the energy-saving opportunities by Focus on Energy, a trusted third party, helped increase the owner's confidence in the building design and energy efficiency strategies.

  One design team respondent said that involving a third-party entity in the conversation lent credibility to their work and was a win-win for the client, who received free advice and unbiased analysis. Another noted that the Program helps their firm build a relationship with the client, and that incorporating a program new to the client was perceived as "going above and beyond." One design team respondent emphasized that "the fact that an outside group is rooting for the project and helping you" helped the executive group of the building owners, in particular, trust the design team more.

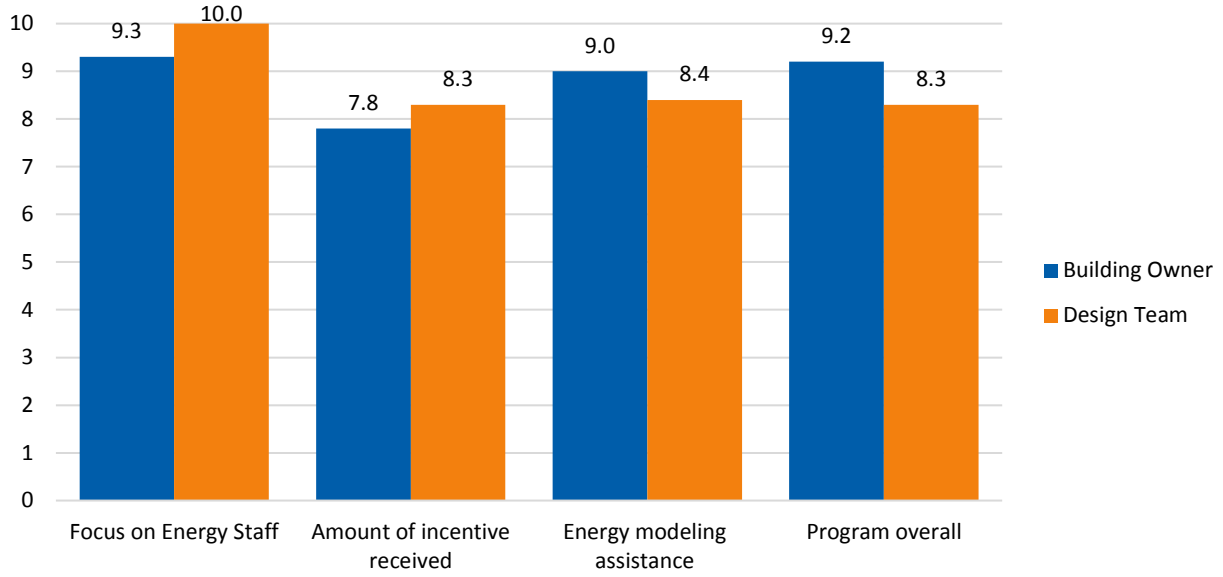
  The building owner appreciated the presence of a third party in the initial design phase to discuss ideas and valued the relationship formed with the Program for future projects and needs.

Customer and Design Team Satisfaction

The Evaluation Team asked building owners and design teams to rate their satisfaction with the Program and its components. Respondents answered questions about satisfaction and their likelihood to recommend the Program on a scale of 0 to 10, where 10 indicated the highest satisfaction or likelihood to recommend and 0 the lowest.

Figure 133 shows average satisfaction with the overall Program and Program components on a scale of 0 to 10. Building owners and design teams were highly satisfied with the Program overall—on average, they rated their satisfaction as 9.2 and 8.3, respectively. One building owner and design team representative, who worked on a remodel project, said the level of effort required was not commensurate with the incentive received and that the modeling assistance was less valuable for a remodel than a new construction project because it did not capture all potential savings. Also, they thought the number of people who had to be involved made the process time-consuming and unduly bureaucratic.

Figure 133. Building Owner and Design Team Average Satisfaction Ratings



Source: CY 2017 Building Owner and Design Team Interview Questions D1.1 – D1.4. "On a scale from 0 to 10, where 0 is *not at all satisfied* and 10 is *extremely satisfied*, how satisfied are you with….?" (Building Owner n=5-6; Design Team n=10-13)

Focus on Energy Support

As in CY 2016, in CY 2017 building owners and design teams gave the highest satisfaction ratings for the Focus on Energy Program staff who assisted them with their projects. They said the staff helped make the Program processes easy to navigate and the incentive easy to obtain. One design team respondent said that "[Program staff] across the board, from administrative to project teams to those revising the energy calculations, were very helpful and unproblematic." Another building owner gave Program staff his "highest compliments," stating they were easy to work with and facilitated a seamless process.

Energy Modeling Assistance

All design teams relied on the Program Implementer to perform the Program-required energy modeling. Building owners and design teams appreciated the energy modeling assistance provided through the Program. Building owners gave the modeling assistance an average satisfaction score of 9.0, and design teams reported an average of 8.4. Respondents provided positive feedback about how the modeling results, report, and subsequent discussions with the Program Implementer helped them effectively identify and prioritize energy-saving strategies. One design team member said the modeling results were particularly helpful as an educational aid to the architects in conveying difficult-to-understand information to the building owner.

Design team respondents suggested some improvements to the modeling. One thought the modeling results and report resulted in informational overload and were overly technical, especially for clients less

experienced with the analysis. Another who was involved in a remodel project said the modeling was adequate for capturing lighting savings but not savings from other efficient equipment and systems.

Incentive Amount Received

The Program's custom incentive design means the final incentive relies on savings per kWh or therm. Design teams receive an incentive of $0.012/kWh if the Program Implementer completes energy modeling or $0.015/kWh if the design team completes the modeling. The building owner receives a larger incentive of $0.09/kWh and $0.55/therm.

Design team representatives provided a slightly higher satisfaction rating with the incentive amount received than did building owners. One design team representative said clients were "over the moon" with the incentives they received. He believed that the Program incentives calculated during the initial screening sometimes set clients' hopes too high; that is, clients thought they would get higher savings with lower efficiency equipment. However, as his firm has become more experienced with the Program and has completed projects of different sizes, they have a better understanding of what the incentive will be and can set client expectations more reasonably.

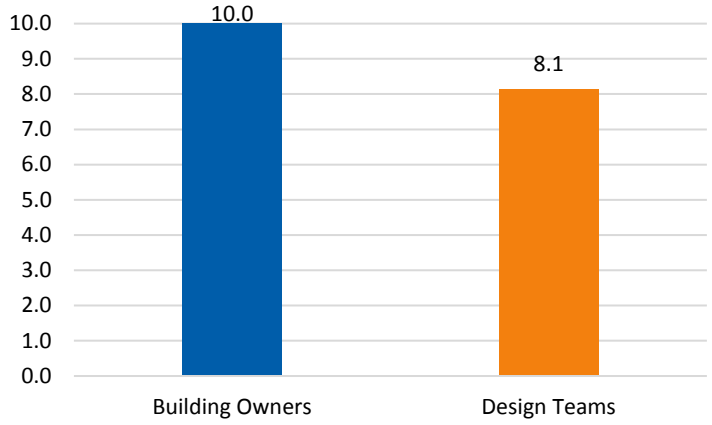
Overall, building owners were satisfied with the incentive and said they were happy to receive any incentive at all. Two respondents said they always want as high an incentive as possible, but this is more because of budget constraints than a fault of the Program. One building owner received a higher incentive than he initially expected, but during the interview stated that retrospectively, he believed it made sense for the level of effort put into the project.

One building owner who participated in a remodel project gave the incentive a score of 0, claiming the incentive was not worth the time and level of effort required for the project. The design team representative for this project gave the incentive a higher rating of 5.

Likelihood to Recommend

As Figure 134 shows, building owners and design teams indicated a very high likelihood to recommend the Program to others. One building owner and design team pair who worked on a remodel project said they would recommend the Program for standalone projects that generate large savings but not for smaller remodel projects.

Figure 134. Building Owner and Design Team Average Likelihood to Recommend Program



Source: CY 2017 Building Owner and Design Team Interview Question D4. "On a scale from 0 to 10 where 0 is *not at all likely* and 10 is *extremely likely*, how likely is it that you would recommend this Program to others?" (Building Owner n=13; Design Team n=6)

The Team asked respondents for suggestions to improve the Program and for comments about their overall experience. Two design team representatives and one building owner said coordinating with the Program Implementer and attending meetings with project stakeholders could be time-consuming and that calls, meetings, and paperwork were burdensome.

A design team respondent said that according to client comments the initial phone call with the Program Implementer to set up the project was tedious and involved a lot of minutiae. He wished the Program could streamline the initial call, especially if the design team had been through the process before, and reduce client involvement in conversations where they were not needed. Another design team representative who completed a hospital project noted there was a lot of bureaucracy and asked if there was a way to decrease the number of people involved.

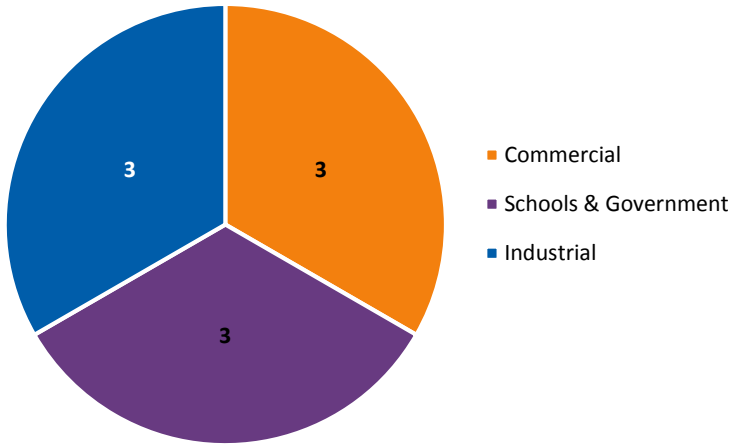
One building owner and one design team representative stressed that continued and expanded funding for the program allowed them to rely on the program for future projects and build more high-efficiency buildings.

Six building owners and design teams praised the Program highly, complimenting the partnership, the value of the assistance and education provided by the Program, the seamlessness of participation, and the responsiveness of Program staff. One design team representative also appreciated the email newsletter he received from Focus on Energy, commenting that it kept him abreast of rapidly changing technologies important to his profession and came at an appropriate frequency.

Participant Demographics

The Evaluation Team interviewed a diverse group of building owners. Of nine building owners, three each represented the commercial, schools and government, and industrial sectors. Figure 135 shows the building owner sectors represented in the CY 2017 interviews.

Figure 135. Building Owner Industries Represented in the CY 2017 Interviews



Source: CY 2017 SPECTRUM Database

Benchmarking

The Team conducted benchmarking research into other utility offerings similar to Focus on Energy's Design Assistance Program. Table 217 shows the results of the comparison of the Program with eight similar programs.

Multiple Tracks

Five of the eight benchmarked programs differ from the Design Assistance Program by offering tracks or types of design assistance based on the size of the project, the design stage in which the modeling assistance is performed, and the level of energy savings achieved. These programs offer two to five tracks for projects and also, for exceeding certain savings levels, projects can receive additional modeling assistance and/or financial incentives.

For example, PG&E and Southern California Edison's Savings by Design Program offers building owners and design teams a range of incentives up to a certain level of savings, then an increased incentive for projects that exceed a set percentage of code. MidAmerican offers five tracks that distinguish between the size of the project (the smallest threshold is 15,000 square feet), the intensity of modeling (online modeling and decision-making tools or custom energy efficiency strategies), and the rigor of savings goals.

Xcel Energy's program includes a simplified, quick track called the Express Track. In contrast to the program's Basic and Enhanced Energy Design Assistance tracks, which develop custom models for projects, the Express Track applies results from previous models and projects to analyze energy efficiency strategies and does not develop a new energy model. Pepco offers two simplified tracks, Modified Comprehensive Design Support and Technical Assistance, that pro-rate incentives for projects beyond the schematic design phase and incent smaller projects going through LEED certification. Smaller

projects not attempting LEED certification may receive free technical assistance and advice from the program.

The various energy codes present in different states are likely drivers of the differences in savings per project, as jurisdictions with more aggressive baselines will therefore achieve higher per project savings to qualify for the incentive program.

Table 217. Design Assistance Program Benchmarking Findings

Benchmarked Program	Report Year	Gross Savings (kWh)	Freeridership	Participation (Projects)	kWh Savings/ Project	Incentive Expenditures
Focus on Energy – Design Assistance Program						
	2017	33,059,843[1]	53%	63	524,759	$3,940,402
Incentive Structure • $0.012/kWh if the Program Implementer completes whole-building energy modeling • $0.015/kWh if the participant completes whole-building energy modeling • Projects must be over 5,000 sq. ft. • Construction schedule must allow for analysis to influence design decisions • Program Provided incentive capped at $10,000; Design Team Completed incentive capped at $15,000 • Construction incentives to building owners after verification of measures: $0.09/kWh, $0.55/therm [1] Verified gross annual savings for the nonresidential measure category						
Vectren Indiana - Commercial & Industrial New Construction						
	2015	479,229	0%	23	20,836	$54,933 (planned)
Incentive Structure • Standard Energy Design Assistance: ▪ $750 for minimum savings of 25,000 kWh; projects under 25,000 sq. ft. ▪ $2,250 for minimum savings of 75,000 kWh, projects between 25,000 – 100,000 sq. ft. ▪ $3,750 for minimum savings of 150,000 kWh; projects over 100,000 sq. ft. ▪ Construction documents must show project meets requirements • Enhanced Energy Design Assistance ▪ $5,000 for projects over 100,000 sq. ft.; must achieve 10% above energy code savings ▪ For projects that become involved with program during design phase						
Southwest Utility						
	2015	11,676,000	27%	9	1,297,333	$ 1,417,892
Incentive Structure • Design Assistance Pathway offered for projects of 75,000 sq. ft. or more • Projects must be in early/flexible stage of design process • Project must have estimated peak demand of at least 400 kW and achieve energy savings of at least 10% above code						
PG&E – Savings by Design						
	2016	11,732,244	0.65 NTG ratio	NA	N/A	$3,670,010 (planned)
Incentive Structure • Incentives for design teams and building owners for whole-building approach projects: ▪ For projects falling between 10% and 40% better than Title 24, kWh incentive rate for owners is on a sliding scale and is equal to "% better than Title 24"; up to $150,000 per project ▪ For design teams, kWh incentive rate is one-third that of owner incentive; up to $50,000 per project • Additional building owner incentives for end use monitoring; up to 10% of owner incentive						
Southern California Edison – Savings by Design						
	2016	40,232,912	N/A	N/A	N/A	$1,698,562 (reported)
	2015	27,471,544 (reported)	0.66 NTG ratio	N/A	N/A	$3,048,728 (reported)
Incentive Structure						

Benchmarked Program	Report Year	Gross Savings (kWh)	Freeridership	Participation (Projects)	kWh Savings/ Project	Incentive Expenditures
• Same as PG&E; reference above						
Xcel Energy Colorado – Commercial New Construction						
	2016	26,694,925	1.0 NTG ratio	133	200,714	$5,279,511
Incentive Structure • Design Assistance incentives for building owners and design teams • Projects must be over 20,000 sq. ft. • Basic Energy Design Assistance Track for projects in schematic or early design stage; 15% minimum electric and gas savings above code; incentives of $450/kW and $.04/kWh saved • Enhanced Energy Design Assistance Track for projects in pre-design or early schematic design stage; 30% electric and 15% gas minimum savings; same incentives as Basic Track; additional modeling and free calculation for green certifications (e.g., LEED) • Express Energy Design Assistance Track does not develop energy model; analyzes strategies by applying results from previous projects and models						
Xcel Energy Minnesota – Commercial New Construction						
	2016	43,072,984 (reported)	N/A	177 (reported)	243,350	$6,725,174 (reported)
Incentive Structure • Same as Xcel Energy Colorado; reference above						
MidAmerican – Commercial New Construction						
	2016	22,343,849 (reported)	N/A	148 (reported)	150,972 kWh/project	$4,439,332 (reported)
Incentive Structure • Five tracks for different square footage thresholds, level of effort for modeling analysis, and intensity of energy efficiency strategies • Ongoing Performance Track for buildings exceeding expected energy use; provides additional technical and financial assistance for meeting performance metrics two years or more after previous participation in program						
Pepco – Commercial & Industrial New Construction						
	2016	7,242,000 (reported)	N/A	33 (reported)	219,455	$1,300,139 (reported)
Incentive Structure • Design Assistance incentives for design teams • Comprehensive Design Support track for projects over 50,000 sq. ft. with a minimum of 150 tons cooling capacity and 75 kW of lighting load. • Modified Comprehensive Design Support and Technical Assistance tracks offer pro-rated incentives for projects beyond schematic design and smaller projects going through LEED certification. • Each phase of program has incentives: ▪ Phase I -- Brainstorming: up to $1,000 based on sq. ft. ▪ Phase II – Simulation Analysis: $0.10/sq. ft. incentive for first 50,000 sq. ft.; afterwards $0.03/sq. ft.; bonus of $0.02/sq. ft. if performance improvement achieved ▪ Phase III – Final Design: up to $8,000 to building owner for measures installed ▪ Phase IV – Enhanced Commissioning: up to $8,000 to building owner based on sq. ft. and cost						

Post-Participation Monitoring

Four other utilities offered additional bonuses for post-participation monitoring, directly built into the design assistance program. The Savings by Design Programs from PG&E and Southern California Edison offer bonus incentives to owners of projects that allow end-use monitoring. MidAmerican's Ongoing Performance Track grants incentives to projects that achieve performance metrics two years or more after participation. Pepco's program offers incentives for third party commissioning six to 10 months after program completion.

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 218 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Design Assistance Program.

Table 218. Design Assistance Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$3,940,402	$4,874,177	$3,181,680

The Evaluation Team found the CY 2017 Program was cost-effective (4.35). Table 219 lists the evaluated costs and benefits.

Table 219. Design Assistance Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$544,066	$604,527	$514,394
Delivery Costs	$1,996,405	$2,275,910	$2,100,485
Incremental Measure Costs	$6,929,961	$11,987,515	$13,218,037
Total Non-Incentive Costs	**$9,470,433**	**$14,867,952**	**$15,832,916**
Benefits			
Electric Benefits	$26,300,185	$36,576,085	$27,677,925
Gas Benefits	$9,771,125	$21,541,900	$12,224,875
Emissions Benefits	$5,132,661	$8,393,755	$5,828,143
Total TRC Benefits	**$41,203,970**	**$66,511,741**	**$45,730,943**
Net TRC Benefits	**$31,733,537**	**$51,643,789**	**$29,898,026**
TRC B/C Ratio	**4.35**	**4.47**	**2.89**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Program.

Outcome 1. The current KPI tracking days between final preapproval and posting of the signed incentive agreement is not appropriate for all Program projects, especially those involving municipalities.

The Program Implementer said the KPI of 15 days between final preapproval and posting of the signed incentive agreement is not realistic for projects involving the City of Madison, which requires the review of multiple individuals and approval by the city council. The Program Implementer would like to develop a KPI that tracks projects from the receipt of the selected bundle to upload of the signed agreement.

Recommendation 1: The Program Implementer and Program Administrator should consider developing a KPI that gives the participant flexibility in the processing period by counting the days since the bundle selection is received. An alternative is to introduce KPIs that are specific to participant type and would allow longer approval timelines for municipal projects. A more flexible KPI will avoid creating the false impression that projects are failing because they cannot meet the 15-day limit.

Outcome 2: Design team respondents exhibited high satisfaction with all aspects of the Program but suggested minor improvements to ease the interpretation of results and to align expectations. Design teams reported an average satisfaction score of 8.4 for the Program's modeling assistance and said the modeling analysis was especially valuable for helping them explain energy efficiency improvements to clients. One respondent said the modeling results were too technically complicated for clients who did not have experience with the analyses. A design team and building owner pair who completed a remodel project said the analysis was not of value for their project because it did not capture all potential savings.

Recommendation 2: During initial meetings between Program staff and participants, gauge building owner expectations of potential savings and their proficiency with modeling analyses. Ensure building owners understand the range of potential savings their project will achieve. For renovation or remodel projects, make clear to participants that capturing all potential savings is complicated, especially for mechanical systems, because it necessitates comparing potential conditions to existing conditions. Find opportunities to translate modeling results into the most meaningful take-aways for building owners and decision-makers, such as presenting visual aids to show the relative savings of different improvements and emphasize which measures have the greatest impacts.

Outcome 3: Participants commented that Program participation can be time-consuming and numerous individuals are required to participate in meetings and calls. Respondents suggested streamlining calls to reduce the number of people, especially any who are not necessary for decision-making, and avoid having to repeat information to design teams that have previously participated.

Recommendation 3: Customize the amount of information transmitted to design teams and building owners and the number of meetings required according to previous involvement with the Program. Allow design teams that are already familiar with the Program and its requirements to represent their clients at meetings and take responsibility for explaining the available energy efficiency options directly to their clients. Altering the perception of design teams and building owners that the Program is bureaucratic will ensure high satisfaction throughout the process.

Business Incentive Program

Through the Business Incentive Program, launched in 2012, Focus on Energy offers customers in the commercial and industrial sectors prescriptive and custom incentives for the installation of energy efficiency measures. Customers who are not eligible for the Agriculture, Schools, and Government or Large Energy Users programs may participate in the Business Incentive Program.

Effective January 2017, Focus on Energy discontinued Chain Stores and Franchises Program offerings; the Business Incentive Program and the Small Business Program now provide incentives for projects previously eligible for that Program. Additionally, small business customers interested in a prescriptive offering that is not available through the Small Business Program or who have reached their annual Small Business Program incentive cap may also participate in the Business Incentive Program.

The Program Administrator is APTIM. The Program Implementer, Franklin Energy, oversees Program management and delivery. The Program Implementer's Energy Advisors, with support from Trade Allies and the Program Administrator, promote and deliver the Program to customers.

To support the PSC's initiative to provide rural customers with energy-efficient technologies and benefits, Focus on Energy also developed and launched the Communications Providers Initiative in the second half of CY 2017. This offering provides outreach and additional incentives for internet service providers. The Initiative will continue to ramp up in 2018, and a complete evaluation of the Initiative will be included in the CY 2018 annual evaluation report.

Table 220 lists the actual Program spending, savings, participation, and cost-effectiveness from CY 2015 to CY 2017. CY 2016 Chain Stores and Franchises Program results are included for reference.

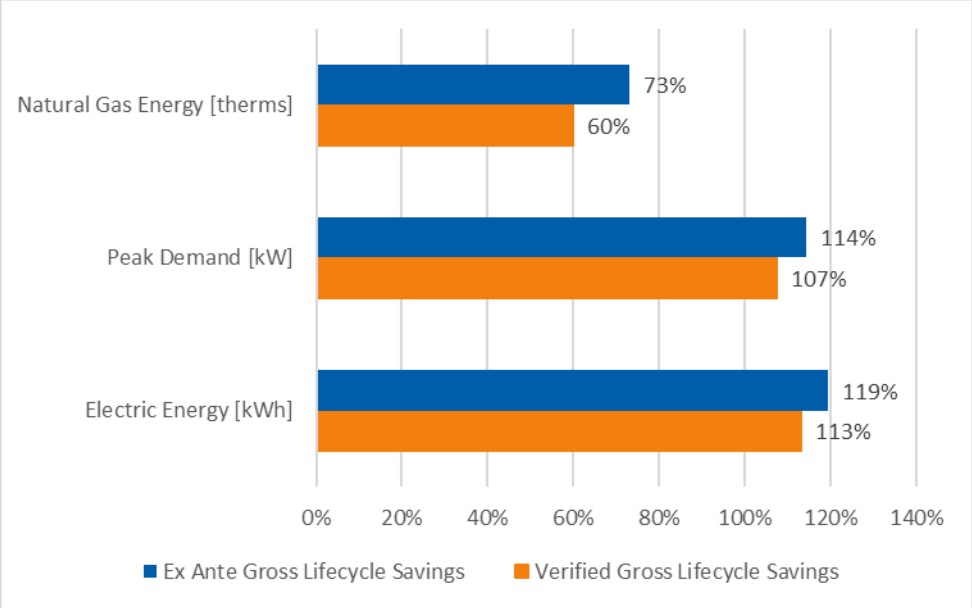
Table 220. Business Incentive Program Summary[1,2]

Item	Units	CY 2017	CY 2016	CY 2016 Chain Stores and Franchises	CY 2015
Incentive Spending	$	$9,461,560	$5,823,243	$2,799,790	$6,943,989
Participation	Number of Participants	2,097	2,298	264	2,601
Verified Gross Lifecycle Savings	kWh	2,525,286,083	1,350,299,389	974,247,457	1,319,996,781
	kW	21,397	13,003	9,434	15,432
	therms	20,249,065	26,560,534	4,737,758	73,006,605
Verified Gross Lifecycle Realization Rate	MMBtu	92%	97%	115%	127%
Annual NTG Ratio	MMBtu	60%	44%	63%	64%
Net Annual Savings	kWh/yr	95,051,087	40,868,245	35,977,885	65,591,587
	kW	12,772	5,721	5,944	9,876
	therms/yr	810,763	920,671	211,335	5,216,163
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	3.81	2.25	2.80	3.61

[1]Chain Stores and Franchises Program was absorbed by the Business Incentive and Small Business programs in PY 2017. Chain store and franchise measures are included in these values.
[2]Exclude Communications Provider Initiative

Figure 136 shows the percentage of gross lifecycle savings goals achieved by the Business Incentive Program in CY 2017. The Program exceeded its CY 2017 electric demand and energy savings goals but did not meet natural gas savings goals. Despite increasing the custom incentives for natural gas savings from $0.40 per therm in CY 2016 to $0.60 in CY 2017, the Program Implementer said low natural gas prices dissuaded customers from investing in natural gas-saving projects.

Figure 136. Business Incentive Program Achievement of CY 2017 Gross Lifecycle Savings Goals[1,2]



[1]The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

[2]Exclude Communications Provider Initiative

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations of the Business Incentive Program in CY 2017. It designed its EM&V approach to integrate multiple perspectives in assessing Program performance. Table 221 lists the specific data collection activities and sample sizes used in the evaluations.

Table 221. CY 2017 Business Incentive Program Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Program Actor Interviews	6
Tracking Database Review	Census
Ongoing Participant Satisfaction Surveys	449
Engineering Desk Reviews	70
Verification Site Visits	42

Program Actor Interviews

In July 2017, the Evaluation Team interviewed the Program Administrator and the Program Implementer. In October 2017, the Team also interviewed four Program Energy Advisors. Two of these Energy Advisors manage customer and Trade Ally accounts and also serve as the lead for the commercial or chain stores and franchises teams. The third Energy Advisor targets large, national retailers and performed no Trade Ally outreach. The fourth Energy Advisor performs outreach exclusively with National Rebate Administrators and had limited direct customer contact during his day-to-day activities.

The purpose of the interviews was to learn about the current state of the Business Incentive Program and to assess its objectives, performance, and implementation challenges and solutions. The Evaluation Team also asked interviewees about their marketing and outreach efforts for engaging Trade Allies and customers when applicable.

Tracking Database Review

The Evaluation Team reviewed the census of Business Incentive Program records in the Focus on Energy database, SPECTRUM. The review involved the following tasks:

- Conduct a thorough review of the data to ensure that the totals in SPECTRUM matched the totals reported by the Program Administrator
- Reassign savings from a number of database adjustment measures to the corresponding program measures
- Check for complete and consistent application of information across data fields (measure names, application of first-year savings, application of EUL, etc.)
- Identify chain stores and franchises participants to determine whether the Program Implementer met the participation goal for this market segment

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct satisfaction surveys beginning in CY 2015 for the 2015–2018 quadrennium. These surveys are intended to give recent Program participants the opportunity to offer feedback quickly and easily, ensure that this feedback is close in time to the participation experience, identify problems at any time of the year, and discover energy efficiency opportunities for delivering follow-up information to interested participants. The Program Implementer also used data collected during ongoing participant satisfaction surveys to assess performance and help meet contractual obligations related to satisfaction KPIs.

Within two weeks of completing participation in the Program, the Program Administrator deployed online surveys to all CY 2017 participants with email addresses, and the Evaluation Team sent paper surveys to participants without email addresses. The Team gathered the online survey results via SPECTRUM and also received and scanned mail survey responses, which were combined with the online results for quarterly and annual reporting.

In CY 2017, 449 Business Incentive Program participants responded to the ongoing customer satisfaction survey.

Engineering Desk Review

The Evaluation Team conducted a detailed review of all available project documentation in SPECTRUM for a sample of 70 program measures. This review included an assessment of the savings calculations and methodology applied by the Program Implementer. The Evaluation Team referred to the applicable TRMs (2017 TRM and 2017 TRM Update, dated spring 2017) and other relevant secondary sources as needed. These secondary sources included energy codes and standards, case studies, and energy efficiency program evaluations of applicable measures (based on geography, sector, measure application, and date of issue).

For prescriptive measures in Wisconsin, the Team used the Focus on Energy TRM and associated workpapers as primary sources to determine methodology and data in nearly all cases. For custom and hybrid measures, the Evaluation Team reviewed the SPECTRUM savings analysis workbooks and adjusted inputs and methodologies as necessary based on engineering judgment and project documentation. The evaluation sample for these reviews was selected using a weighted, random stratified sampling approach known as PPS (Probability Proportional to Size, here lifecycle total energy savings).

Verification Site Visits

The Evaluation Team conducted 42 verification site visits for the Business Incentive Program in CY 2017. Site visits involved verifying the type and quantity of equipment installed, determining how the installed equipment is controlled, and documenting the operating hours of the installed equipment. During three verification site visits, the Team also installed power meters to record equipment demand and operating hours. These projects were selected for power metering because they were hybrid measures with high savings relative to the sample. Two of the projects involved the installation of VFDs on motors serving process fans and the third involved the installation of a VFD-controlled air compressor, which tends to have high levels of variation in demand and operating hours. The Evaluation Team did not collect any project-specific electric or gas utility bill data in CY 2017.

Impact Evaluation

The Evaluation Team used the following methods to conduct an impact evaluation of the Program:

- Tracking database review
- Engineering desk reviews
- Verification site visits

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data to determine reported installations then applied the results from engineering desk reviews (n=70) and verification site visits (n=42) to calculate verified gross savings.

The Team found that the overall accounting of demand and energy savings in the SPECTRUM database was generally accurate and adhered to industry best practices. SPECTRUM offers the typical date fields, such as “paid date” and “application received date,” and offers several additional fields that help users track projects in greater detailed. SPECTRUM also employs unique customer identifier numbers, a best practice not followed in many other jurisdictions, so account numbers and customer contact information can be used to easily classify unique customers.

The Evaluation Team identified several types of measures where savings calculations did not align with the 2017 TRM Update.

The Evaluation Team worked with the PSC and Program Administrator to assess the causes and impacts of inaccuracies for several measures:

- For MMID #3409 (Retrofit Open Refrigerated Cases with Doors), the Team found an error in which the deemed savings from the 2017 TRM were not updated in SPECTRUM, resulting in a low realization rate.
- The Team found an error for MMID #3103 (LED Fixture, Replacing 250 Watt HID, Parking Garage, 24 Hour), in which the SPECTRUM deemed savings appear to be based on an old workpaper from 2013, not the current 2017 TRM or 2015 TRM.

The Evaluation Team also reviewed the submitted custom project calculations for accuracy. For MMID #2377 (Heat Recovery, Compressor Heat Used for Space Heating), the reported savings were calculated using a temperature-dependent bin model that assumed heating load up to 72°F outside air temperature. The Team accepted this approach since the heating system was used for dehumidification, but modified the setpoint to 68°F based on site visit data. As a result, this measure yielded lower savings than claimed.

Site visits generally confirmed that program measures were installed and operating as planned, but the Team did find deviations. For MMID #3521 (Steam Trap Repair, >225 psig, General Heating, ¼”) the Team found a misapplication of the measure. The reported measure was for steam traps >225 psig, but the inspected system never goes above 120 psig. At the evaluated site, the Team also found that all of the installed steam traps had failed within a few months of installation.

During a site visit for a hybrid measure involving a VFD on a vacuum pump, the Team found the actual hours of use were lower than reported based on the VFD output screen. The Team also found that the submitted hybrid calculator used "VFD Fan" for the load curve, but because vacuum pumps are constant torque, the load curve was adjusted to "VFD Constant Torque."

At a visit for another hybrid measure involving a VFD on a process fan, the Team found that the installed fan VFD operates in manual mode and is maintained at 55 Hz year round. The VFD does not vary the speed of the fan to match the load. The Team updated these inputs in the hybrid calculator.

Finally, for a hybrid measure involving a VFD-controlled air compressor, the Team updated the savings calculator using hours of use based on power metered data and adjusted the shift airflow assumptions to align with the metered data.

In-Service Rates

The ISR represents the percentage of measures still installed, in use, and operating as planned following installation by the Program Implementer. The Evaluation Team did not conduct participant surveys in CY 2017 but applied a combined ISR of 98.6% from CY 2015 and CY 2016 to estimate CY 2017 ISRs at the measure level for all engineering desk reviews without a completed site visit. The Team applied a site-specific ISR to all measures where verification site visits were performed.

Verified Gross Savings Results

Table 222 lists the annual and lifecycle realization rates for CY 2017. Overall, the Program achieved a first-year evaluated realization rate of 89%, weighted by total (MMBtu) energy savings.[146] Realization rates are generally the same for a given savings type. These results represent weighted average realization rates for the entire Program.

Table 222. CY 2017 Business Incentive Program Annual and Lifecycle Realization Rates

Measure	Annual Realization Rate				Lifecycle Realization Rate		
	kWh	kW	therms	MMBtu	kWh	therms	MMBtu
Total	94%	94%	78%	90%	95%	82%	92%

The Chain Stores and Franchises Program was absorbed into the Small Business and Business Incentive Programs in CY 2017. For comparison with CY 2015 and CY 2016, chain stores and franchises project results were broken out separately.

Table 223 lists the annual and lifecycle realization rates for chains, stores, and franchises projects. Overall, these projects achieved a first-year evaluated realization rate of 91%, weighted by total (MMBtu) energy savings.[146]

Table 223. CY 2017 Chain Stores and Franchises Project Annual and Lifecycle Realization Rates[1]

Measure	Annual Realization Rate				Lifecycle Realization Rate		
	kWh	kW	therms	MMBtu	kWh	therms	MMBtu
Total	94%	94%	78%	89%	95%	82%	92%

[1] Includes both Small Business and Business Incentive Program chain stores and franchises projects.

Table 224 lists the total *ex ante* and verified annual gross savings for the CY 2017 Program by measure category.

[146] The Evaluation Team calculated realization rates by dividing annual verified gross savings by *ex ante* savings.

Table 224. CY 2017 Business Incentive Program First-Year Gross Savings Summary

Measure	*Ex Ante* Gross Annual Savings			Verified Gross Annual Savings		
	kWh	kW	therms	kWh	kW	therms
Air Sealing	0	0	19,754	0	0	15,441
Boiler	0	0	216,537	0	0	169,257
Chiller	3,028,825	214	0	2,834,164	201	0
Compressor	3,227,201	695	0	3,019,791	653	0
Controls	13,027,910	411	145,990	12,190,615	386	114,114
Delamping	2,278,822	469	0	2,132,364	441	0
Dishwasher, Commercial	164,501	1	2,658	153,929	1	2,078
Door	-1,190	-12	7,787	-1,114	-11	6,087
Dryer	260,332	51	0	243,600	48	0
Energy Recovery	37,934	76	371,085	35,496	71	290,060
Filtration	69,225	14	21,487	64,776	13	16,795
Fluorescent, Linear	2,253,037	436	0	2,108,235	410	0
Fryer	17,694	4	3,960	16,557	3	3,095
Furnace	72,926	0	31,779	68,239	0	24,840
Grain Dryer	0	0	83,278	0	0	65,095
Infrared Heater	0	0	42,675	0	0	33,357
Insulation	792	0	10,043	741	0	7,850
Light Emitting Diode (LED)	111,186,423	16,186	0	104,040,544	15,218	0
Motor	6,469,112	766	0	6,053,346	720	0
Other	8,429,701	1,260	250,465	7,887,930	1,185	195,777
Oven	0	0	5,742	0	0	4,488
Packaged Terminal Unit (PTAC, PTHP)	642,246	0	0	600,969	0	0
Pre-Rinse Sprayer	0	0	52	0	0	41
Reconfigure Equipment	1,938,330	325	0	1,813,755	306	0
Refrigerated Case Door	4,615,172	367	129,738	4,318,558	345	101,410
Refrigerator / Freezer - Commercial	576,389	66	0	539,345	62	0
Rooftop Unit / Split System AC	389,472	512	46,685	364,441	481	36,491
Scheduling	55,708	17	4,948	52,128	16	3,868
Steam Trap	0	0	288,100	0	0	225,195
Steamer	52,716	10	0	49,328	9	0
Strip Curtain	21,420	2	0	20,043	2	0
Tune-up / Repair / Cx	3,771,842	1	10,622	3,529,428	1	8,303
Unit Heater	0	0	20,646	0	0	16,138
Variable Speed Drive	7,423,144	840	0	6,946,063	789	0
Water Heater	-150	0	20,637	-140	0	16,131
Ice Machine	32,179	4	0	30,111	3	0
Griddle	5,859	1	0	5,482	1	0
Window	25,913	0	2,998	24,248	0	2,343
Nozzle	57,600	22	0	53,898	20	0
Welder	42,809	22	0	40,058	21	0
Total Annual	**170,173,893**	**22,757**	**1,737,666**	**159,236,928**	**21,397**	**1,358,252**

Table 225 lists the *ex ante* and verified gross lifecycle savings by measure type for the CY 2017 Program.

Table 225. CY 2017 Business Incentive Program Lifecycle Gross Savings Summary

Measure	*Ex Ante* Gross Lifecycle Savings			Verified Gross Lifecycle Savings		
	kWh	kW	therms	kWh	kW	therms
Air Sealing	0	0	215,690	0	0	176,711
Boiler	0	0	4,328,586	0	0	3,546,343
Chiller	60,576,500	214	0	57,406,256	201	0
Compressor	48,407,980	695	0	45,874,570	653	0
Controls	143,014,048	411	2,132,606	135,529,473	386	1,747,211
Delamping	22,788,220	469	0	21,595,609	441	0
Dishwasher, Commercial	1,645,010	1	26,580	1,558,919	1	21,777
Door	-23,800	-12	155,740	-22,554	-11	127,595
Dryer	3,904,973	51	0	3,700,608	48	0
Energy Recovery	569,010	76	5,634,642	539,231	71	4,616,374
Filtration	207,675	14	322,310	196,806	13	264,064
Fluorescent, Linear	31,989,856	436	0	30,315,681	410	0
Fryer	212,328	4	47,520	201,216	3	38,932
Furnace	1,312,375	0	571,869	1,243,692	0	468,523
Grain Dryer	0	0	1,665,560	0	0	1,364,567
Infrared Heater	0	0	640,125	0	0	524,444
Insulation	19,800	0	251,075	18,764	0	205,702
Light Emitting Diode (LED)	1,908,041,849	16,186	0	1,808,185,345	15,218	0
Motor	103,953,792	766	0	98,513,417	720	0
Other	127,688,526	1,260	3,648,374	121,006,005	1,185	2,989,056
Oven	0	0	68,905	0	0	56,453
Packaged Terminal Unit (PTAC, PTHP)	9,633,690	0	0	9,129,515	0	0
Pre-Rinse Sprayer	0	0	260	0	0	213
Reconfigure Equipment	19,383,300	325	0	18,368,884	306	0
Refrigerated Case Door	46,701,013	367	1,915,410	44,256,937	345	1,569,266
Refrigerator / Freezer - Commercial	6,916,668	66	0	6,554,687	62	0
Rooftop Unit / Split System AC	5,844,570	512	700,275	5,538,697	481	573,724
Scheduling	278,540	17	24,740	263,963	16	20,269
Steam Trap	0	0	1,728,472	0	0	1,416,110
Steamer	579,876	10	0	549,528	9	0
Strip Curtain	85,680	2	0	81,196	2	0
Tune-up / Repair / Cx	7,746,453	1	53,110	7,341,046	1	43,512
Unit Heater	0	0	309,693	0	0	253,726
Variable Speed Drive	110,942,815	840	0	105,136,673	789	0
Water Heater	-1,500	0	214,047	-1,421	0	175,365
Ice Machine	321,792	4	0	304,951	3	0
Griddle	64,449	1	0	61,076	1	0
Window	518,260	0	59,960	491,137	0	49,124
Nozzle	864,000	22	0	818,783	20	0
Welder	556,517	22	0	527,392	21	0
Total Lifecycle	**2,664,744,264**	**22,757**	**20,171,273**	**2,525,286,083**	**21,397**	**16,526,010**

Evaluation of Net Savings

The Evaluation Team did not perform participant surveys and therefore did not calculate freeridership or spillover for CY 2017. The overall Program NTG for CY 2017 was calculated using the CY 2015 and CY 2016 net savings data (sum of net savings from CY 2015 and CY 2016, divided by the sum of the gross savings from CY 2015 and CY 2016), which was based on participant surveys.

The historical average NTG ratio for Business Incentive Program participants was 56%. The final calculation for 2017 also applied an adjustment to this ratio to incorporate the historic NTG ratio from the Chain Stores and Franchises Program, whose participants were incorporated into the Business Incentive Program at the beginning of 2017.

The Business Incentive Program accounted for nearly all of the 2017 Chain Stores and Franchises Program savings (98% for Business Incentive Program versus 2% of 2017 first year MMBtu savings). This adjustment used the 98% of the first-year net MMBtu savings from CY 2015 and CY 2016 (314,661 MMBtu) and added it to the Business Incentive Program NTG calculation at the historic Chain Stores and Franchises Program NTG ratio of 70%. In other words, 98% of 316,661 MMBtu was added to the numerator, and 98% of 450,177 MMBtu was added to the denominator of the Business Incentive Program NTG calculation. This yielded an overall NTG estimate of 60% for the Business Incentive Program in CY 2017.

Table 226 shows total first year gross and net savings in MMBtu as well as the overall Program NTG.

Table 226. CY 2017 Business Incentive Program Annual Net Savings and NTG Ratio

Total First-Year Gross Verified Savings (MMBtu)	Total First-Year Net Savings (MMBtu)	Program First-Year NTG Ratio
679,142	405,391	60%

Table 227 shows the annual Program net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 227. CY 2017 Business Incentive Program First-Year Net Savings

Measure	First-Year Net		
	kWh	kW	Therms
Air Sealing	0	0	9,217
Boiler	0	0	101,032
Chiller	1,691,758	120	0
Compressor	1,802,562	390	0
Controls	7,276,774	231	68,116
Delamping	1,272,842	263	0
Dishwasher, Commercial	91,882	0	1,240
Door	-665	-7	3,633
Dryer	145,409	29	0
Energy Recovery	21,188	42	173,141
Filtration	38,666	8	10,025
Fluorescent, Linear	1,258,440	245	0
Fryer	9,883	2	1,848
Furnace	40,733	0	14,827

Measure	First-Year Net		
	kWh	kW	Therms
Grain Dryer	0	0	38,856
Infrared Heater	0	0	19,911
Insulation	442	0	4,686
Light Emitting Diode (LED)	62,103,477	9,084	0
Motor	3,613,340	430	0
Other	4,708,432	707	116,862
Oven	0	0	2,679
Packaged Terminal Unit (PTAC, PTHP)	358,728	0	0
Pre-Rinse Sprayer	0	0	24
Reconfigure Equipment	1,082,659	182	0
Refrigerated Case Door	2,577,817	206	60,533
Refrigerator / Freezer - Commercial	321,944	37	0
Rooftop Unit / Split System AC	217,541	287	21,782
Scheduling	31,116	9	2,309
Steam Trap	0	0	134,422
Steamer	29,445	6	0
Strip Curtain	11,964	1	0
Tune-up / Repair / Commissioning	2,106,773	1	4,956
Unit Heater	0	0	9,633
Variable Speed Drive	4,146,217	471	0
Water Heater	-84	0	9,629
Ice Machine	17,974	2	0
Griddle	3,273	1	0
Window	14,474	0	1,399
Nozzle	32,173	12	0
Welder	23,911	12	0
Total First Year	**95,051,087**	**12,772**	**810,763**

Table 228 lists the lifecycle Program net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 228. CY 2017 Business Incentive Program Lifecycle Net Savings

Measure	Lifecycle Net		
	kWh	kW	Therms
Air Sealing	0	0	105,482
Boiler	0	0	2,116,870
Chiller	34,266,719	120	0
Compressor	27,383,270	390	0
Controls	80,899,726	231	1,042,938
Delamping	12,890,767	263	0
Dishwasher, Commercial	930,544	0	12,999
Door	-13,463	-7	76,164
Dryer	2,208,952	29	0
Energy Recovery	321,876	42	2,755,588
Filtration	117,477	8	157,624
Fluorescent, Linear	18,095,919	245	0
Fryer	120,109	2	23,239
Furnace	742,380	0	279,669
Grain Dryer	0	0	814,532
Infrared Heater	0	0	313,049

Measure	Lifecycle Net		
	kWh	kW	Therms
Insulation	11,200	0	122,787
Light Emitting Diode (LED)	1,079,334,959	9,084	0
Motor	58,804,246	430	0
Other	72,230,434	707	1,784,216
Oven	0	0	33,698
Packaged Terminal Unit (PTAC, PTHP)	5,449,555	0	0
Pre-Rinse Sprayer	0	0	127
Reconfigure Equipment	10,964,683	182	0
Refrigerated Case Door	26,417,678	206	936,720
Refrigerator / Freezer - Commercial	3,912,598	37	0
Rooftop Unit / Split System AC	3,306,138	287	342,465
Scheduling	157,564	9	12,099
Steam Trap	0	0	845,299
Steamer	328,022	6	0
Strip Curtain	48,467	1	0
Tune-up / Repair / Commissioning	4,381,989	1	25,973
Unit Heater	0	0	151,453
Variable Speed Drive	62,757,774	471	0
Water Heater	-849	0	104,678
Ice Machine	182,030	2	0
Griddle	36,457	1	0
Window	293,168	0	29,323
Nozzle	488,745	12	0
Welder	314,809	12	0
Total Lifecycle	**1,507,383,941**	**12,772**	**12,086,993**

Process Evaluation

In CY 2017, as part of its process evaluation activities, the Evaluation Team reviewed program materials and conducted interviews and a participant satisfaction survey. The Evaluation Team focused its process evaluation on these key Business Incentive Program topics:

- Customer satisfaction with the Program and energy-efficient upgrades
- Trade Ally and customer engagement
- Program tracking processes and coordination among the Program Administrator, Program Implementer, and utility partners

Program Design, Delivery, and Goals

The Evaluation Team interviewed key staff members of the Program Administrator and Program Implementer to obtain an overview of the Program design and delivery process and any associated changes or challenges.

Program Design

Focus on Energy launched the Business Incentive Program in April 2012 as one of three core nonresidential programs that were designed around energy use and organizational decision-making

instead of by industry sectors. Through the Program, Focus on Energy offers incentives for a variety of prescriptive measures, including lighting, HVAC, refrigeration, and compressed air (see Appendix C for a list of measures). Custom incentives are available for nonstandard projects that involve either more complex technologies or changes in equipment different than a one-for-one replacement.

The Program pays for custom incentives on the basis of estimated performance for demand reduction and first-year electric and/or natural gas savings.

Program Management and Delivery Structure

Franklin Energy has implemented the Business Incentive Program since its inception. A Program Manager is supported by Energy Advisors (up to 22 staff who manage customer and Trade Ally relationships across the Business Incentive and Small Business Programs) and operational staff who handle marketing, incentive review and processing, quality assurance, and general strategy. Energy Advisors primarily conduct outreach to prospective customers and Trade Allies within specific market sectors—commercial, industrial, chain and franchises, and rural broadband communications providers. Some Energy Advisors have subject matter or customer segment expertise, such as in lighting or mechanical technologies or food processing and refrigeration industries. Other Energy Advisors support different geographical regions and, by virtue of these regional assignments, work most closely with rural customers or with urban customers.

Outreach efforts are shared with the Business Incentive and Small Business programs. Energy Advisors coordinate with utility account representatives to streamline customer outreach.

Trade Allies are a key component to delivering the Program to customers. To manage this large network, the Program Implementer categorizes Trade Allies with an A, B, C, or D (or platinum, gold, silver, or green status) that ranks based on savings delivered to the Business Incentive and Small Business programs (where A and B rankings signify the most active and engaged Trade Allies) and the presence of warnings or other customer complaints on a Trade Ally's record, which deducted from the ranking. Green, or D, rankings signify new Trade Allies. The ranking is intended to help the Program Implementer prioritize outreach efforts and resources for managing the network.

National Rebate Administrators, a subset of the Trade Ally network, are third-party rebate aggregation and management companies that help clients calculate possible incentives and prioritize properties for energy efficiency projects by "matching" them with various utility incentive programs around the country. National Rebate Administrators will often help national companies complete incentive applications, advise the companies on program-qualifying equipment, and navigate eligibility guidelines.

Program Changes

In CY 2017, Focus on Energy changed four aspects of the Program's design or delivery. It completed the incorporation of chain stores and franchises customer eligibility into the Business Incentive Program, introduced an initiative for rural broadband customers, shifted its outreach from mainly emphasizing Trade Allies to also concentrating on prospective customers (detailed in the Marketing and Outreach

section below), and increased the custom incentives for therm savings to $0.60 per therm in CY 2017 from $0.40 per therm in CY 2016.

As part of the transition, the Program Implementer revised the Business Incentive Program catalog to include customers who were previously eligible for the Chain Stores and Franchises Program. This resulted in one change to Program incentives—the Program Implementer reduced the incentive cap for chain stores and franchises participants from $250,000 to $200,000 per project and from $500,000 to $400,000 per customer per year.

According to the interviews, some Program actors disagreed about the extent of the impact of this transition on participation. The Program Implementer believed the transition had minimal impacts on the market. However, one Energy Advisor said the Program's cap on the annual incentive had impacted the project activities of large chain store participants. For example, several of the larger chains use one federal identification number across the state, with dozens or hundreds of stores with similar energy efficiency opportunities. This Energy Advisor said the incentive cap limits the ability of these larger chains to implement projects across all of their stores and that, rather than focusing attention on their Wisconsin locations, some of these customers have shifted their energy efficiency efforts to other states. However, the Evaluation Team's review of SPECTRUM savings data for several larger chains revealed that these customers completed CY 2017 projects that generated higher electric and demand savings than in CY 2016.

The Program Implementer maintained its field staff who concentrate on the chain stores and franchises market segment and incorporated them into the existing Business Incentive Program. Teams are organized by market segment and specialize in commercial, chain stores and franchises, industrial, and Trade Ally markets. The Energy Advisors said integrating the Chain Stores and Franchises Program into the Business Incentive Program has improved communications across all team members. As shown in Table 229, Focus on Energy generated more electric energy savings from this customer segment in CY 2017 than in CY 2016.

Table 229. CY 2016 and CY 2017 Chain Stores and Franchises Customer Savings Comparison

Year	Verified Gross Lifecycle Electric Energy Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Lifecycle Natural Gas Energy Savings (therms)
CY 2016	974,247,457	9,434	4,737,758
CY 2017	1,083,620,679	8,441	3,731,711

In the second half of CY 2017, the Program Implementer also launched a new initiative called the Communications Providers Initiative. The Program Implementer dedicated field staff to support outreach to small, midsize, and large local broadband providers and the manufacturers that deliver equipment to these markets. More information on this initiative is provided below.

Program Goals

The overall objective of the Program is to encourage businesses to use more energy-efficient products. Focus on Energy set these savings goals for CY 2017:

- Demand reduction of 19,920 kW
- Lifecycle electric savings of 2,265,725,625 kWh
- Lifecycle natural gas savings of 33,790,000 therms

For CY 2017, the Program revised savings and demand goals to align with the actual CY 2016 participation levels across the Business Incentive and the Chain Stores and Franchises programs. Compared to the combined CY 2016 goals for these programs, Focus on Energy increased the CY 2017 goal by 366,225,625 lifecycle kWh. It decreased the goal for demand reduction by 1,080 kW and 19,940,000 lifecycle therm savings.

In CY 2017, the Program met its electric savings and demand goals but did not meet its therms savings goal. The Program Implementer said that although it increased the custom incentives, low natural gas prices limited businesses' interest in the Program. As a result, the number of Program participants with therm-saving projects decreased by 27% from CY 2016 to CY 2017.

In addition to the energy goals, the Program Administrator and Program Implementer track several KPIs. They made the following changes to the KPIs from CY 2016 to CY 2017:

- Removed the custom application preapproval processing goal
- Tightened the prescriptive application processing timeline from 35 to 30 days
- Increased the overall satisfaction score goal from an average of 8.0 to 8.6 on a scale of 0 to 10

The Program Implementer also revised its customer participation goals, increasing the new customer participation goal based on CY 2016 results and setting a chains and franchise customer minimum threshold to monitor the transition of the Chain Stores and Franchises Program into the Business Incentive Program. The Program Implementer also adjusted its Trade Ally participation goals from monitoring activity by rank to encouraging the participation of all registered Trade Allies.

Table 230 shows the results for these KPIs, as reported through the Program interviews, which the Evaluation Team confirmed with SPECTRUM data. The Program met all of its CY 2017 KPI goals except the Trade Ally participation KPI (50% of registered Trade Allies complete at least one CY 2017 project). The Program Implementer reported that expanding the definition of Trade Allies included in the analysis—from any registered beginning in CY 2016 to any registered beginning in CY 2015—found that more than 200 Trade Allies had not participated since CY 2015. Therefore, the KPI result would have been 53% based on the CY 2016-registered Trade Ally network and 43% based on the combined CY 2016- and CY 2017-registered network.

Table 230. CY 2017 Business Incentive Program Key Performance Indicators

KPI	Goal	CY 2017 Result	CY 2017 Result Source
Days an Incentive is Outstanding for Complete Prescriptive Applications	30 calendar days; includes the Program Implementer's time to process incentive applications and the Program Administrator's time to cut incentive checks	Reached goal (28 days)	SPECTRUM, application received/received complete date against the date of status change to paid
New Customer Participation	New customers, defined as those who did not submit and receive payment for a project in CY 2016, accounting for at least 60% of participating customer base	Reached goal (78%)	SPECTRUM ID comparison, CY 2016 to CY 2017
Chain Stores and Franchises Customer Participation	At least 200 retail, food sales, and food service customers in CY 2017	Reached goal (246 unique chain stores and franchises customers)	SPECTRUM
Trade Ally Participation	50% of registered Trade Allies complete at least one CY 2017 project	Did not reach goal (38%)	SPECTRUM
New Trade Ally Participation	15% of Trade Allies who registered for the first time in CY 2017 complete at least one project	Reached goal (19%)	SPECTRUM
Customer Satisfaction	Meet or exceed 8.6 overall satisfaction score, on scale of 0 to 10	Reached goal (9.0)	Evaluation Team's ongoing customer satisfaction survey

Data Management and Reporting

In CY 2017, the Program Implementer continued to manage project data and generate reports through SPECTRUM. According to the Program Implementer and the Program Administrator, the data management system meets the needs of the Program. The Program Administrator said the payment process was modified in CY 2017 to allow the customer to release incentive payment to a third party, which simplifies the process for entities such as commercial tenants, National Rebate Administrators participating in the Program on behalf of building owners, or building owners participating on behalf of their business tenants.

The Program Administrator and Program Implementer reported that the level and frequency of their reporting and communication works well.

Marketing and Outreach

The CY 2017 marketing plan aimed to increase business customer engagement in Focus on Energy programs, increase promotion of programs by Trade Allies and other stakeholders, and build affinity with Focus on Energy programs. The Program Administrator designed web pages summarizing the top opportunities for specific market segments, such as manufacturing, hospitality, and supermarkets.

The Program Implementer generated a number of materials and activities to support the marketing plan objectives and web pages—materials included Program summary brochures and industry-specific pieces

such as digital grocery, restaurant, and lodging guides. The Program Implementer also aimed to maintain participation levels for chain stores and franchises through its marketing and outreach efforts and did so by refreshing its standard materials to include content that targeted this customer segment.

In CY 2017, the Program Implementer revised its marketing approach, redirecting much of its marketing activity to increasing the awareness and engagement of prospective customers rather than of Trade Allies. The Program Implementer also required that Energy Advisors conduct at least one in-person meeting and one direct phone call per Trade Ally account each year instead of communicating exclusively through email. Overall, the Program Implementer said the reorganization and shift to marketing to customers directly were particularly successful in improving the customer experience.

In CY 2017, the Program Implementer resumed customer outreach, including its previous efforts to engage these target segments—commercial real estate, cheese processing, healthcare and senior care facilities, grocery, retail, and restaurants. In CY 2016, the Program Implementer had deprioritized these efforts to focus its marketing activities on Trade Ally participation and engagement.

For CY 2017, as an alternative to its standard digital campaigns, the Program Implementer prepared a quarterly mailing for commercial real estate property managers and owners to explain the Business Incentive, Small Business, and Multifamily Energy Savings programs and eligibility considerations for this customer segment. For the cheese industry, the Program Implementer created case studies that presented project details from businesses that have participated in the Business Incentive Program to illustrate the savings potential for prospective participants.

As in previous years, the Program Implementer also continued to target small to midsized industrial customers through its energy assessment offering. To encourage businesses to develop a project, Energy Advisors perform a free on-site facility assessment and provide an assessment report that identifies the top five energy-saving opportunities at the facility. As a follow-up, the Energy Advisor sends a $300 coupon toward the customer's next project, if completed within 120 days of the assessment. In CY 2017, the Program issued 67 coupons, and nine participants redeemed coupons for CY 2017 Business Incentive or Small Business Program projects.

The Evaluation Team compared SPECTRUM data to determine if changes to marketing efforts have resulted in increased participation, and it appears that these efforts have not been fully realized. Reviewing SPECTRUM counts of unique customers, 2,104 participated in the CY 2017 Business Incentive Program, compared to 2,559 participants in the Business Incentive and Chain Stores and Franchises programs in CY 2016. Performing a simple search for SPECTRUM customer names containing "cheese" or "dairy" revealed seven unique CY 2017 customers, compared to six unique CY 2016 customers.

Although marketing activities shifted from Trade Allies to prospective customers in CY 2017, the Program Implementer continued to deliver the quarterly Trade Ally performance summary (launched in CY 2016) to advise Trade Allies of their status as platinum, gold, silver, or green (A, B, C, or D according to internal ranking by activity and engagement). The summary is sent by mail as a customized letter that

details overall savings and budget status and the contributions of individual Trade Allies to the Program's budget and savings goals.

According to the Program Implementer, the intent is to give Trade Allies visible standing compared to other participating Trade Allies and to encourage greater performance that can lead to a higher ranking. This year, following input from Trade Allies during advisory group meetings, the Program Implementer gave Trade Allies their status based on performance across the nonresidential portfolio and the Multifamily Energy Savings Program.

Customer Outreach Approach and Goals

In addition to the marketing materials available to customers, the Energy Advisors conduct outreach through several approaches. They contact prospective participants directly via email, in-person visits, and telephone calls.

To reach chain stores and franchises customers, Energy Advisors said they regularly call regional or national contacts and attend annual retailer-hosted meetings. They directly call smaller chain or franchise owners who prefer one-on-one contact.

For other commercial or industrial segments, the Energy Advisors said they typically contact business owners as a follow-up to a direct mail or email campaign, perform quarterly or annual outreach to past participants or leads, and attend professional association meetings or conferences to engage and educate business customers. When assessing the potential for an energy efficiency project, one Energy Advisor asks about the business' one-, two-, and five-year building upgrade plans. As Energy Advisors identify projects, whether proactively or reactively, they said they maintain follow-up contact at the level appropriate for the project or timeline. One Energy Advisor said some customers prefer to be contacted during the third or fourth quarter of the year, when projects are typically wrapping up and customers need application assistance.

The Evaluation Team asked Energy Advisors about their project, savings and demand, and outreach goals for the Program. Most reported having project and/or energy savings and demand goals that depend on their assigned geographical location and/or market served, and translated their savings and/or project goals into individual outreach goals.

Annual Results from Ongoing Participant Satisfaction Survey

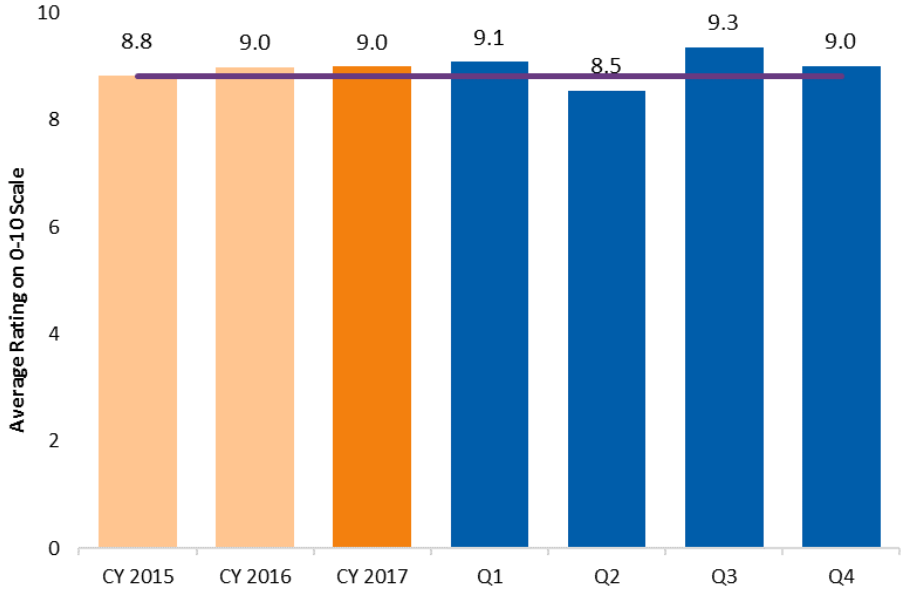
Throughout CY 2017, the Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Business Incentive Program.[147] Respondents answered satisfaction and likelihood

[147] The Evaluation Team found that some surveys did not include identifying information to allow it to match survey responses to program participation dates. Survey responses without participation dates were included in the year-end total but not the quarterly breakdown.

questions on a scale of 0 to 10, where 10 indicates the highest satisfaction or likelihood and 0 the lowest. [148]

Figure 137 shows that average overall Program satisfaction is 9.0 among CY 2017 participants, identical to the average rating in CY 2016. Ratings from both of these years were significantly higher than the portfolio baseline of 8.8.[149] Although the CY 2017 rating was equivalent to CY 2016, ratings were significantly lower than the previous year in Q2 (8.5) and significantly higher in Q3 (9.3).[150]

Figure 137. CY 2017 Overall Business Incentive Program Satisfaction



Source: Business Incentive Program Participant Satisfaction Survey Question: "Overall, how satisfied are you with the Program?" (CY 2015 n=372, CY 2016 n=493, CY 2017 n=442, Q1 n=143, Q2 n=88, Q3 n=92, Q4 n=88). The portfolio baseline (8.8) is indicated by a purple line.

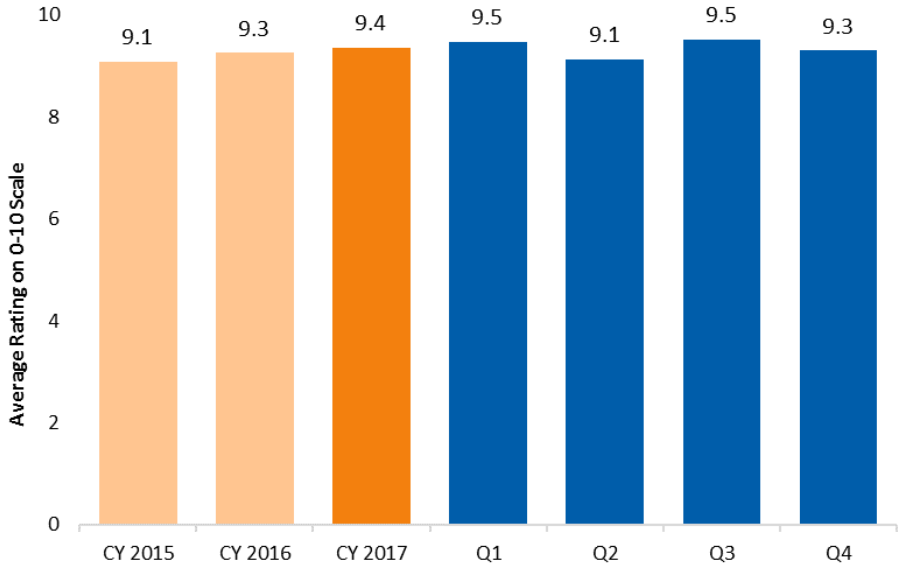
[148] The number of participants who completed a survey does not always match the number of responses for each question, as some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

[149] $p < 0.05$ using binomial t-test. The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[150] $p < 0.10$ for Q2 compared to CY 2016 and $p < 0.05$ for Q3 compared to CY 2016, using binomial t-tests.

As shown in Figure 138, respondents' satisfaction with the upgrades they received through the Program received an average rating of 9.4 in CY 2017, statistically equivalent to the average rating from previous year (9.3). However, ratings during Q1 and Q3 were significantly higher than the CY 2016 Program.[151]

Figure 138. CY 2017 Satisfaction with Business Incentive Program Upgrades

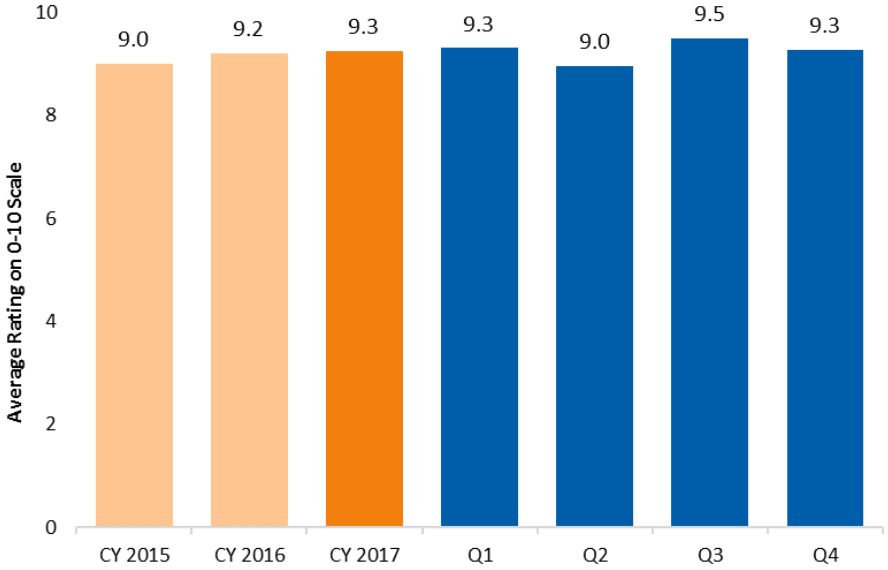


Source: Business Incentive Program Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient upgrades you received?" (CY 2015 n=355, CY 2016 n=484, CY 2017 n=425, Q1 n=135, Q2 n=84, Q3 n=89, Q4 n=87)

[151] $p < 0.05$ using binomial t-tests.

Participants gave the Focus on Energy staff who assisted them an average satisfaction rating of 9.3, statistically equivalent to the average rating of 9.2 in CY 2016 (Figure 139). The Q3 rating (9.5) was significantly higher than the CY 2016 average rating.[152]

Figure 139. CY 2017 Satisfaction with Focus on Energy Staff

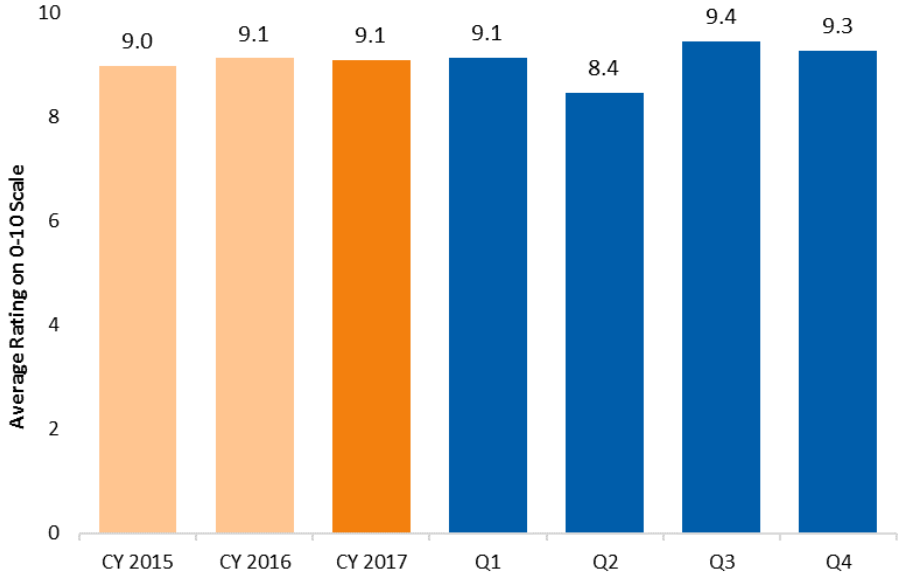


Source: Business Incentive Program Participant Satisfaction Survey Question: "How satisfied are you with the Energy Advisor or Focus on Energy staff who assisted you?" (CY 2015 n=291, CY 2016 n=360, CY 2017 n=311, Q1 n=91, Q2 n=63, Q3 n=64, Q4 n=69)

[152] $p < 0.10$ using binomial t-test.

Respondents gave an average rating of 9.1 for the Trade Ally who provided the services (Figure 140), identical to the average rating during CY 2016. Although the CY 2017 rating was equivalent to CY 2016, ratings were significantly lower than the previous year in Q2 (8.4) and significantly higher in Q3 (9.4).[153] This quarterly pattern closely corresponds to the pattern in overall Program satisfaction (see Figure 137).

Figure 140. CY 2017 Satisfaction with Business Incentive Program Contractors

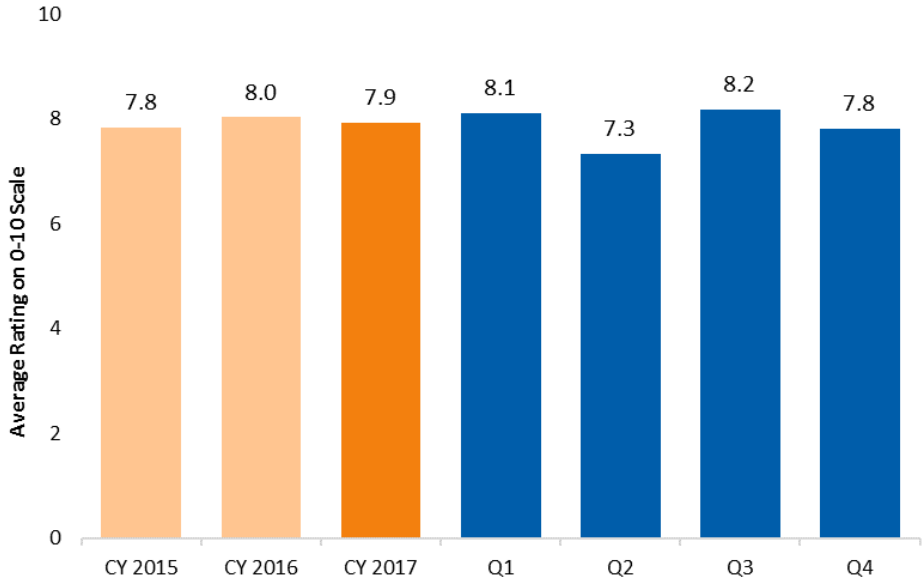


Source: Business Incentive Program Participant Satisfaction Survey Question: "How satisfied are you with the contractor who provided the service?" (CY 2015 n=332, CY 2016 n=445, CY 2017 n=404, Q1 n=124, Q2 n=78, Q3 n=87, Q4 n=86)

[153] $p < 0.05$ using binomial t-tests.

Respondents gave an average rating of 7.9 for their satisfaction with the incentive they received, which is statistically equivalent to ratings from CY 2016 and CY 2015 (Figure 141). Ratings from Q2 respondents (7.3) are the lowest of the year, and Q2 was the only quarter where ratings were significantly lower than CY 2016.[154]

Figure 141. CY 2017 Satisfaction with Business Incentive Program Incentives

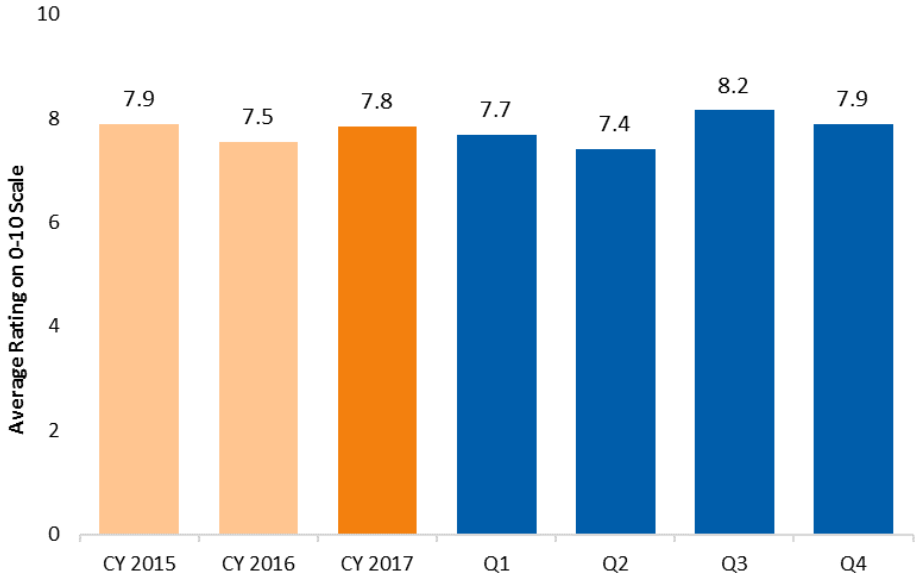


Source: Business Incentive Program Participant Satisfaction Survey Question: "How satisfied are you with the amount of incentive you received?" (CY 2015 n=366, CY 2016 n=489, CY 2017 n=437, Q1 n=141, Q2 n=87, Q3 n=91, Q4 n=87)

[154] $p < 0.05$ using binomial t-test.

As shown in Figure 142, the likelihood that respondents will initiate another energy efficiency project in the next 12 months was on average 7.8. This represented an increase from CY 2016 responses, although the difference between Program years was not statistically significant. The only quarter with significantly different ratings from CY 2016 was Q3 (8.2), when the average rating was significantly higher than the previous year. [155]

Figure 142. CY 2017 Likelihood of Initiating Energy Efficiency Improvement



Source: Business Incentive Program Participant Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (CY 2015 n=340, CY 2016 n=437, CY 2017 n=381, Q1 n=114, Q2 n=70, Q3 n=86, Q4 n=83)

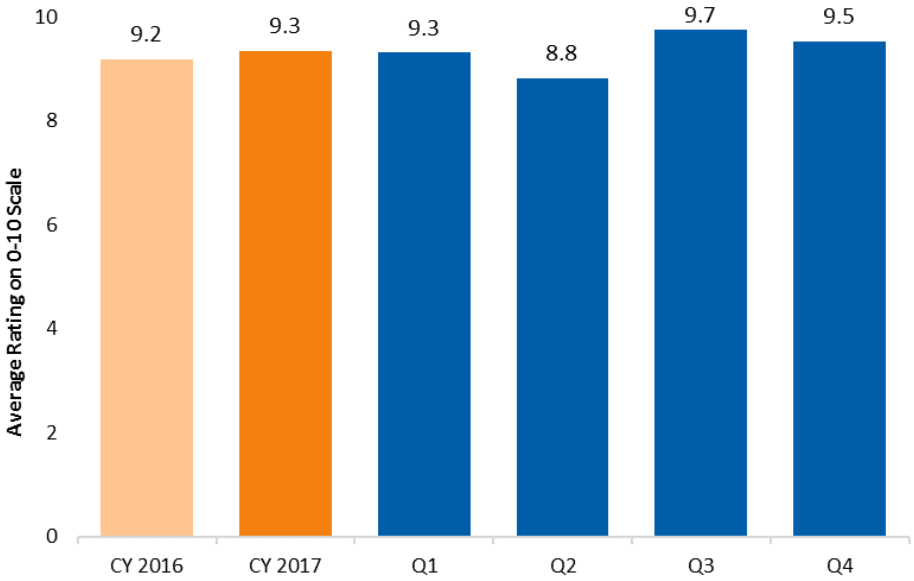
Figure 143 shows that the likelihood that respondents would recommend this Program to other businesses is 9.3 in CY 2017, statistically equivalent to CY 2016 (9.2).[156] However, ratings from Q3 (9.7) and Q4 (9.5) were statistically higher than average CY 2016 ratings,[157] indicating improvement in the second half of 2017. Using these survey data, the Evaluation Team calculated a net promoter score (NPS) based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and detractors (respondents giving a rating of 0 to 6). The Business Incentive Program's NPS is +79 for CY 2017, representing a slight increase from +74 in CY 2016.

[155] $p < 0.10$ using binomial t-test.

[156] Customers who said they already have recommended the Program were counted in mean ratings as a rating of 10 (most likely).

[157] $p < 0.05$ using binomial t-tests.

Figure 143. CY 2017 Likelihood of Recommending the Program



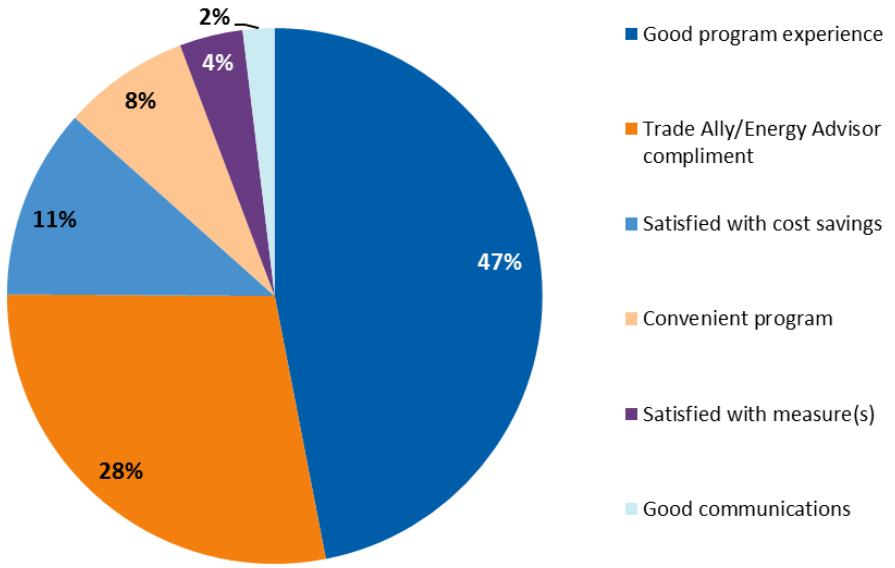
Source: Business Incentive Program Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to others?" (CY 2016 n=494, CY 2017 n=436, Q1 n=139, Q2 n=86, Q3 n=91, Q4 n=89)

During the customer satisfaction surveys, the Evaluation Team asked participants if they had any comments or suggestions for improving the Program. Of the 449 participants who responded to the survey, 135 (30%) provided open-ended feedback, which the Evaluation Team coded into a total of 183 mentions. Of these mentions, 106 were complimentary comments (58%) and 77 were suggestions for improvement (42%). However, during Q2 there were more suggestions for improvement (54% of comments; n=48) than positive comments, which corresponded to lower satisfaction ratings during that quarter.

Respondents' positive comments are shown in Figure 144. Most of these comments reflected a positive Program experience (47%) or were complimentary of Trade Allies and Energy Advisors (28%), which were also the two most common responses in CY 2016. The only significant difference from CY 2016 was relatively fewer positive comments about Trade Allies and Energy Advisors (38% in CY 2016; n=116).[158]

[158] $p < 0.10$ using binomial t-test.

Figure 144. CY 2017 Positive Comments about the Program



Source: Business Incentive Program Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions: n=106)

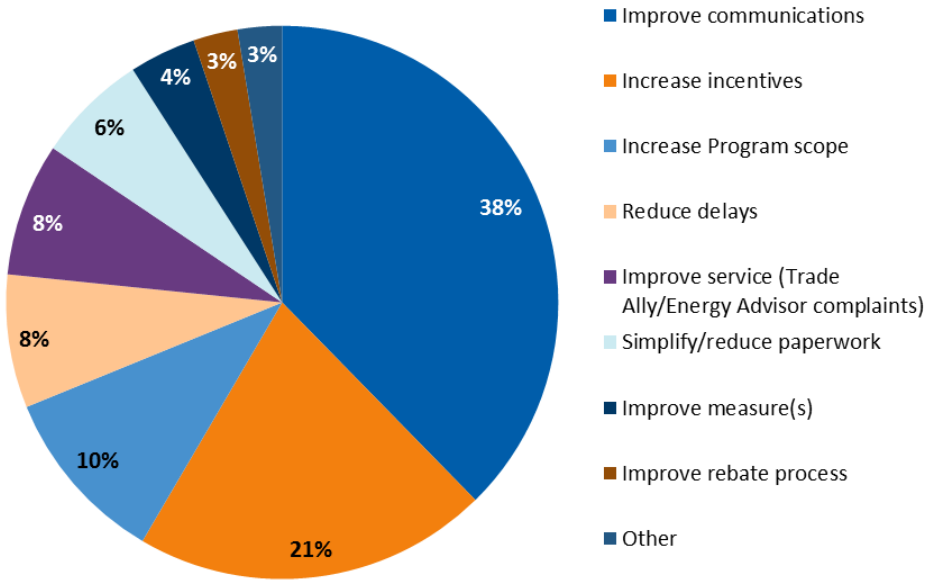
The most frequent suggestions were to improve communications about the Program (38% of mentions) and to increase incentives (21%), which were also the most frequent suggestions for improvement from CY 2016 participants. Suggestions to increase incentives made up the same percentage of suggestions in CY 2016 (21%; n=78), but there was a significant increase in suggestions to improve communications (up from 21% in CY 2016).[159] Several CY 2017 suggestions relating to Program communications mentioned a lack of sufficient explanation when incentive amounts decreased or equipment covered by the Program changed. Another suggestion was that Energy Advisors and Trade Allies could provide better documentation of incentives by project. Respondents also requested that Energy Advisors and Trade Allies make more timely responses to inquiries, contact customers more frequently, and generally increase promotion and outreach for the Program.

Another 25% of suggestions dealt with key processes for delivering the Program: improving customer service (8%), reducing delays (8%), simplifying paperwork (6%), and improving rebate processing (3%). Many of the suggestions about improving service also related to applications, in that several participants said their Trade Ally or Energy Advisor had not delivered on a perceived promise to smoothly handle the application process on behalf of the customer. Other service suggestions mentioned by respondents included having difficulty reaching Focus on Energy staff to answer questions and clarify requests.

[159] $p < 0.05$ using binomial t-test.

Suggestions for improvement are shown in Figure 145.

Figure 145. CY 2017 Suggestions for Improving the Business Incentive Program



Source: Business Incentive Program Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: n=77)

Communications Provider Initiative

The Communications Provider Initiative is designed to drive infrastructure updates for telephone, cable, broadband, and internet service providers in Wisconsin. Outreach activities primarily target providers that are associated with the Wisconsin State Telecommunications Association (WSTA) and The Internet and Television Association (NCTA).

Initiative Offerings

The Initiative seeks to make connections with internet service providers (ISPs) to identify projects that fit the general description of updating infrastructure and improving system efficiency. The Initiative offers a wide range of measures including soft switch server upgrades, power system/uninterrupted power supply improvements, HVAC optimization, lighting, and infrastructure improvements for the various communications sites within Wisconsin. The resulting opportunities are mostly facilitated through a custom application process on a project-by-project basis and vary in terms of size and scope depending on the service area supported by the ISP.

The Initiative offers the following enhanced incentives for energy savings from its custom projects:

- $0.09 per kWh and $200 per kW for small and medium telecoms
- $0.06 per kWh and $150 per kW for large cable and ISP providers
- These incentives will cover approximately 15% to 20% of most project costs

Initiative Accomplishments

During CY 2017, the Initiative Implementer invested time in making connections with trade associations and various other market actors to raise awareness about the Initiative and develop a pipeline of potential participants for CY 2018. In CY 2017, the Initiative Implementer engaged all WSTA member companies (typically small and mid-size cable and ISP providers). The Implementer also engaged a steering committee of NCTA (The Internet & Television Association), whose charter is to identify and engage energy efficiency best practices and opportunities across the industry for large cable and ISP providers.

The Initiative processed five applications in CY 2017 with savings of 131,072 kWh as shown in Table 231. The Implementer also preapproved four projects with WSTA customers and has identified six NCTA and 10 WSTA opportunities for CY 2018 by the end of Q4. The Initiative has processed incentives worth $15,313 in CY 2017 (0.61% of the incentive budget).

Table 231. CY 2017 Communications Provider Initiative Annual and Lifecycle Gross Savings Summary

Measure	*Ex Ante* Gross Annual			*Ex Ante* Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
Projects (Five Total)	131,072	13	1,859	2,459,770	13	37,155
Target	n/a	n/a	n/a	420,975,000	4,678	0
% Progress	n/a	n/a	n/a	0.58%	0.28%	n/a

Although the savings results and incentive dollars spent for CY 2017 did not meet the goals established for the initiative to date, the Implementer has successfully identified and quantified several significantly larger infrastructure investment projects with large ISPs from the NCTA and regional ISPs that are members of the WSTA. These larger infrastructure projects are anticipated to bring in significant energy savings for CY 2018. As of Q1 of CY 2018, the Initiative is reportedly on track to achieve as much as 80% of its two-year program goal while spending 95% of its incentive budget by the end of CY 2018.

Future Evaluation Plan

Given the relatively small level of Initiative savings, the Evaluation Team did not perform savings verifications or cost-effectiveness calculations for CY 2017. The Team is working with PSC staff and the Program Administrator to develop a formal evaluation plan for CY 2018.

At present, it is anticipated that the Initiative will be evaluated through a combination of on-site visits and on-site interviews. The Evaluation Team will target up to 30 baseline facilities for on-site visits in CY 2018. The Team will also interview facility managers to help inform NTG values for the Initiative, aiming to visit a representative sample of small- and mid-size cable and ISPs and large ISP participants and baseline facilities.

At this point, a process evaluation is not currently planned.

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 232 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Business Incentive Program.

Table 232. Business Incentive Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$9,453,441	$5,820,692	$6,943,989

The Evaluation Team found the CY 2017 Program was cost-effective (3.81). Table 233 lists the evaluated costs and benefits.

Table 233. Business Incentive Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$1,211,595	$943,943	$941,845
Delivery Costs	$4,947,445	$3,854,513	$3,845,947
Incremental Measure Costs	$25,917,820	$20,001,455	$25,188,784
Total Non-Incentive Costs	**$32,076,860**	**$24,799,911**	**$29,976,576**
Benefits			
Electric Benefits	$97,087,875	$39,469,899	$57,009,772
Gas Benefits	$8,173,944	$8,431,618	$37,219,059
Emissions Benefits	$17,102,397	$7,855,712	$14,059,978
Total TRC Benefits	**$122,364,216**	**$55,757,229**	**$108,288,809**
Net TRC Benefits	**$90,287,356**	**$30,957,319**	**$78,312,233**
TRC B/C Ratio	**3.81**	**2.25**	**3.61**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Program.

Outcome 1. Program design and Program Implementer organizational changes from CY 2016 to CY 2017 produced mixed Program participation, savings, and demand achievements.

Focus on Energy resumed its emphasis on customer outreach and marketing, and the Program Implementer created teams that concentrate on customer segments or Trade Ally outreach. Participant satisfaction remained strong, and the Program successfully met a higher electric savings goal and maintained demand savings achievements similar to CY 2016, while meeting the majority of its KPIs. However, it did not increase the number of participants served from CY 2016 to CY 2017, and therm savings achievements decreased from CY 2016 to CY 2017.

Recommendation 1. Program design and delivery changes can take time to influence participation. Continue expanding customer marketing efforts that encourage therm-saving projects and to monitor the immediate results of marketing campaigns (click-through rates, web page visits, etc.).

Outcome 2. The Program Implementer incorporated the Chain Stores and Franchises Program into the Business Incentive Program with minimal impact to customer and Trade Ally outreach and participation.

Although the Program Implementer made changes to its organizational structure during the transition of the Chain Stores and Franchises Program into the Business Incentive Program, Program stakeholders were confident the transition had little impact on chain stores and franchises customers. Focus on Energy generated greater electric energy savings from this customer segment in CY 2017 than in CY 2016, and the Program Implementer met its goal of reaching at least 200 chain stores and franchises customers in CY 2017. Although one Energy Advisor had concerns about the reduction in the incentive cap for chain stores and franchises customers as part of the transition, this did not appear to impact participation or savings in CY 2017, as the Program Administrator continues to works closely with large customers to evaluate projects and whether exceptions to the cap are warranted.

Recommendation 2. Continue to monitor participation of the largest chain store customers to ensure needs are met under the new program structure.

Outcome 3. Measures which were not supported by current approved workpapers resulted in deviation of evaluated savings from expected (*ex ante*) values.

The Wisconsin TRM is made up of workpapers that have been reviewed and accepted by stakeholders. A number of accepted workpapers are not included in the TRM but are still used to support SPECTRUM savings. Some measures in SPECTRUM, such as MMID #3491 (Furnace with ECM, 95% AFUE, NG), are not supported by the current TRM or current accepted workpapers but rather are based on old, outdated workpapers or other substandard documentation. These active measures with insufficient documentation are a major source of deviation from expected savings, because the Evaluation Team must rely upon other algorithms, input parameters, and sources.

Recommendation 3. Increase the rigor of the measure management process to mitigate the effects of old or insufficient documentation on current Program savings. Consider employing sunset dates on measures to restrict how long a measure savings can persist in the SPECTRUM database. Also consider creating an opt-in process where only those measures with current, approved methodology are listed for use in the current Program year database.

Agriculture, Schools, and Government Program

Focus on Energy launched the Agriculture, Schools, and Government Program in CY 2015 to better serve agricultural and government customers. CB&I serves as the Program Administrator, and CESA 10 serves as the Program Implementer. Through the Program, Focus on Energy offers prescriptive and custom incentives to customers with average peak monthly demand under 1,000 kW.

The following customer groups are eligible for the Program:

- **Agricultural producers** (producers of grain, livestock, milk, poultry, fruits, vegetables, bees and honey, fish, shellfish as well as greenhouses, grain elevators, and feed mills)
- **Educational entities** (K-12 schools, two-year University of Wisconsin colleges, and private four-year colleges)
- **Government entities** (counties, cities, towns, villages, tribes, and state and federal agencies)
- **Municipal wastewater treatment facilities**

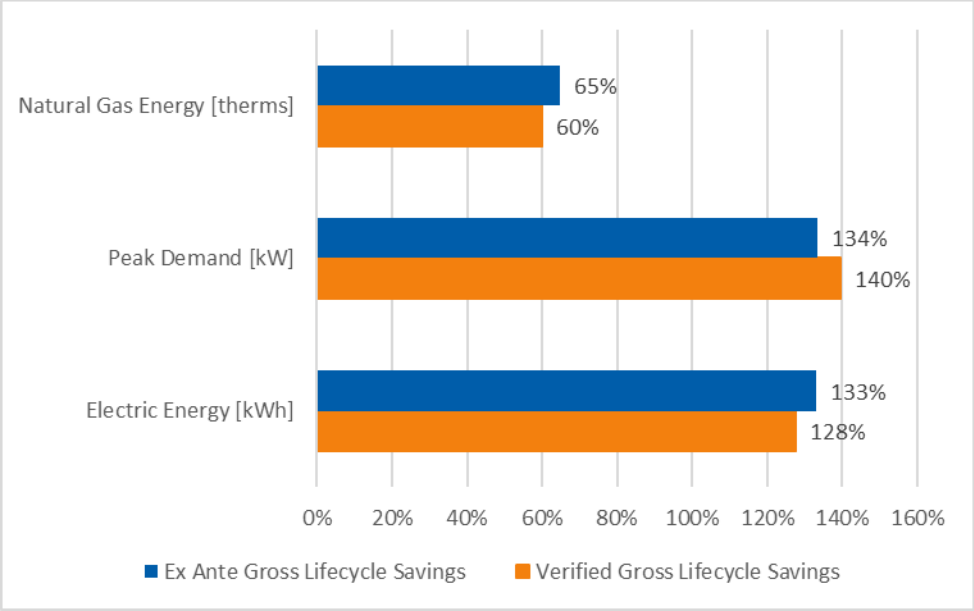
Prior to CY 2015, Focus on Energy served these targeted customer groups through the Business Incentive Program. Currently, these customers can obtain all of Focus on Energy's commercial incentives through the Program as well as through specialized incentives targeting agricultural producers, educational entities, and public buildings. Table 234 lists actual Program spending, savings, participation, and cost-effectiveness in CY 2016 and CY 2017.

Table 234. Agriculture, Schools, and Government Program Summary

Item	Units	CY 2017	CY 2016	CY 2015
Incentive Spending	$	$6,821,381	$6,381,950	$5,656,868
Participation	Number of Participants	1,233	1,172	1,003
Verified Gross Lifecycle Savings	kWh	1,292,589,875	968,975,311	868,239,709
	kW	13,253	9,431	7,983
	therms	28,473,760	51,899,853	74,802,106
Verified Gross Lifecycle Realization Rate	MMBtu	95%	97%	105%
Annual Net-to-Gross Ratio	MMBtu	78%	65%	88%
Net Annual Savings	kWh	66,852,000	43,941,765	56,589,391
	kW	10,295	6,130	7,025
	therms	1,485,720	2,882,971	8,052,023
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	4.18	2.47	3.45

Figure 146 shows the percentage of gross lifecycle savings goals achieved by the Agriculture, Schools, and Government Program in CY 2017. The Program exceeded CY 2017 peak demand (kW) and electric energy savings (kWh) goals. The Program did not achieve CY 2017 gas savings (therms) goals, but contractual energy savings implementation targets were met according to the Program Administrator when carryover savings were applied.

Figure 146. Agriculture, Schools, and Government Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1]



[1]The 100% *ex ante* gross lifecycle savings reflects the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations of the Agriculture, Schools, and Government Program in CY 2017. The Team designed its EM&V approach to integrate multiple perspectives in assessing Program performance. Table 235 lists specific data collection activities and sample sizes used in the evaluations.

Table 235. Agriculture, Schools, and Government Program Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Program Actor Interviews	2
Tracking Database Review	Census
Ongoing Participant Satisfaction Surveys	486
Engineering Desk Review	44
Verification Site Visits	12

Program Actor Interviews

The Evaluation Team interviewed the Program Administrator and the Program Implementer in August 2017 to learn about the Program's current status and to assess its objectives, performance, and implementation challenges and solutions. The interviews covered the following topics:

- Program goals and achievements
- Program delivery changes

- Marketing and outreach strategies and effectiveness
- Barriers to participation
- Data tracking
- Trade Ally management

Tracking Database Review

The Evaluation Team reviewed the census of Agriculture, Schools, and Government Program records in SPECTRUM, the Focus on Energy database. The review involved the following tasks:

- Conduct a thorough review of the data to ensure that the totals in SPECTRUM matched the totals reported by the Program Administrator
- Reassign savings from a number of database adjustment measures to the corresponding program measures
- Check for complete and consistent application of information across data fields (measure names, application of first-year savings, application of EUL, etc.)

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct ongoing participant satisfaction surveys beginning in CY 2015 for the 2015–2018 quadrennial. The goal of these surveys is to provide a quick and easy opportunity for recent Program participants to provide feedback, ensure timely feedback close to their participation experience, enable problem identification at any time of year, and identify energy efficiency opportunities for delivering follow up to interested participants. Additionally, the Program Implementer used data collected during ongoing participant satisfaction surveys to assess performance and to help meet contractual obligations related to satisfaction key performance indicators.

The Program Administrator deploys online surveys through SPECTRUM to all CY 2017 participants with an email address within two weeks of completing participation in the Program. The Evaluation Team gathers online survey results via SPECTRUM and sends, receives, and scans mail survey responses, combining these with the online results for quarterly and annual reporting.

In CY 2017, 486 participants responded to the Agriculture, Schools, and Government Program's ongoing participant satisfaction survey.

Engineering Desk Review

The Evaluation Team reviewed all available project documentation in SPECTRUM for a sample of 44 Program measures. This review included an assessment of the savings calculations and methodology applied by the Program Implementer. The Team relied on the applicable TRMs (2017 TRM and 2017 TRM Update) and other relevant secondary sources as needed. Secondary sources included energy codes and standards, case studies, and energy efficiency program evaluations of comparable measures (based on geography, sector, measure application, and date of issue). For prescriptive measures in Wisconsin, the Focus on Energy TRM and associated workpapers were the primary sources used by the Evaluation Team to determine methodology and data in nearly all cases. For hybrid and custom

measures, the Team reviewed the SPECTRUM savings analysis workbooks and adjusted inputs and methodologies as necessary based on engineering judgment and project documentation. The evaluation sample for these reviews was selected using a weighted, random stratified sampling approach known as PPS (Probability Proportional to Size, where size here refers to lifecycle total energy savings).

Verification Site Visits

The Evaluation Team conducted 12 verification site visits for the CY 2017 Agriculture, Schools, and Government Program. Site visits involved verifying the type and quantity of equipment installed, determining how the installed equipment is controlled, and documenting the operating hours of the installed equipment. The Team verified savings calculation input parameters based on operational and occupancy schedules, claimed and observed setpoints, and any other relevant details identified prior to or upon arrival at the site.

Impact Evaluation

The Evaluation Team used the following approaches to measure the impact of the Agriculture, Schools, and Government Program:

- Tracking database review
- In-service rate determination
- Engineering desk reviews
- Verification site visits

Evaluation of Gross Savings

The Evaluation Team used the CY 2017 tracking data to gather reported installations then applied the results from engineering desk reviews (n=44) and verification site visits (n=12) to determine verified gross savings.

The Team identified several types of measures for which savings calculations did not align with the 2017 TRM, the 2017 TRM Update, or current approved workpapers. In the desk review, the Team found that for two prescriptive boiler measures (MMID #3276 and MMID #3277), used in three separate projects, the input capacity of the boiler system was used instead of the rated capacity as specified in the TRM. The Team adjusted the verified savings from these measures using rated capacity inputs and, consequently, the measure-specific realization rates ranged from 70% to 96%.

Site visits confirmed that program measures were installed and operating as planned, with a few exceptions. The Team identified a steam trap measure (MMID #4009) that was incorrectly applied. This measure ID refers to systems with 10 psi to 49 psi steam delivery, but the project's steam delivery system ranged from 3 psi to 5 psi. The Team adjusted the project's verified savings using the more appropriate measure (MMID #4005, designed for systems with <10 psi), which resulted in a realization rate of 5%.

The Team also made sizable adjustments to one hybrid measure (MMID #3666) and two custom measures (MMID #2386 and MMID #2680), based on observed operating parameters (airflow volume,

operating hours, setback temperatures, etc.), which differed from the proposed design that formed the basis of the *ex ante* calculations. The largest impact of these projects was MMID #2386, a custom HVAC measure, for which the ventilation system was replaced with low airflow displacement ventilation systems. The Team modified the calculations to reflect the higher airflow rate and increased conditioning requirements that would result. This change resulted in a measure-specific realization rate of 79%. This single project constituted 24% of the evaluation savings for the agriculture, schools, and government sector and thus was a driver of overall Program performance.

The tracking database review found that several EUL fields were blank, but these did not affect the lifecycle savings calculated and attributed to these projects.

In-Service Rates

The ISR represents the percentage of measures still installed, in use, and operating as planned following installation by the Program Implementer. In CY 2017, participant surveys were not conducted, so the Evaluation Team derived the ISR from the combined weighted average ISRs of CY 2015 and CY 2016. The Team applied this combined, weighted ISR of 100% to all projects that had an engineering desk review (no site visit) and applied a site-specific ISR to all measures verified during a visit to the facility.

CY 2017 Verified Gross Savings Results

Table 236 lists the annual and lifecycle realization rates for the CY 2017 Program. Overall, the Program achieved a first-year evaluated realization rate of 92%, weighted by total (MMBtu) energy savings. Realization rates are generally the same for a given demand or energy savings type unless influenced by the ISR. Totals given in this report represent a weighted average realization rate for the entire Program.

Table 236. CY 2017 Agriculture, Schools, and Government Program Annual and Lifecycle Realization Rates

Measure	Annual Realization Rate				Lifecycle Realization Rate		
	kWh	kW	therms	MMBtu	kWh	therms	MMBtu
Total	99%	104%	88%	94%	96%	92%	95%

Table 237 lists the *ex ante* and verified annual gross savings for the Program for CY 2017 by measure type. The Program Implementer includes the category of bonus measures in the tracking database for accounting purposes (specifically to capture funds paid out to various participants and Trade Allies); no demand reduction or energy savings are associated with these measures, and they are omitted from the following tables.

Table 237. CY 2017 Agriculture, Schools, and Government Program First-Year Gross Savings Summary

Measure	*Ex Ante* Gross First Year			Verified Gross First Year		
	kWh	kW	therms	kWh	kW	therms
Aeration	544,602	97	0	537,010	101	0
Air Sealing	10,754	0	55,092	10,604	0	48,286
Boiler	0	0	811,650	0	0	711,374
Chiller	3,467,016	1,163	0	3,418,685	1,215	0

Measure	*Ex Ante* Gross First Year			Verified Gross First Year		
	kWh	kW	therms	kWh	kW	therms
Clothes Washer	0	0	823	0	0	721
Compressor	131,856	19	0	130,018	20	0
Controls	5,445,465	343	397,716	5,369,554	358	348,580
Delamping	1,703,506	349	0	1,679,759	364	0
Dishwasher, Commercial	137,417	0	2,531	135,501	0	2,218
Dryer	26,059	0	40,266	25,696	0	35,291
Economizer	3,472	0	0	3,424	0	0
Energy Recovery	220,270	50	108,843	217,199	52	95,396
Fan	2,789,058	587	5,486	2,750,178	614	4,808
Fluorescent, Linear	745,812	141	0	735,415	147	0
Furnace	37,733	0	16,443	37,207	0	14,411
Greenhouse	0	0	45,781	0	0	40,125
Heat Exchanger	1,080,056	0	0	1,065,000	0	0
High Intensity Discharge (HID)	7,672	1	0	7,565	1	0
Hot Holding Cabinet	9,351	2	0	9,221	2	0
Infrared Heater	0	0	13,175	0	0	11,547
Insulation	6,301	1	15,756	6,213	1	13,809
Light Emitting Diode (LED)	39,490,753	6,006	0	38,940,247	6,275	0
Livestock Waterer	576,536	0	0	568,499	0	0
Motor	94,566	15	0	93,248	16	0
Other	8,094,926	1,379	126,550	7,982,082	1,440	110,915
Oven	14,581	3	3,375	14,378	4	2,958
Pre-Rinse Sprayer	0	0	26	0	0	23
Refrigerator/Freezer - Commercial	39,376	4	0	38,827	5	0
Rooftop Unit/Split System AC	118,905	148	23,203	117,247	155	20,336
Scheduling	7,746	2	636	7,638	2	557
Steam Trap	0	0	316,514	0	0	277,410
Steamer	42,832	8	0	42,235	8	0
Supporting Equipment	36,741	2	0	36,229	2	0
Tune-up/Repair/Commissioning	780,735	37	179,188	769,851	39	157,050
Unit Heater	0	0	1,197	0	0	1,049
Variable Speed Drive	21,434,467	2,301	0	21,135,668	2,404	0
Water Heater	20,476	0	15,374	20,191	0	13,475
Ice Machine	2,302	0	0	2,270	0	0
Window	0	0	2,541	0	0	2,227
Pump	51,547	3	0	50,828	3	0
Irrigation	102,325	24	0	100,899	25	0
Total First Year	**87,275,215**	**12,685**	**2,182,165**	**86,058,588**	**13,253**	**1,912,567**

Table 238 lists *ex ante* and verified gross lifecycle savings by measure type for the Program in CY 2017.

Table 238. CY 2017 Agriculture, Schools, and Government Program Lifecycle Gross Savings Summary

Measure	*Ex Ante Gross Lifecycle*			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
Aeration	8,985,775	97	0	8,620,767	101	0
Air Sealing	215,080	0	1,101,840	206,343	0	1,019,058
Boiler	0	0	16,211,910	0	0	14,993,891
Chiller	69,340,320	1,163	0	66,523,670	1,215	0
Clothes Washer	0	0	12,354	0	0	11,426
Compressor	1,977,795	19	0	1,897,456	20	0
Controls	65,002,301	343	5,609,854	62,361,864	358	5,188,379
Delamping	17,035,060	349	0	16,343,085	364	0
Dishwasher, Commercial	1,374,170	0	25,310	1,318,350	0	23,408
Dryer	390,874	0	604,004	374,996	0	558,625
Economizer	34,720	0	0	33,310	0	0
Energy Recovery	3,304,004	50	1,023,454	3,169,793	52	946,561
Fan	42,649,410	587	82,290	40,916,963	614	76,107
Fluorescent, Linear	10,786,960	141	0	10,348,786	147	0
Furnace	679,038	0	295,891	651,455	0	273,661
Greenhouse	0	0	253,304	0	0	234,273
Heat Exchanger	16,200,840	0	0	15,542,751	0	0
High Intensity Discharge (HID)	30,660	1	0	29,415	1	0
Hot Holding Cabinet	112,212	2	0	107,654	2	0
Infrared Heater	0	0	197,625	0	0	182,777
Insulation	157,525	1	379,631	151,126	1	351,109
Light Emitting Diode (LED)	660,359,750	6,006	0	633,535,496	6,275	0
Livestock Waterer	5,765,360	0	0	5,531,167	0	0
Motor	1,648,423	15	0	1,581,463	16	0
Other	108,907,223	1,379	1,577,350	104,483,339	1,440	1,458,842
Oven	174,986	3	40,500	167,878	4	37,457
Pre-Rinse Sprayer	0	0	130	0	0	120
Refrigerator/Freezer - Commercial	472,512	4	0	453,318	5	0
Rooftop Unit/Split System AC	1,783,575	148	348,045	1,711,125	155	321,896
Scheduling	116,190	2	9,540	111,470	2	8,823
Steam Trap	0	0	1,898,850	0	0	1,756,187
Steamer	471,152	8	0	452,013	8	0
Supporting Equipment	551,115	2	0	528,728	2	0
Tune-up/Repair/Commissioning	4,517,786	37	837,120	4,334,271	39	774,226
Unit Heater	0	0	17,953	0	0	16,604
Variable Speed Drive	321,517,192	2,301	0	308,456,949	2,404	0
Water Heater	307,401	0	209,031	294,914	0	193,326

Measure	*Ex Ante Gross Lifecycle*			Verified Gross Lifecycle		
	kWh	kW	therms	kWh	kW	therms
Ice Machine	23,020	0	0	22,085	0	0
Window	0	0	50,820	0	0	47,002
Pump	891,555	3	0	855,339	3	0
Irrigation	1,534,883	24	0	1,472,535	25	0
Total Lifecycle	**1,347,318,866**	**12,685**	**30,786,807**	**1,292,589,875**	**13,253**	**28,473,760**

CY 2017 Verified Net Savings Results

The Evaluation Team did not perform participant surveys in CY 2017, and therefore did not calculate new freeridership or spillover estimates. The overall Program NTG for CY 2017 was determined using the CY 2015 and CY 2016 net savings data (sum of net savings from CY 2015 and CY 2016, divided by the sum of the gross savings from CY 2015 and CY 2016), which was based on participant surveys. This yielded an overall NTG estimate of 78% for the Program in CY 2017. Table 239 shows total annual gross and net savings in MMBtu as well as the overall Program NTG.

Table 239. CY 2017 Agriculture, Schools, and Government Program Annual Net Savings and NTG

Total First Year Gross Verified Savings	Total First Year Net Savings	Program First Year NTG Ratio
484,889	376,671	78%

Table 240 shows the annual net demand and energy impacts (kWh, kW, and therms) by measure category for the Program. The Evaluation Team attributed these savings as net of what would have occurred naturally without the presence of the Program.

Table 240. CY 2017 Agriculture, Schools, and Government Program Annual Net Savings

Measure	First Year Net		
	kWh	kW	therms
Aeration	417,160	78	0
Air Sealing	8,237	0	37,509
Boiler	0	0	552,609
Chiller	2,655,702	944	0
Clothes Washer	0	0	560
Compressor	101,000	15	0
Controls	4,171,175	278	270,784
Delamping	1,304,870	283	0
Dishwasher, Commercial	105,260	0	1,723
Dryer	19,961	0	27,415
Economizer	2,660	0	0
Energy Recovery	168,725	41	74,105
Fan	2,136,392	477	3,735
Fluorescent, Linear	571,285	114	0
Furnace	28,903	0	11,195
Greenhouse	0	0	31,170
Heat Exchanger	827,313	0	0
High Intensity Discharge (HID)	5,877	1	0
Hot Holding Cabinet	7,163	1	0
Infrared Heater	0	0	8,970
Insulation	4,827	1	10,727
Light Emitting Diode (LED)	30,249,548	4,875	0
Livestock Waterer	441,621	0	0
Motor	72,437	13	0
Other	6,200,638	1,119	86,161
Oven	11,169	3	2,298
Pre-Rinse Sprayer	0	0	18
Refrigerator/Freezer - Commercial	30,162	4	0
Rooftop Unit/Split System AC	91,080	120	15,798
Scheduling	5,933	2	433
Steam Trap	0	0	215,497
Steamer	32,809	6	0
Supporting Equipment	28,143	1	0
Tune-up/Repair/Commissioning	598,035	30	121,999
Unit Heater	0	0	815
Variable Speed Drive	16,418,602	1,868	0
Water Heater	15,684	0	10,467
Ice Machine	1,763	0	0
Window	0	0	1,730
Pump	39,485	2	0
Irrigation	78,380	20	0
Total First Year	**66,852,000**	**10,295**	**1,485,720**

Table 241 lists the lifecycle net demand and energy impacts (kWh, kW, and therms) by measure category for the Program.

Table 241. CY 2017 Agriculture, Schools, and Government Program Lifecycle Net Savings

Measure	Lifecycle Net		
	kWh	kW	therms
Aeration	6,696,781	78	0
Air Sealing	160,292	0	791,624
Boiler	0	0	11,647,549
Chiller	51,676,893	944	0
Clothes Washer	0	0	8,876
Compressor	1,473,981	15	0
Controls	48,443,920	278	4,030,435
Delamping	12,695,629	283	0
Dishwasher, Commercial	1,024,120	0	18,184
Dryer	291,305	0	433,950
Economizer	25,876	0	0
Energy Recovery	2,462,358	41	735,307
Fan	31,785,100	477	59,122
Fluorescent, Linear	8,039,140	114	0
Furnace	506,063	0	212,585
Greenhouse	0	0	181,988
Heat Exchanger	12,073,914	0	0
High Intensity Discharge (HID)	22,850	1	0
Hot Holding Cabinet	83,628	1	0
Infrared Heater	0	0	141,985
Insulation	117,398	1	272,749
Light Emitting Diode (LED)	492,142,809	4,875	0
Livestock Waterer	4,296,719	0	0
Motor	1,228,511	13	0
Other	81,164,709	1,119	1,133,257
Oven	130,411	3	29,097
Pre-Rinse Sprayer	0	0	94
Refrigerator/Freezer - Commercial	352,147	4	0
Rooftop Unit/Split System AC	1,329,235	120	250,055
Scheduling	86,592	2	6,854
Steam Trap	0	0	1,364,241
Steamer	351,133	6	0
Supporting Equipment	410,727	1	0
Tune-up/Repair/Commissioning	3,366,947	30	601,434
Unit Heater	0	0	12,899
Variable Speed Drive	239,615,413	1,868	0
Water Heater	229,095	0	150,180
Ice Machine	17,156	0	0
Window	0	0	36,512
Pump	664,444	2	0
Irrigation	1,143,894	20	0
Total Lifecycle	**1,004,109,187**	**10,295**	**22,118,975**

Process Evaluation

In CY 2017, the Evaluation Team conducted interviews as part of the process evaluation activities, focusing on the following Program key topics:

- Program changes from CY 2016 to CY 2017
- Special offerings and bonuses offered in CY 2017
- Factors influencing progress toward goals for CY 2017
- Things that worked well in CY 2017

Program Design, Delivery, and Goals

The Program focuses on direct and personal communication between dedicated Energy Advisors (Program Implementer staff) and customers. Program delivery centers on customers rather than Trade Allies, with each Energy Advisor assigned to a territory located within 150 miles of his or her customers. This ensures that customers have access to a local Focus on Energy representative who is familiar with their specific needs. Customers may be assigned to other Energy Advisors, depending on the project type, the customer's participation level, the Energy Advisors' experience in specific industries and past project experience, or the customer-Energy Advisor relationship. Although the Program's design emphasizes customer outreach and engagement through Energy Advisors, participants also can be recruited through a utility contact, a Trade Ally, or direct customer contact.

Program Management and Delivery Structure

In CY 2017, a new program lead was hired by the Program Administrator to oversee the Agriculture, Schools, and Government Program, the Business Incentive Program, the Small Business Program, and some small initiatives, such as the rural small business offering. The new role is designed to act more strategically than prior staff roles and will work directly with the Program Implementer to refine, troubleshoot, and improve the Programs.

Since the Program's launch in CY 2015, CESA 10 has served as the Program Implementer, taking responsibility for conducting customer outreach, providing Energy Advisors, training Trade Allies, and ensuring applications are submitted with complete and correct information. For CY 2017, the Program draws upon a budget of $9,982,711. Both the Program Administrator and the Program Implementer said they could achieve greater energy savings with a higher budget for incentives (specifically, HVAC incentives). The Program Implementer said the 12 current Energy Advisors help customers with all Program aspects—such as identifying projects and helping with paperwork—and could reach more customers if additional staff were hired to help with paperwork.

The Program uses a customer-driven process when applying for and receiving incentives. Energy Advisors help customers start a project by identifying opportunities, then each customer contacts a Trade Ally. For custom projects, the Trade Ally completes a custom application with the customer, using project information, and provides the savings and incentive calculations to the Energy Advisor. The Energy Advisor submits the project workbook to an Intake Team Member (ITM) of the Program Implementer's staff, who enters project data into SPECTRUM. The Intake Team Member uses a checklist

to ensure the application is complete and accurate before sending the document to the Technical Review Team. If the application misses data or contains errors, the Intake Team Member attempts to procure the information from previous SPECTRUM customer records. If this cannot be completed, the Intake Team Member logs the error and sends the application back to the customer or Trade Ally (depending on which filled it out).

Program Changes

From CY 2016 to CY 2017, the Program made four changes in program design and delivery, with sections of this chapter discussing each of these:

- Offering special offerings and bonus incentives
- Changing the "delivering energy efficiency together" (DEET) initiative
- Including streetlights for municipal customers
- Changing seven agriculture measures from hybrid to prescriptive measures

Special Offerings and Bonus Incentives

To drive participation, the Program offered seven special offerings, initiatives, and bonuses in CY 2017:

- **Agriculture Multiple Equipment Bonus** provides additional funds to agricultural customers who install more than one type of measure, with bonuses structured as follows:
  - $400 for installing two measure types
  - $500 for installing three measure types
  - $600 for installing four+ measure types
  - Capped at 50% of the normal incentive if costs are less than $800 for two measures; $1,000 for three measures; or $1,200 for four measures.

  This bonus seeks to persuade existing customers to undertake more projects for one application (e.g., lamps and fans together). The Program Implementer reported that the bonus was not as successful as initially hoped. Notably, it encountered a challenge through Trade Allies who typically offer or specialize in only one technology type, so taking advantage of the bundled offering often meant customers had to find more than one Trade Ally.
- **Comprehensive Lighting Initiative** offers a $0.10/kWh incentive to preapproved projects completing LED and lighting control updates in areas greater than 50,000 square feet or with 75% or more of the participants' building square footage. The initiative sought to achieve deeper energy reductions from installing controls during a lighting upgrade (rather than only upgrading the lamp types).
- **TLED 50 Lamp Trial** special offering gave schools an opportunity to purchase 50 discounted TLEDs for $2 each before upgrading the entire facility. This trial uses sign-up periods that take place throughout the year, coordinated with typical school break times. This special offering sought to reach new customers and familiarize them with Focus on Energy by offering a "try before you buy" experience. The Program Administrator said this Program exceeded participation goals in CY 2017 and achieved its objective of bringing in new customers who had

not yet participated in a Focus on Energy program (according to the Program Implementer, of the 262 customers, 98 had not yet participated in a program prior to this offering). The trial also provided learning opportunities to improve marketing techniques in the future.

- **Future Farmers of America (FFA) to Farm Fundraiser with Engine Block Heater Timers** is a partnership with Focus on Energy to raise awareness for the Program. For this ongoing FFA fundraiser, the Program buys engine block heater timers and ships them to participating FFA chapters at no cost. The FFA students sell them to people in their districts for around $20. The farmer pays the FFA, and Focus sends the farmers the timers. FFA Chapters keep 100% of the funds raised from this Program partnership.

  In cold climates, engine block heaters warm engines prior to start up. Doing so provides the following benefits: easier engine starting, reduced engine wear, improved air quality by reducing carbon monoxide emissions (by an average of 60%), and fast payback in as little as one to three months. For convenience, many block heater users leave the units plugged in all night (10+ hours) or—worse—all the time. To automate the on/off heating cycle, a programmable timer turns on the block heater at the appropriate time, leaving it on only as long as needed.

  Figure 147. FFA to Farm Fundraiser Flyer

- **Wastewater Bridge Initiative** targets wastewater customers participating in the "Wastewater Infrastructure Accelerator Initiative" offered through the U.S. Department of Energy, in which the state of Wisconsin is a partner. As part of this partnership, Focus on Energy offers a special incentive for customers signing up for the infrastructure accelerator (which, outside of the Focus on Energy Program, provides wastewater ideas rather than incentives). Focus on Energy reviews a participant's utility bills every six months, compares these to the prior year's energy use during the same time frame, then offers incentives for kWh and kW reductions for implementing no- and low-cost energy conservation measures.
- **Water/Wastewater Bonus:** The Bonus offers a 20% additional incentive for prescriptive measures and a 10% additional incentive for custom measures submitted for preapproval during CY 2017.

- **DEET**, which stands for "Delivering Energy Efficiency Together," is an initiative that seeks to engage schools in the Program by offering behavioral savings opportunities. This program's delivery strategy underwent major changes in CY 2017, details are discussed in the following section.

Restructuring DEET

Focus's Delivering Energy Efficiency Together (DEET) initiative is a behavioral offering that targets schools. Since its launch in 2015, DEET has lacked consistent customer engagement and has had lower than expected savings, realizing only 17% of the kWh goal in its first 18 months. The offering has had a high level of interest from schools; nevertheless, the requirement to commit to three years of engagement has proven to be a barrier to enrollment, and the schools that have enrolled in DEET have struggled to generate significant savings after the first year of engagement.

In CY 2017, the PSC approved a proposal for restructuring this initiative. Changes to DEET are intended to increase customer support, reduce barriers to participation, simplify participation, and more directly reward participant, described in more detail as follows:

- **Increase customer support.** The prior offering relied on School Champions to promote behaviors that generate energy savings over the course of three years, with some initial Focus support but very limited Focus engagement for the remainder of the three years. Under the restructured initiative, Focus provides three performance reports and in-person visits annually; offers stickers, magnets, and other visual reminders to help promote energy-efficient behaviors in the school; and provides a best practices guide.
- **Reward behavior.** The prior model provided incentive dollars to schools for reducing energy consumption; however, those funds were not necessarily earmarked to directly benefit the individuals responsible for the energy savings. The restructured offering adds a points/rewards system that benefits building inhabitants. The points are awarded for energy saving and can be redeemed for a variety of educational energy efficiency prizes, a value of up to $500 per year. Prizes include energy-efficient products such as LED light bulbs and smart power strips, money toward class field trips, and others. Possible prizes are advertised in a list from which schools can choose what they want.
- **Simplify participation.** The prior offering had nine different incentive rates, an incentive holdback structure, and a three-year enrollment requirement. The new DEET model includes two incentive rates, does not have a holdback structure, and requires a one-year commitment that is renewable.
- **Improve cost-effectiveness.** The prior offering averaged over $8.36 per MMBtu, far exceeding the estimated $4.62 per MMBtu. The new DEET initiative removes kW incentives, reduces the kWh incentive rate, updates the baseline annually to avoid paying for the same savings for multiple years, pays incentives once per year, and introduces a probation period for underperformance to help close this gap.

See Table 242 for descriptions of each change to the DEET Initiative and the logic underlying the decision.

Table 242. Changes to DEET Initiative

Previous	New DEET Structure	Logic
3-year commitment	1-year commitment, renewable for up to 4 years total	3-year commitment is a barrier for some schools
Continuous enrollment	3 enrollment periods annually (1/15, 5/15 and 9/15)	Streamline admin effort required to order prizes and obtain utility data; align with new elevated EA engagement timing
Incentives for therms, kWh and kW	Incentives for therms and kWh only	Most significant kW usage changes are due to building usage changes, not EE efforts
20% of incentives held until end of year 3	No incentive holdback	No longer relevant in annual model
Incentive structure changes each year, ranging from $0.04-0.06/kWh and $0.40-$0.60/therm	Simplified incentive structure	Flat incentive of $0.04/kWh and $0.60/therm
Baseline to calculate savings is usage in year prior to three-year commitment	Baseline to calculate savings is prior year's usage	Ensure that incentives are paid only for 'new' usage reduction; current approach overpays when usage fluctuates up and down
No probation period	Two consecutive periods of non-savings result in no incentives that year; provide reports and some EA support if the customer plans to reengage with DEET after 12 months of re-baselining	Avoid paying incentives for low performance, reduce cost of supporting customers who do not engage
Incentives paid twice a year	Incentives paid annually	Avoid paying incentives for savings that do not persist
Light initial engagement and outreach is limited to data collection and delivery of two reports per year thereafter	Heavy initial engagement, facility audit, three annual reports and EA visits to document activities and re-engage building champion and staff	Increase long term customer engagement
No points or prizes	Points earned to be redeemed for prizes that directly and visibly reward those generating savings	Increase customer engagement by rewarding those directly responsible for energy savings
Require one year off to create a new baseline with installation of capital equipment over $5k	Require one year to create a new baseline after two consecutive periods of underperformance, installation of over $5k of capital equipment, or significant change in usage of space (i.e. no more summer school)	Encourage reengagement with DEET
No participation reminders	Distribute stickers, post its and magnets to provide regular good energy habit reminders to participants	Visible daily reminders for customers to increase savings

Annual energy savings forecasts are based on historical energy savings data and estimated enrollment of 12 buildings (Table 243).

Table 243. Electric and Gas Savings Forecasts for DEET

Annual Electric Savings	Annual Natural Gas Savings
384,259 kWh	14,400 Therms

The program did not request changes to the 2017 budget as a result of the changes to the DEET initiative. However, assuming that 12 schools engage annually, the expectation is that prizes will add $6,000 and additional outreach materials will add $1,500 to annual costs. Table 244 shows the annual incentive budgets and dollar per lifecycle ($/LC) MMBtu.

Table 244. Annual Incentive Budget for DEET Initiative

Electric		Natural Gas		Total	
Incentive	$/LC MMBtu	Incentive	$/LC MMBtu	Total Incentive	$/LC MMBtu
$15,370	$2.93	$8,640	$1.50	$27,010	$2.45

To minimize disruption to customers, schools enrolled in the current version of DEET will be allowed to either make the transition to the new model or complete their three-year commitment under the current model. If a school opts to continue with the current model, it will not be eligible to receive points and prizes; however, it will receive greater Energy Advisor support, as provided in the proposed model.

As of September 2017, half of the enrolled schools had chosen to switch to the new model. A school might choose to grandfather in its participation if it has a difficult and lengthy internal approval process. More engaged schools are expected to choose to grandfather their participation because they can get a higher incentive using their pre-participation baseline rather than the yearly baseline.

Streetlights for Municipal Customers

The PSC approved the Agriculture, Schools, and Government Program to offer LED streetlights to municipal customers during CY 2017, granting an exemption from the 2017 Focus on Energy Policy because of a large number of customer requests. Moving forward, incentives will be eligible as long as streetlights are customer-owned lamps and not utility-owned.[160]

The Program Implementer reported that this offering experienced slower-than-expected uptake because of long government planning cycles. As of August 2017, the Program had five municipal streetlight projects, with an additional six opportunities logged in SPECTRUM.

Changing Measures from Hybrid to Prescriptive

Since the Program's inception in CY 2015, the Program Administrator and Program Implementer have worked to streamline the incentive application process. In CY 2016, incentive applications changed from a program format to a catalog format so customers could find the appropriate technology for whatever facility type they occupied. In CY 2017, the program continued streamlining applications by changing from hybrid to prescriptive agriculture measures.

[160] The 2018 Focus on Energy Policy Manual reflects this change.

The Program's projects can be initiated by a Trade Ally, an Energy Advisor, and/or a utility account manager. For CY 2017, the Program changed a number of measures from hybrid to prescriptive measures, resulting in fewer inputs necessary to qualify for incentives. In previous years, the application required that customers provide inputs on (for example) water temperatures, numbers of cows, and water heater sizes. The Program Implementer said this change could be accomplished because the Program had two years of data from previous applications, and it no longer needed to ask customers for those inputs to determine eligibility. The change affected only agricultural applications because the schools and government sectors shared applications between the Large Energy Users Program and the Business Incentive Program. The Program Administrator said that moving from hybrid to prescriptive measures resulted in fewer application errors and happier Trade Allies.

Program Goals

Overall, the Program seeks to encourage agricultural, educational, and institutional customers to use more energy-efficient products. For CY 2017, the Program's savings goals include the following:

- Energy savings: 1,012,000,000 kWh
- Demand reduction: 9,500 kW
- Natural gas savings: 47.5 million therms

In CY 2017, the Program achieved 141% of its verified gross lifecycle peak demand savings goal, 129% of its verified gross lifecycle electric energy goal, and 54% of its verified natural gas goal.

The Program Implementer reported that one significant reason the Program reached its kWh savings goal was the Comprehensive Lighting Initiative, which decreased the total number of lightbulbs in a large space rather than conducting a 1:1 replacement.

The Program did not achieve its therm savings goal for CY 2017. Rather, the Program used carryover savings from CY 2016 to overcome the lagging therm savings. The Program Administrator attributed not reaching the therm savings goal to the steam trap savings goal, which was updated in CY 2016. Other therm savings came from boilers. The Program Implementer said the Program currently pays 10% to 15% of the cost for a new boiler. Although that incentive is generous, boilers are a very expensive piece of equipment and encouraging market transformation on efficient boilers remains difficult with incentives offered through the CY 2017 Program budget.

In addition to energy and demand goals, the Program Administrator and Program Implementer track several KPIs, as shown in Table 245. The Program met, exceeded, or is on track to meet eight of its nine CY 2017 KPIs.

Table 245. Agriculture, Schools, and Government Program CY 2017 Key Performance Indicators

KPI	Goal	CY 2017 Result	CY 2017 Result Source
Internal Days Incentive Processing	Minimize incentive processing times as measured by internal days incentive outstanding (DIO)	Average internal DIO of 9.49 days	Program Implementer
Customer Participation	Increase total customers participating by 5% annually (1,217 customers)	Exceeded goal with 1,233 unique customers	SPECTRUM
Energy Advisor Education	Provide three industry-specific education events per year for Energy Advisors, so they can communicate up-to-date information to their customers	Three events completed	Program Administrator
Leverage Emerging Technology Program	In four years, adopt four emerging technologies from the Clean Tech Partners Program	Three technologies adopted in three years (e.g., swimming pool sensors in CY 2015 and control systems and spring-loaded garage door hinges in CY 2016); on track to meet goal in 2018	Program Administrator
Utility Coordination	Obtain 36 leads or opportunities from marketing efforts coordinated with utility stakeholders	52 leads from utilities	Program Administrator
Agriculture Trade Ally Participation	Increase agriculture's use of the Program in 2017, quantified as a 5% increase in number of agriculture applications received (or 882 applications)	743 agriculture applications processed or received for preapproval; 84% of goal	Program Implementer
Custom Projects	Increase custom projects received for processing by 10% annually (or 185 applications), including preapprovals	303 custom applications processed or received for preapproval; 164% of goal	Program Implementer
Organizational Partnerships	Garner two additional organizational partnerships in 2017	Two of two; 100% (cranberry association and corn growers)	Program Administrator
Customer Satisfaction	Increase or maintain the 9.0 baseline customer satisfaction score	9.1 average satisfaction score	Satisfaction Survey

Data Management and Reporting

The Program uses SPECTRUM as a primary data management tool as well as a customer resource database and a program information tracking database. The Program Administrator said that, although sufficient for data tracking, SPECTRUM lacks visibility and reporting capabilities that prove useful for program management, such as QA/QC tracking and tracking the number of days from when application was first received to incentive payment.

The Program Administrator also said that retrocommisioning is challenging to track in SPECTRUM: the Program is not part of the same staff person's purview but that the applications all get routed to the same place. Identifying applications with a retrocommissioning flag is a manual process, and the Program Administrator receives around 200 applications a week, which leads to the mistaken approval of some retrocommissioning projects under the Program.

Marketing and Outreach

Customers learn about the Program through Energy Advisors, Trade Allies, or utility representatives. The Program Implementer attends trade shows and contacts previous customers once a year to inform them about new Program offerings. Energy Advisors use their existing relationships with customers to inform them of Program offerings, and Trade Allies conduct their own marketing. Specific marketing activities undertaken in CY 2017 include radio interviews with Energy Advisors,[161] partnering with Pam "The Fabulous Farm Babe" on the Wisconsin Farm Report Radio Network, and sending out agriculture mailers.

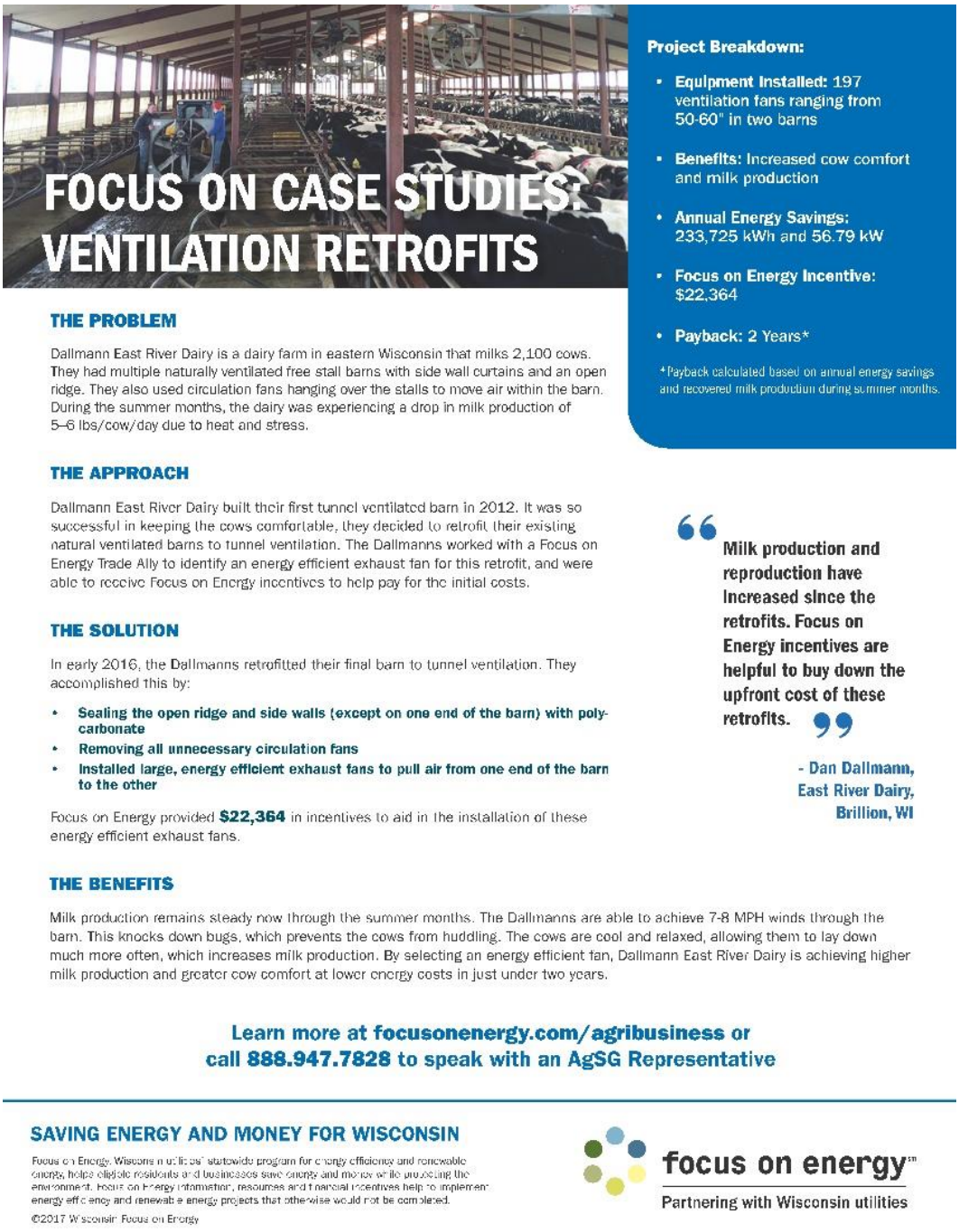
The Program Implementer said the Program sent out a pop-up barn mailer to agricultural entities this year, which created a buzz and increased Program awareness. The Program received phone calls about the mailer, with callers saying things such as: "I got this cool thing in the mail and I don't know who you are!" The Program also started showcasing case studies on its website and making them available at events (Figure 148 is an example). These case studies, clearly outlining program benefits in big blue boxes at the top, included information such as how much equipment was installed, annual energy savings, incentives, payback periods, and benefits that farmers cared about, including "increased cow comfort and milk production."

Program Barriers

The Evaluation Team asked the Program Administrator and Program Implementer about their perceptions regarding the biggest barriers to the Program's success. Since its CY 2015 inception, the Program has worked to increase penetration of energy-efficient equipment in the agricultural sector. For CY 2015, the greatest barriers to program success included the need to establish interpersonal relationships and trust among agricultural customers, the high cost of equipment, and the seasonality of agricultural work. The CY 2016 survey found that almost three-quarters of respondents said high initial equipment costs was the biggest participation challenge, and 10% of agricultural participants said replacing equipment without affecting operations was their biggest challenge to making energy-efficient improvements.

[161] Links to radio interviews: http://waxxradio.com/2017/02/13/focus-energy-nicole/ and http://waxxradio.com/2017/02/13/focus-energy-terry/

Figure 148. Ventilation Tunnel Barn Case Study



In CY 2017, the Evaluation Team did not conduct a participant survey for the Program, but the Program Administrator and Program Implementer shed some light on challenges facing the program along with methods for overcoming these. The Program Administrator said the high cost of energy-efficient equipment affects agricultural customers differently, depending on their size. Small, disparate agriculture facilities remain very relationship-oriented. The Program offers multiple incentives for therms savings, but many of these incentives were too low for small agricultural customers. The

seasonality of agricultural work remains a barrier; the Program Implementer reported that incentive applications had to be submitted within 60 days of installation, a very difficult task for farms during their busy season.

As has been the case since the Program began, low milk prices make it difficult for Wisconsin dairy farmers to find additional funds for any upgrades. Although milk prices in Wisconsin have increased since their 2015 low, they have not recovered to pre-2015 levels. The Program already addresses other participation barriers, seeking to reduce burdens on customers and Trade Allies (e.g., changing from hybrid to prescription measures, streamlining the application process, and making Program requirements easier to fulfill).

Schools and Government

The schools and government sectors face their own unique barriers. For schools, the primary barriers reported by Program staff included the application's complexity, the number of requirements, the large number of available measures, and internal competition for funding. Schools will likely encounter further challenges in identifying budget funds necessary to invest in energy efficiency, given an upcoming change in Wisconsin public school spending policies. In previous years, there has been a revenue limit exemption for energy efficiency projects in public schools. Recently passed amendments with the 2017/2018 school year budget put the energy efficiency spending exemption on hold, which eliminates additional money available for schools to spend on energy efficiency projects.

Annual Results from Ongoing Participant Satisfaction Survey

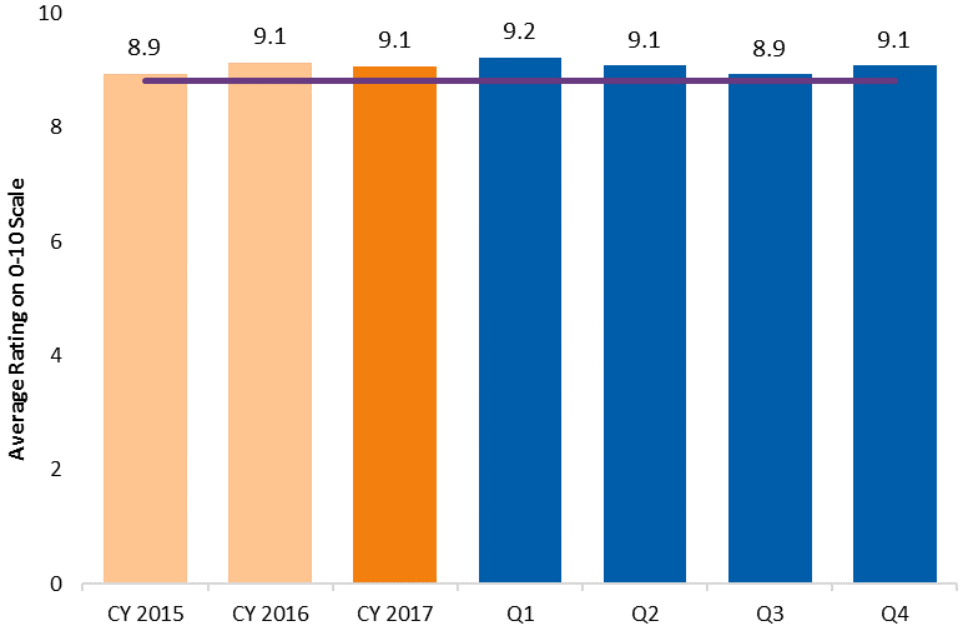
Throughout CY 2017, the Program Administrator and Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Program.[162] Respondents answered satisfaction and likelihood questions on a scale of 0 to 10, where 10 indicated the highest satisfaction or likelihood and 0 the lowest.[163]

[162] The Evaluation Team found that some surveys did not include identifying information that would allow the matching of survey responses to Program participation dates. The Team included survey responses without participation dates in the year-end total but not in the quarterly breakdown.

[163] The number of participants who completed a survey does not always match the number of responses for each question because some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

As shown in Figure 149, the average overall Program satisfaction rating among CY 2017 participants was 9.1, which was statistically higher than the portfolio baseline(8.8) and identical to the average Program rating for CY 2016 (9.1).[164] The Program's satisfaction rating was statistically higher than the baseline for Q1, Q2 and Q4 of CY 2017, while Q3 was consistent with the baseline (indicated by the purple line).[165]

Figure 149. CY 2017 Overall Program Satisfaction



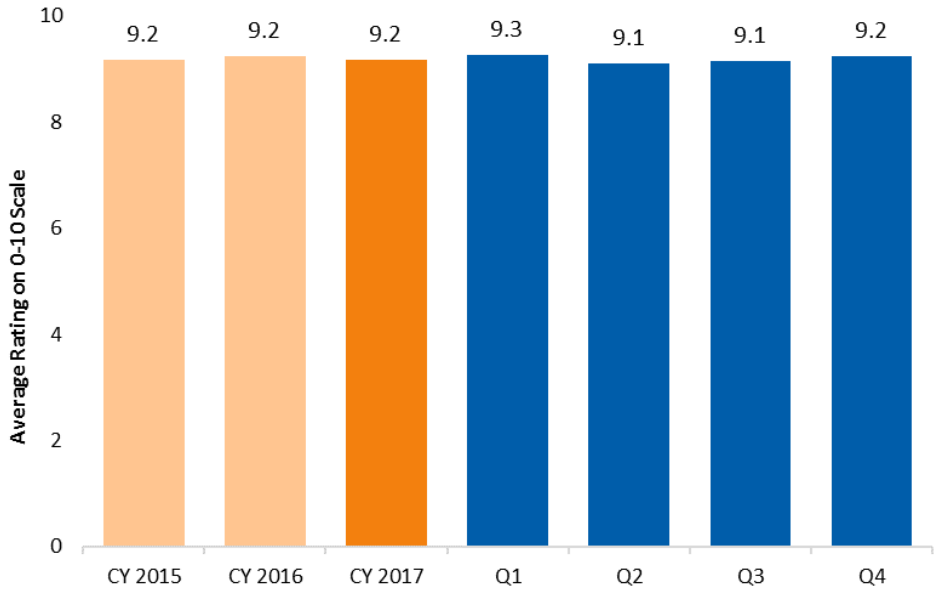
Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "Overall, how satisfied are you with the program?" (CY 2015 n=323, CY 2016 n=471, CY 2017 n=482, Q1 n=90, Q2 n=128, Q3 n=134, Q4 n=114). The portfolio baseline (8.8) is indicated by a purple line.

[164] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[165] CY 2017 (p=0.000), Q1 (p=0.001), Q2 (p=0.024), and Q4 (p=0.048) were significantly higher than the portfolio baseline using t-tests.

As shown in Figure 150, on average, respondents rated their satisfaction with the upgrades they received through the Program as a 9.2, which is the same as the average rating in CY 2016 and CY 2015. The average rating was very stable throughout CY 2017, with no significant differences between quarters or years.

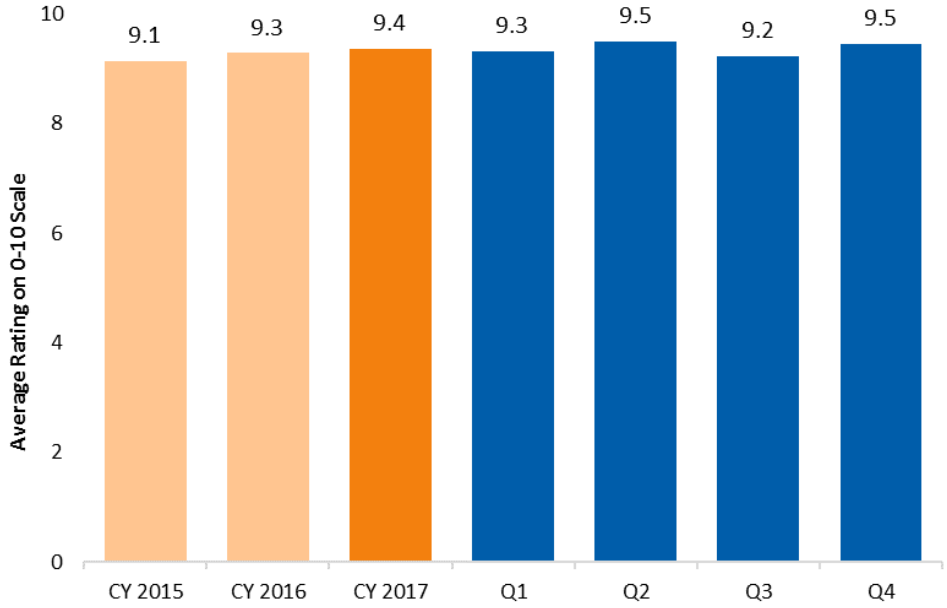
Figure 150. CY 2017 Satisfaction with Program Upgrades



Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient upgrades you received?" (CY 2015 n=302, CY 2016 n=447, CY 2017 n=464, Q1 n=88, Q2 n=124, Q3 n=127, Q4 n=109)

Participants gave the Focus on Energy staff who assisted them an average satisfaction rating of 9.4 for CY 2017 (Figure 151). The increase from the average rating of 9.3 in CY 2016 was not statistically significant, and the average rating from every quarter of CY 2017 was statistically equivalent to CY 2016.

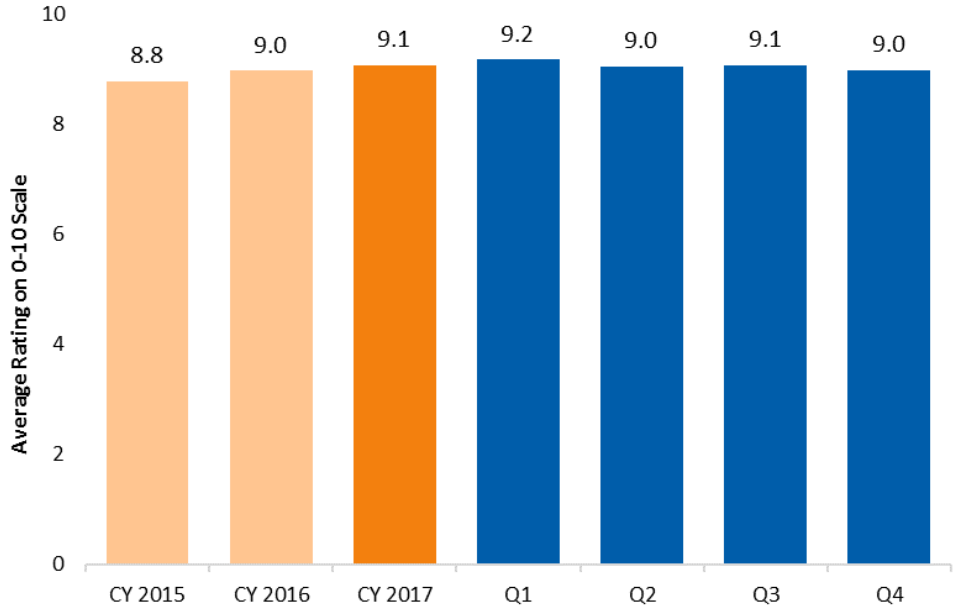
Figure 151. CY 2017 Satisfaction with Focus on Energy Staff



Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the Focus on Energy staff who assisted you?" (CY 2015 n=296, CY 2016 n=380, CY 2017 n=390, Q1 n=70, Q2 n=100, Q3 n=107, Q4 n=99)

Respondents gave an average rating of 9.1 for their satisfaction with the Trade Ally who provided services for them (Figure 152). The increase from the average CY 2016 rating (9.0) was not statistically significant, and the average rating from every quarter of CY 2017 was statistically equivalent to CY 2016.

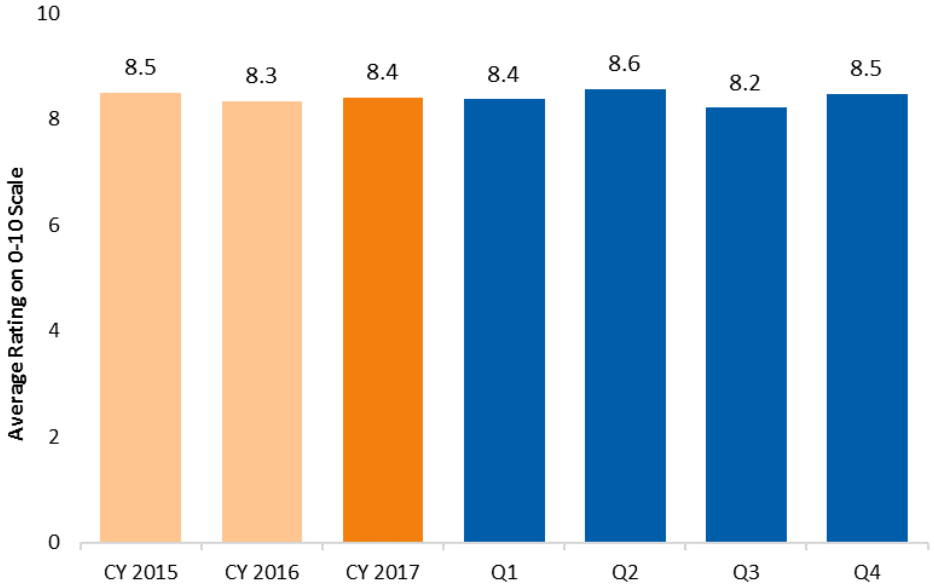
Figure 152. CY 2017 Satisfaction with Program Trade Allies



Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the contractor who provided the service?" (CY 2015 n=293, CY 2016 n=421, CY 2017 n=397, Q1 n=79, Q2 n=106, Q3 n=102, Q4 n=97)

Respondents gave an average rating of 8.4 for their satisfaction with the incentive they received (Figure 153), which was equivalent to ratings from CY 2016 and CY 2015. The average rating from every quarter of CY 2017 was statistically equivalent to CY 2016.

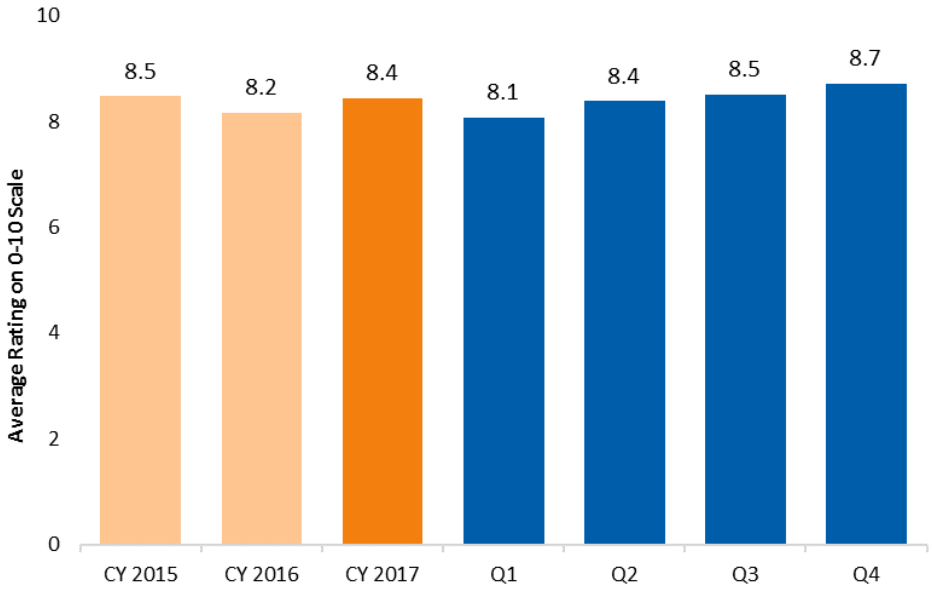
Figure 153. CY 2017 Satisfaction with Program Incentives



Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the amount of incentive you received?" (CY 2015 n=322, CY 2016 n=464, CY 2017 n=477, Q1 n=89, Q2 n=125, Q3 n=134, Q4 n=114)

As shown in Figure 154, respondents gave an average rating of 8.4 for the likelihood that they will initiate another energy-efficiency project in the next 12 months. The CY 2017 was statistically equivalent to CY 2016, though the average ratings in Q4 (8.7) represented a significant increase over the CY 2016 average rating.[166]

Figure 154. CY 2017 Likelihood of Initiating Energy-Efficiency Improvement



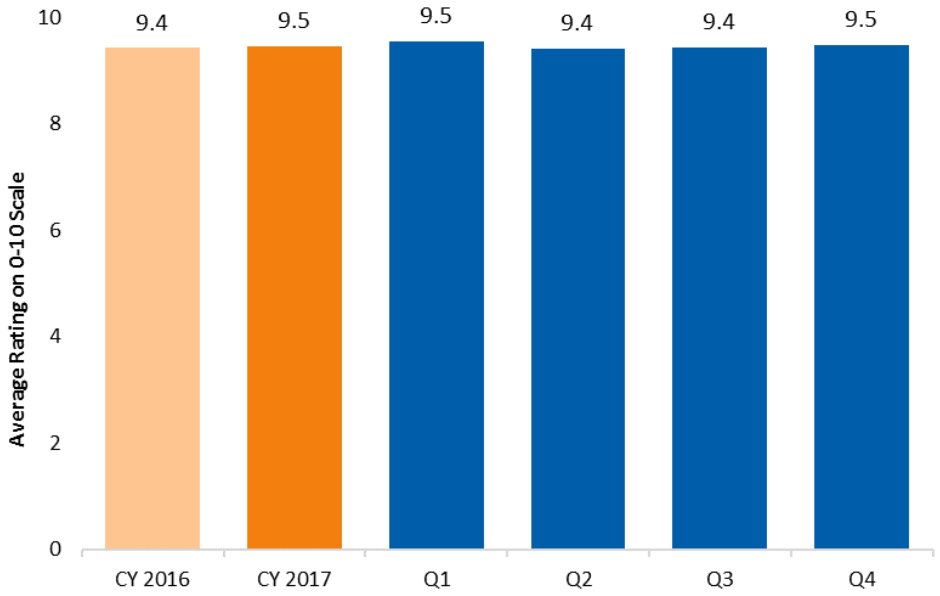
Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "How likely are you to initiate another energy-efficiency improvement in the next 12 months?" (CY 2015 n=286, CY 2016 n=430, CY 2017 n=433, Q1 n=76, Q2 n=113, Q3 n=123, Q4 n=106)

Figure 155 shows that respondents' rating for likelihood they would recommend this Program to others was 9.5, an increase from 9.4 in CY 2016 which was not statistically significant.[167] Using these survey data, the Evaluation Team calculated an NPS based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and the percentage of detractors (respondents giving a rating of 0 to 6). The NPS for all CY 2017 participants was +83, and ranged from +81 to +89 by quarter.

[166] Q4 ratings were significantly higher than CY 2016 (p=0.037) using t-test.

[167] Customers who said they already have recommended the Program were counted in mean ratings as a rating of 10 (most likely).

Figure 155. CY 2017 Likelihood of Recommending the Program

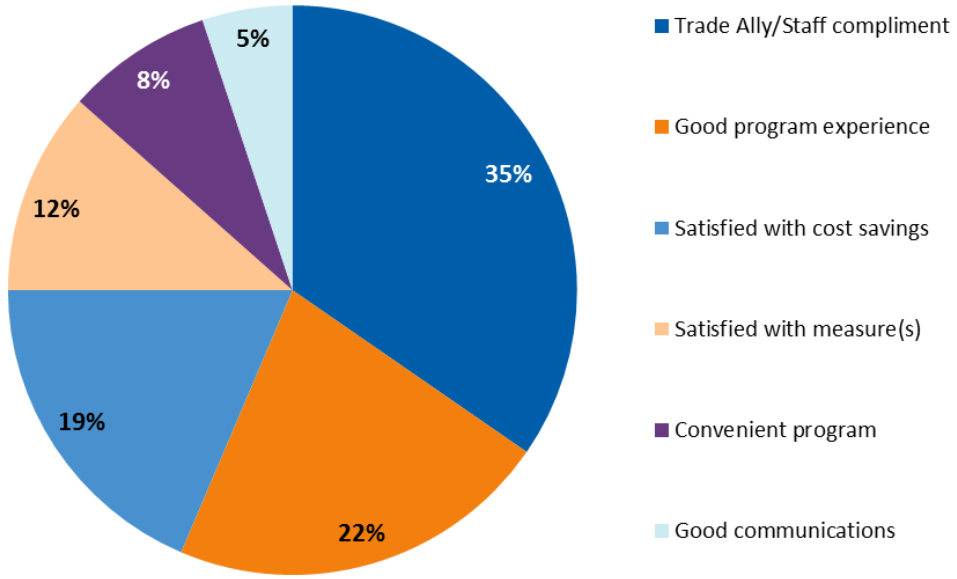


Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "How likely is it that you would recommend this program to others?" (CY 2016 n=459, CY 2017 n=471, Q1 n=87, Q2 n=124, Q3 n=133, Q4 n=111)

During the customer satisfaction surveys, the Evaluation Team asked participants if they had any comments or suggestions for improving the Program. Of the 486 participants who responded to the survey, 151 (31%) provided open-ended feedback, which the Evaluation Team coded into a total of 218 mentions. Of these mentions, 156 were positive or complimentary comments (72%), and 62 were suggestions for improvement (28%), identical to the proportion of positive comments and suggestions for improvement in CY 2016.

Respondents' positive comments are shown in Figure 156. The largest share of the 156 comments were complimentary of the Program staff and Trade Allies (35%), followed by general sentiments of a positive experience (22%) and positive comments about cost savings (19%). These were also the three most common types of positive comments in CY 2016, in the same order of ranking, although satisfaction with cost savings increased compared to CY 2016 (11%).

Figure 156. CY 2016 Positive Comments About the Program



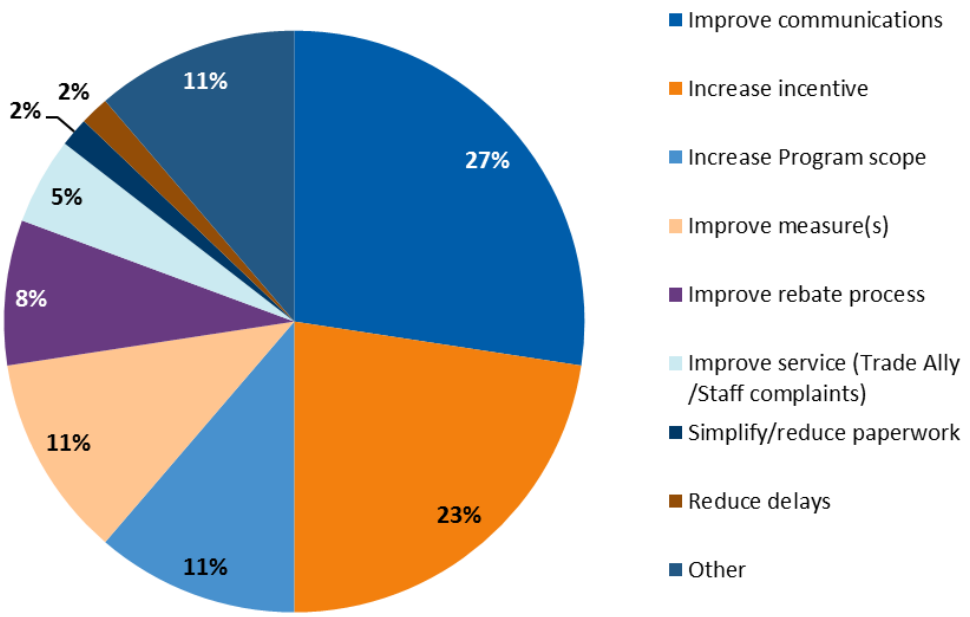
Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions: CY 2017 n=156)

Respondents' suggestions for improvement are shown in Figure 157. The most common suggestions regarded improving communications (27%) and increasing incentives (23%), followed by expanding the Program scope and improving measures covered by the program (both 11%).

Specific suggestions about improving communications included these:

- More frequent updates about application and rebate status
- Increase outreach to improve awareness of the Program
- Provide more detail with rebate payments: clearly reference the applications that payments are associated with, itemize rebate amounts for multiple measures
- Provide copies of application forms for customer record-keeping

Figure 157. CY 2016 Suggestions for Improving the Program



Source: Agriculture, Schools, and Government Program Ongoing Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: CY 2017 n=62)

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 246 lists the incentive costs for the CY 2015, CY 2016, and CY 2017 Agriculture, Schools and Government Program.

Table 246. Agriculture, Schools and Government Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$6,836,351	$6,373,340	$5,656,868

The Evaluation Team found the CY 2017 Program was cost-effective (4.18). Table 247 lists the evaluated costs and benefits.

Table 247. Agriculture, Schools and Government Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$808,476	$776,604	$762,602
Delivery Costs	$3,301,342	$3,171,197	$3,114,023
Incremental Measure Costs	$19,171,821	$27,047,432	$28,464,405
Total Non-Incentive Costs	**$23,281,639**	**$30,995,232**	**$32,341,030**
Benefits			
Electric Benefits	$69,239,637	$42,529,151	$49,956,749
Gas Benefits	$15,309,240	$23,737,403	$47,207,282
Emissions Benefits	$12,844,571	$10,146,612	$14,442,289
Total TRC Benefits	**$97,393,447**	**$76,413,166**	**$111,606,319**
Net TRC Benefits	**$74,111,809**	**$45,417,934**	**$79,265,289**
TRC B/C Ratio	**4.18**	**2.47**	**3.45**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations for Program improvements.

Outcome 1. The Agriculture, Schools, and Government Program performed well in CY 2017 by exceeding peak demand and electric savings targets, achieving high customer satisfaction, and continuing to expand its reach into Wisconsin's agriculture sector. The program met or exceeded eight of its nine KPIs, launched multiple new initiatives, and is in the process of implementing reforms to the DEET initiative, all with the aim to drive deeper energy savings and improve the ease in which customers can pursue energy efficiency projects and improvements. The main obstacle for this Program remains its ability to achieve natural gas savings, which fell considerably under the CY 2017 goal.

Recommendation. High efficiency boilers are a high-impact measure that contributes significantly to the therm savings for this Program and, to boost natural gas savings, the Program could consider revisiting this measure's incentive levels. According to Program staff, the incentive covers just 10% to 15% of the cost of an upgrade, which is particularly hard for smaller customers. Currently, schools and agricultural customers are eligible to receive a fraction of the incentive available to small businesses. The Program should consider changes to this incentive structure for K-12 schools and small agricultural customers and possibly explore a tiered incentive based on square footage or monthly electric bill that would be more appropriate for small customers and improve their uptake of natural gas measures. The Program could also consider revising the current incentive of $75 for smart thermostats for K-12 schools to match the $125 incentive offered under the Small Business Program.

Outcome 2. Customers are highly engaged and satisfied with this Program. The Program's overall satisfaction score of 9.1 is one of the highest among the Focus on Energy nonresidential programs, and its overall satisfaction rating of 9.1 is statistically higher than the portfolio's baseline. The participant survey garnered a large number of optional, positive anecdotal comments from participants, more than twice the number of comments aimed at Program improvements. To continue maintaining high customer satisfaction heading into the final year of the quadrennium, the Program Administrator and the Program Implementer should respond to customer suggestions for improvement, particularly with communications, for which 27% of 62 participants had suggestions.

Recommendations. Customers had these specific suggestions about improving communications based on their experience in CY 2017, which the Program should seek to implement where possible:

- Convey more frequent updates about application and rebate status
- Increase outreach to improve awareness of the Program
- Provide more detail with rebate payments by more clearly referencing the applications payments are associated with and itemizing rebate amounts for multiple measures
- Give customers copies of application forms for their records

Large Energy Users Program

Through the Large Energy Users Program, Focus on Energy provides custom and prescriptive incentives to customers whose average monthly demand exceeds 1,000 kW of electricity or 100,000 therms of natural gas and whose combined utility bill was at least $60,000 in any month of the preceding year. These participating customers, which include commercial, industrial, educational, and government facilities, are assigned an Energy Advisor who helps them identify savings opportunities in the facilities. APTIM is the Program Administrator and Leidos Engineering, LLC, is the Program Implementer.

Focus on Energy launched the Strategic Energy Management Pilot in CY 2015 to provide support for approximately 30 large energy customers to implement management systems and energy saving initiatives in their facilities. In CY 2015, CY 2016, and continuing through CY 2017, the Strategic Energy Management Pilot had independent funding and energy savings goals and was fully operational under the Large Energy Users Program.

In the Strategic Energy Management Pilot, Energy Advisors work with large energy customers to promote an energy management information system in their facilities, demonstrate its value, and develop a workforce of individuals in Wisconsin with experience in leading strategic energy management (SEM) initiatives. The Pilot targeted customers that are eligible for the Large Energy Users Program. The impacts from six of the pilot participants were included in the CY 2017 evaluation; the remaining participants' savings will be evaluated as part of the CY 2018 evaluation.

In addition to the ongoing pilot, in CY 2017 a new SEM offering was launched, called Strategic Energy Management Partners (SEM Partners). This offering is not a pilot but is a permanent offering of the Large Energy Users Program. It is managed and implemented by the Program Implementer, delivers the same custom and prescriptive incentives as the Large Energy Users Program delivers, and is currently available only for customers eligible for the Large Energy Users Program. The Program began conducting outreach for SEM Partners in 2017 to a new set of participants beyond the customers already enrolled in the pilot. The impacts from this offering were not included in this year's evaluation; the CY 2017 savings will be evaluated as part of the CY 2018 evaluation.

Table 248 lists the Large Energy Users Program spending, savings, participation, and cost-effectiveness for CY 2015, CY 2016 and CY 2017.

Table 248. Large Energy Users Program Spending, Savings, Participation, and Cost-Effectiveness[1]

Item	Units	CY 2017	CY 2016	CY 2015
Incentive Spending	$	$9,118,075	$10,423,365	$13,920,708
Participation	Number of Participants	386	368	422
Verified Gross Lifecycle Savings	kWh	2,233,657,429	1,768,582,191	2,526,960,091
	kW	21,084	15,041	21,122
	therms	144,988,131	201,477,193	206,852,066
Verified Gross Lifecycle Realization Rate	% (MMBtu)	99%	104%	94%
Net Annual Savings	kWh/yr	138,432,453	107,223,854	131,174,772
	kW	17,289	12,333	17,320
	therms/yr	8,449,980	11,394,993	12,069,402
Annual Net-to-Gross Ratio	% (MMBtu)	82%	82%	82%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	6.76	4.54	5.14

[1]Excludes Strategic Energy Management (SEM) offering

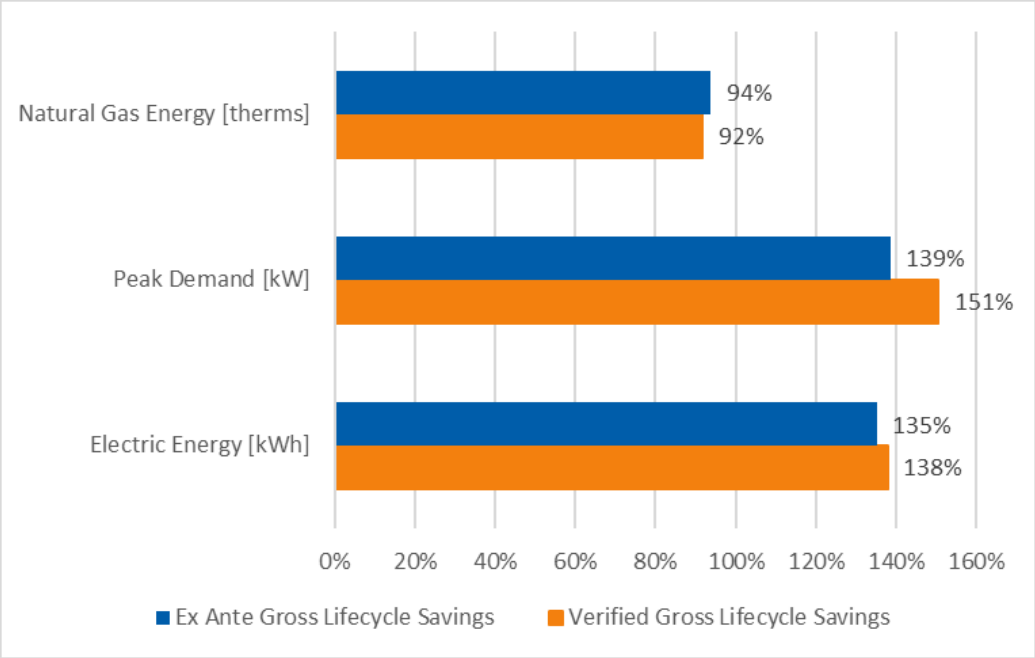
Table 249 lists the Strategic Energy Management Pilot spending, savings, participation, and cost-effectiveness for claimed CY 2017 savings.

Table 249. Strategic Energy Management Pilot Spending, Savings, Participation, and Cost-Effectiveness

Item	Units	CY 2017
Incentive Spending	$	$1,549,322
Participation	Number of Participants	6
Ex Ante Savings	kWh	4,648,326
	kW	499
	therms	1,343,787
Verified Gross Lifecycle Realization Rate	% (MMBtu)	99%
Net Annual Savings	kWh/yr	5,133,522
	kW	499
	therms/yr	1,315,102
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	2.61

Figure 158 shows the percentage of gross lifecycle savings goals achieved by the Large Energy Users Program in CY 2017. The Program exceeded its CY 2017 verified gross and *ex ante* demand and lifecycle electric savings goals, but it did not meet the lifecycle natural gas savings goal.

Figure 158. Large Energy Users Program Achievement of CY 2017 Gross Lifecycle Savings Goal[1,2]



[1] The 100% *ex ante* gross lifecycle savings reflect the Program Implementer's contract goals for CY 2017. The verified gross lifecycle savings contribute to the Program Administrator's portfolio-level goals.

[2]Excludes Strategic Energy Management (SEM) offering.

Evaluation, Measurement, and Verification Approach

In CY 2017, the Evaluation Team conducted impact and process evaluations of the Large Energy Users Program and an impact evaluation of the Strategic Energy Management Pilot. The Team designed its evaluation, measurement, and verification approach to integrate multiple perspectives in assessing the Program performance. Table 250 lists the specific data collection activities and sample sizes used in the evaluations.

Table 250. Large Energy Users Program and Strategic Energy Management Pilot Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)	Large Energy Users Program	Strategic Energy Management Pilot
Program Actor Interviews	2	✓	-
Tracking Database Review	Census	✓	✓
Ongoing Participant Satisfaction Surveys	149	✓	-
Engineering Desk Review	44	✓	-
Verification Site Visits	44	✓	-
Regression Modeling	6	-	✓

Program Actor Interviews

The Evaluation Team interviewed the Program Administrator and the Program Implementer in July 2017 to learn about the status of the Large Energy Users Program and Strategic Energy Management Pilot. During the interviews, the Team assessed Program performance, objectives, and implementation challenges and solutions. Interview topics included questions about the Program goals and KPIs; Program design, implementation, and operations; marketing and outreach; interactions with Trade Allies; and data tracking.

Tracking Database Review

The Evaluation Team reviewed the census of Program records in SPECTRUM. The review involved the following tasks:

- Thorough review of the data to ensure that the totals in SPECTRUM matched the totals reported by the Program Administrator
- Reassignment of savings from a number of database adjustment measures to the corresponding program measures
- Check for complete and consistent application of information across data fields (measure names, application of first-year savings, application of EUL, etc.).

Ongoing Participant Satisfaction Surveys

The PSC requested that the Evaluation Team conduct satisfaction surveys beginning in CY 2015 for the 2015 to 2018 quadrennium. These surveys are intended to give recent Program participants the opportunity to offer feedback quickly and easily, ensure that this feedback is close in time to the participation experience, identify problems at any time of the year, and discover energy efficiency opportunities associated with delivering follow-up information to interested participants.

Within two weeks of completing participation in the Program, the Program Administrator deployed online surveys to all CY 2017 participants with email addresses on a rolling basis. The Evaluation Team gathered the online survey results via SPECTRUM. The Team also sent, received, and scanned mail survey responses, which it combined with the online results for quarterly and annual reporting.

In CY 2017, 149 Large Energy Users Program participants responded to the ongoing customer satisfaction survey.

Engineering Desk Review

The Evaluation Team conducted a detailed review of all available project documentation in SPECTRUM, for a sample of 44 program measures. This review included an assessment of the savings calculations and methodology applied by the Program Implementer. The Evaluation Team relied on the applicable TRMs (2017 TRM and 2017 TRM Update) and other relevant secondary sources as needed. Secondary sources included energy codes and standards, case studies, and energy efficiency program evaluations of applicable measures (based on geography, sector, measure application, and date of issue).

For prescriptive measures in Wisconsin, the Focus on Energy TRM and associated workpapers were the primary sources the Evaluation Team used to determine methodology and data in nearly all cases. For custom and hybrid measures, the Team reviewed the SPECTRUM savings analysis workbooks and adjusted inputs and methodologies as necessary based on engineering judgment and project documentation. The Team selected the evaluation sample for these reviews using a weighted, random stratified PPS (Probability Proportional to Size) sampling approach based on lifecycle total *ex ante* energy savings.

Verification Site Visits

The Evaluation Team conducted 44 verification site visits for the Large Energy Users Program in CY 2017 (all sampled projects received site visits). Site visits involved verifying the type and quantity of equipment installed, determining how the installed equipment is controlled, and documenting the operating hours of the installed equipment. The Team collected project-specific gas utility bill data for one custom boiler measure in CY 2017. The Team did not install any temporary data loggers as part of the evaluation of the Program in CY 2017.

Regression Modeling

The Evaluation Team conducted regression analyses for six SEM participant facilities for each fuel type. This methodology allows the Evaluation Team to estimate savings that cannot be quantified through engineering analyses, including operational and behavioral changes. First a model is created using weather data, facility production and consumption data, and other possible energy use drivers that describes energy consumption during the baseline period (which ideally begins at least 12 months prior to implementation of the SEM program). This model is then used to predict energy use after the facility enters the program, the period known as the reporting period. The difference between the predicted and metered energy use provides an estimate of operational and behavioral savings resulting from participation in the Program.

Impact Evaluation

The impact evaluation of the Program included these activities:

- Tracking database review
- Engineering desk reviews
- Verification site visits

Evaluation of Gross Savings

The Evaluation Team reviewed CY 2017 tracking data to determine reported installations and then applied the results from engineering desk reviews (n=44) and verification site visits (n=44) to calculate verified gross savings.

The Team found that the overall accounting of demand and energy savings in the SPECTRUM database was generally accurate and adhered to industry best practices. SPECTRUM offers the typical date fields, such as “paid date” and “application received date,” and offers several additional fields that help users

track projects in greater detail. SPECTRUM also employs unique customer identifier numbers, a best practice not followed in many other jurisdictions, so account numbers and customer contact information can be used to easily classify unique customers.

The Evaluation Team made verified savings adjustments to several prescriptive, custom, and hybrid projects based on desk reviews and site visit findings. The Team worked with the PSC and Program Administrator to assess the causes and impacts of inaccuracies for these projects.

The Team identified one SPECTRUM database issue for a project under MMID #2499 (Process, Not Otherwise Specified). The *ex ante* reported lifetime energy savings (kWh) was missing three decimal places in SPECTRUM. Because the database review verified the peak demand reduction and annual gas and electric energy savings were correct, this deviation was judged to be a database error.

The Evaluation Team identified two measure types where savings calculations did not align with the 2017 TRM Update:

- For hybrid MMID #2262 (Compressed Air System Leak Survey and Repair, Year 2), the *ex ante* reported savings calculations did not follow 2017 TRM Update hybrid savings algorithm. To calculate verified savings, the Team used the 2017 TRM Update savings algorithm with site visit findings. The Team also found that all site conditions were as reported except for one 5 cfm compressed air leak that had not yet been repaired. Using the TRM algorithm significantly increased the verified energy savings but reduced the peak demand reduction because the 2017 TRM Update specified that there are no peak demand savings from this measure.
- For one of the projects under hybrid MMID #2648 (VFD, Process Pump), the Evaluation Team found that the *ex ante* savings did not follow the 2017 TRM Update hybrid savings algorithm. The Team calculated verified savings using the hybrid VFD savings workbook.

The Evaluation Team reviewed monthly post-installation gas billing data for one custom project under MMID #2220 (Boiler, Not Otherwise Specified) and compared it to the expected energy use from the *ex ante* reported savings calculations. Since the consumption for the installed gas measures (based on utility data) was higher than expected, the realization rate was less than 100%.

Site visits generally confirmed that program measures were installed and operating as planned, but the Team did find minor deviations. For four sampled prescriptive lighting projects, the Team found the *ex ante* reported savings were calculated using an incorrect TRM facility type. At two of the sites, the Team found that all the installed lighting fixtures were in production areas, but the facility types were reported as commercial. At the other two sites, the Team verified the facility types were an office and a motel, respectively, but the *ex ante* reported savings were calculated using the industrial facility type.

At a few sites, the Team found the installed equipment ISR was less than 100%. At two prescriptive lighting sites, the Team found the ISR was approximately 95%. During the inspection for a project under MMID #2726 (VFD, Chilled Water Distribution Pump), inspectors verified that the VFDs were on the site but not installed on the chilled water pumps, which resulted in zero savings for that sampled measure.

At a hybrid MMID #2648 site, the Team found only two of the reported three installed VFDs were in use at a time; the third unit was used as a backup only. During the review of the hybrid savings workbook for this same site, the Team found that the *ex ante* reported peak demand reduction was calculated by dividing the total installed energy use (kWh) by operating hours, instead of dividing the annual energy savings (kWh) by hours.

During the on-site evaluation for one of the projects under MMID #3097 (LED Fixture, Bilevel, Stairwell and Passageway), the Team found the installed lighting fixtures were submitted under an incorrect MMID. The facility was a 24/7 doctor's office and blood lab and the installed fixtures were in hallways that operated 24/7 and were not dimmed. The Team calculated evaluated energy savings and demand reduction using MMID #3400 (LED Fixture, 2'x2', DLC Listed, Low Output), with annual operating hours of 8,760 hours and a peak coincidence factor of 1.0 versus the TRM default values.

The Team also found that the expected chilled water load and system operating hours were less than expected at a custom project under MMID #2499 (Process, Not Otherwise Specified). In the interviews, facility staff said the annual operating hours are approximately 2,600 hours, rather than the reported 8,000 hours, and the average annual load is approximately 113 tons, rather than the reported 160 tons.

Finally, during the site visit for another project under custom MMID #2499 (Process, Not Otherwise Specified), the Team verified that the installed flow rate during typical operation was significantly less than reported based on a rotameter display on each line.

In-Service Rates

The ISR represents the percentage of measures still installed, in use, and operating as planned following installation by the Program Implementer. The Evaluation Team did not conduct participant surveys in CY 2017 and performed site visits for all sampled measures. Since the Team applied a site-specific ISR to all measures where it conducted verification site visits, it did not use a historic ISR from previous evaluation years.

Verified Gross Savings Results

Table 251 lists the annual and lifecycle realization rates. Overall, the Program achieved a first-year evaluated realization rate of 108%, weighted by total (MMBtu) energy savings.[168] Realization rates are generally the same for a given savings type. These results represent weighted average realization rates for the entire Program.

Table 251. CY 2017 Large Energy Users Program Annual and Lifecycle Realization Rates

Measure	Annual Realization Rate				Lifecycle Realization Rate		
	kWh	kW	therms	MMBtu	kWh	therms	MMBtu
Total	116%	109%	99%	105%	102%	98%	99%

[168] The Evaluation Team calculated realization rates by dividing annual verified gross savings by *ex ante* savings.

Table 252 lists the total *ex ante* and verified annual gross savings for the CY 2017 Program by measure category.

Table 252. CY 2017 Large Energy Users Program First-Year Gross Savings Summary

Measure	*Ex Ante* Gross Annual Savings			Verified Gross Annual Savings		
	kWh	kW	therms	kWh	kW	therms
Aeration	187,607	25	0	217,354	27	0
Air Sealing	0	0	91,518	0	0	90,840
Boiler	23,445	5	167,076	27,162	6	165,839
Chiller	6,202,966	1,234	0	7,186,507	1,341	0
Compressor	2,583,797	356	0	2,993,483	387	0
Controls	8,107,776	1,469	344,939	9,393,344	1,597	342,385
Delamping	863,646	179	0	1,000,586	194	0
Dishwasher, Commercial	54,106	0	190	62,685	0	189
Door	0	0	39,242	0	0	38,951
Dryer	266,752	52	0	309,048	57	0
Economizer	159,951	0	0	185,313	0	0
Energy Recovery	-615,729	-85	1,478,101	-713,359	-92	1,467,155
Filtration	969,994	203	251,080	1,123,796	221	249,221
Fluorescent, Linear	1,103,527	193	0	1,278,502	209	0
Fryer	983	0	0	1,139	0	0
Furnace	-50,119	-6	201,472	-58,065	-7	199,980
Infrared Heater	0	0	21,225	0	0	21,068
Insulation	0	0	155,074	0	0	153,926
LED	49,929,177	7,727	0	57,845,936	8,398	0
Motor	61,204	12	0	70,908	13	0
Other	26,917,143	2,553	7,124,311	31,185,119	2,774	7,071,556
Oven	0	0	1,248	0	0	1,239
Pre-Rinse Sprayer	0	0	52	0	0	52
Process Heat	21,600	4	0	25,025	4	0
Reconfigure Equipment	761,918	109	0	882,728	118	0
Refrigerator/Freezer - Commercial	27,102	3	0	31,399	3	0
Rooftop Unit/Split System AC	52,374	89	0	60,678	97	0
Steam Trap	0	0	278,319	0	0	276,258
Supporting Equipment	67,660	8	0	78,388	8	0
Tune-up/Repair/Cx	8,505,146	1,055	0	9,853,720	1,147	0
Variable Speed Drive	33,983,821	3,476	0	39,372,288	3,777	0
Water Heater	-50	0	135,896	-58	0	134,890
Ice Machine	1,151	0	0	1,334	0	0
Nozzle	384,000	144	0	444,887	156	0
Pump	5,074,642	596	0	5,879,276	648	0
VAV	69,864	0	91,988	80,942	0	91,307
Total Annual	**145,715,455**	**19,400**	**10,381,731**	**168,820,065**	**21,084**	**10,304,854**

Table 253 lists the *ex ante* and verified gross lifecycle savings by measure type for the CY 2017 Program.

Table 253. CY 2017 Large Energy Users Program Lifecycle Gross Savings Summary

Measure	*Ex Ante* Gross Lifecycle Savings			Verified Gross Lifecycle Savings		
	kWh	kW	therms	kWh	kW	therms
Aeration	3,752,140	25	0	3,827,590	27	0
Air Sealing	0	0	1,192,960	0	0	1,168,194
Boiler	468,900	5	3,341,058	478,329	6	3,271,697
Chiller	124,058,126	1,234	0	126,552,752	1,341	0
Compressor	38,756,989	356	0	39,536,335	387	0
Controls	84,210,784	1,469	4,989,900	85,904,138	1,597	4,886,309
Delamping	8,636,460	179	0	8,810,126	194	0
Dishwasher, Commercial	541,060	0	1,900	551,940	0	1,861
Door	0	0	784,842	0	0	768,549
Dryer	4,001,283	52	0	4,081,743	57	0
Economizer	2,159,820	0	0	2,203,251	0	0
Energy Recovery	-9,235,932	-85	22,171,509	-9,421,653	-92	21,711,225
Filtration	11,404,326	203	3,766,185	11,633,650	221	3,687,998
Fluorescent, Linear	16,069,315	193	0	16,392,445	209	0
Fryer	11,796	0	0	12,033	0	0
Furnace	-745,338	-6	3,024,887	-760,326	-7	2,962,090
Infrared Heater	0	0	318,375	0	0	311,765
Insulation	0	0	2,445,438	0	0	2,394,670
LED	830,740,961	7,727	0	847,445,932	8,398	0
Motor	1,101,685	12	0	1,123,838	13	0
Other	392,750,635	2,553	100,242,613	400,648,268	2,774	98,161,562
Oven	0	0	14,976	0	0	14,665
Pre-Rinse Sprayer	0	0	260	0	0	255
Process Heat	324,000	4	0	330,515	4	0
Reconfigure Equipment	12,514,040	109	0	12,765,679	118	0
Refrigerator/Freezer - Commercial	325,224	3	0	331,764	3	0
Rooftop Unit/Split System AC	785,622	89	0	801,420	97	0
Steam Trap	0	0	1,669,716	0	0	1,635,052
Supporting Equipment	1,353,200	8	0	1,380,411	8	0
Tune-up/Repair/Cx	17,010,283	1,055	0	17,352,335	1,147	0
Variable Speed Drive	565,693,287	3,476	0	577,068,542	3,777	0
Water Heater	-500	0	2,717,478	-510	0	2,661,063
Ice Machine	11,510	0	0	11,741	0	0
Nozzle	5,760,000	144	0	5,875,825	156	0
Pump	76,119,630	596	0	77,650,283	648	0
VAV	1,047,960	0	1,379,820	1,069,033	0	1,351,175
Total Lifecycle	**2,189,627,267**	**19,400**	**148,061,918**	**2,233,657,429**	**21,084**	**144,988,131**

Evaluation of Net Savings

The Evaluation Team did not perform participant surveys and therefore did not calculate freeridership or spillover for CY 2017. The Team calculated overall Program NTG for CY 2017 using the CY 2015 and CY 2016 net savings data (sum of net savings from CY 2015 and CY 2016, divided by the sum of the gross savings from CY 2015 and CY 2016), which was based on participant surveys. This yielded an overall NTG estimate of 82% for the Program in CY 2017.

Table 254 shows total first year gross and net savings in MMBtu as well as the overall Program NTG.

Table 254. CY 2017 Large Energy Users Program Annual Net Savings and NTG Ratio

Total First-Year Gross Verified Savings (MMBtu)	Total First-Year Net Savings (MMBtu)	Program First-Year NTG Ratio
1,606,499	1,317,330	82%

Table 255 shows the annual Program net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 255. CY 2017 Large Energy Users Program First-Year Net Savings

Measure	First-Year Net		
	kWh	kW	Therms
Aeration	178,230	22	0
Air Sealing	0	0	74,489
Boiler	22,273	5	135,988
Chiller	5,892,936	1,099	0
Compressor	2,454,656	317	0
Controls	7,702,542	1,309	280,755
Delamping	820,480	159	0
Dishwasher, Commercial	51,402	0	155
Door	0	0	31,940
Dryer	253,420	47	0
Economizer	151,956	0	0
Energy Recovery	-584,954	-75	1,203,067
Filtration	921,513	181	204,361
Fluorescent, Linear	1,048,372	172	0
Fryer	934	0	0
Furnace	-47,614	-5	163,984
Infrared Heater	0	0	17,276
Insulation	0	0	126,219
LED	47,433,667	6,887	0
Motor	58,145	10	0
Other	25,571,798	2,275	5,798,676
Oven	0	0	1,016
Pre-Rinse Sprayer	0	0	42
Process Heat	20,520	3	0
Reconfigure Equipment	723,837	97	0
Refrigerator/Freezer - Commercial	25,747	3	0
Rooftop Unit/Split System AC	49,756	80	0
Steam Trap	0	0	226,532
Supporting Equipment	64,278	7	0
Tune-up/Repair/Commissioning	8,080,050	940	0
Variable Speed Drive	32,285,276	3,098	0
Water Heater	-48	0	110,610
Ice Machine	1,093	0	0
Nozzle	364,807	128	0
Pump	4,821,006	531	0
VAV	66,372	0	74,872
Total First Year	**138,432,453**	**17,289**	**8,449,980**

Table 256 lists the lifecycle Program net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 256. CY 2017 Large Energy Users Program Lifecycle Net Savings

Measure	Lifecycle Net		
	kWh	kW	Therms
Aeration	3,138,624	22	0
Air Sealing	0	0	957,919
Boiler	392,230	5	2,682,792
Chiller	103,773,256	1,099	0
Compressor	32,419,794	317	0
Controls	70,441,393	1,309	4,006,773
Delamping	7,224,304	159	0
Dishwasher, Commercial	452,591	0	1,526
Door	0	0	630,210
Dryer	3,347,029	47	0
Economizer	1,806,666	0	0
Energy Recovery	-7,725,755	-75	17,803,205
Filtration	9,539,593	181	3,024,159
Fluorescent, Linear	13,441,805	172	0
Fryer	9,867	0	0
Furnace	-623,467	-5	2,428,914
Infrared Heater	0	0	255,648
Insulation	0	0	1,963,630
LED	694,905,665	6,887	0
Motor	921,547	10	0
Other	328,531,580	2,275	80,492,481
Oven	0	0	12,025
Pre-Rinse Sprayer	0	0	209
Process Heat	271,022	3	0
Reconfigure Equipment	10,467,857	97	0
Refrigerator/Freezer - Commercial	272,046	3	0
Rooftop Unit/Split System AC	657,164	80	0
Steam Trap	0	0	1,340,743
Supporting Equipment	1,131,937	7	0
Tune-up/Repair/Commissioning	14,228,914	940	0
Variable Speed Drive	473,196,204	3,098	0
Water Heater	-418	0	2,182,071
Ice Machine	9,628	0	0
Nozzle	4,818,177	128	0
Pump	63,673,232	531	0
VAV	876,607	0	1,107,963
Total Lifecycle	**1,831,599,092**	**17,289**	**118,890,267**

Strategic Energy Management Pilot

Evaluation of Gross Savings

The Evaluation Team conducted regression analyses for six SEM participant facilities for each fuel type. This methodology allows the Team to estimate savings that cannot be quantified through engineering analyses, including operational and behavioral changes. First a model is created using weather data, facility production and consumption data, and other possible energy use drivers that describes energy consumption during the baseline period (which ideally begins at least 12 months prior to implementation of the Strategic Energy Management Pilot). This model is then used to predict energy use after the facility enters the program, the period known as the reporting period. The difference between the predicted and metered energy use provides an estimate of operational and behavioral savings resulting from the Program.

The six facilities evaluated in CY 2017 participated in various discrete energy saving projects, known as capital projects. Some of these capital projects were claimed and given incentives under the Strategic Energy Management Pilot, others were included as part of the Large Energy Users Program.

Regression modeling methodology evaluates the total savings at each facility for each fuel type. Therefore, regression model-derived savings include the effects of SEM and large energy user capital projects as well as any operational and behavioral savings. Because the savings for the SEM and large energy user projects were already tracked, the goal of the modeling was to isolate only the operational and behavioral savings attributable to the Strategic Energy Management Pilot.

The Evaluation Team subtracted the savings associated with capital projects from the total estimated facility savings to verify only the operational and behavioral savings for each participant. SEM capital project savings that were claimed in SPECTRUM were then added back to the operations and behavior modeling results to estimate the total savings associated with the Strategic Energy Management Pilot. Claimed savings for large energy users reported in SPECTRUM were added to the Pilot-only total and are also reported. Although Large Energy Users Program savings are officially claimed elsewhere, this exercise was done to ascertain the overall influence of the Pilot on total participant energy savings.

Regression Modeling

To calculate gross savings, the Evaluation Team reviewed facility-level baseline and reporting periods, and raw data for six facilities. The Program Implementer provided the Evaluation Team with raw energy consumption and facility production data from the beginning of the baseline period through the end of the reporting period. The Implementer also produced its own regression models and provided the Team with a performance report that summarized its model parameters and findings.

To estimate facility-level savings, the Evaluation Team first checked raw data against the Implementer's cleaned dataset to verify the Implementer's data handling. The Evaluation Team then developed regression models using only data from the baseline period. The Implementer defined the date boundaries of each facility's baseline period, which is meant to capture "business-as-usual" energy

consumption. Based on the Implementer's information, the Evaluation Team chose to not alter any of the baseline periods. The Team built each baseline model by selecting the combination of heating degree days (HDD), cooling degree days (CDD), production variables, and holiday indicators that optimized the adjusted R-squared and Akaike Information Criterion (AIC).

The Program Implementer provided reporting period data only for the facility production variables that it had selected in its final models. As a result, the Evaluation Team was restricted from including any additional production variables in its reporting period models, which limited the Team's ability to fully assess the impact of all production variables for a facility. However, because all facility production data were collected during the baseline period, the Team could test the significance of these additional variables. In many cases, it added another production variable to the baseline models to improve their adjusted R squared and AIC. The Evaluation Team improved upon the adjusted R squares of the implementer's baseline model in all but one case, for which the Team's model did not agree with the Implementer's suppression of the intercept. Appendix H includes detailed descriptions of each facility's regression models.

To estimate a facility's savings for the reporting period, the Team forecasted baseline consumption into the reporting period to predict what consumption would have been if the Program had not been implemented. The Team then took the difference between predicted and measured energy consumption during the reporting period. To isolate the operational and behavioral savings obtained through the Strategic Energy Management Pilot, the Evaluation Team deducted savings resulting from additional claimed capital projects that received incentives through both the Large Energy User Program and the Strategic Energy Management Pilot.

The Team investigated if the Program Implementer's savings estimation methodology followed industry best practices by reviewing the Implementer's program tracking data, project documentation, data collection and preparation, regression model development, models, and savings calculations. The Team met frequently with the Implementer to discuss the methodology used to estimate the final savings.

Although the Evaluation Team found minor differences across each facility and was not able to test all possibly relevant production variables because of missing data, it found that the Implementer's models were generally consistent with the Team's models. Given the final realization rate and relatively high adjusted R squares of the Implementer's models, it appears that the Implementer was able to capture the largest components of energy use in its baseline models. The biggest driver of the difference between *ex ante* and verified savings was from the selection of HDD and CDD and the Evaluation Team's inclusion of interactions between variables.

CY 2017 Verified Gross Savings Results

Savings were documented in three ways to investigate the full influence of the Strategic Energy Management Pilot. First, the operational and behavioral savings from the Pilot were isolated via regression modeling. Then *ex ante* gross savings were added from the SEM capital projects listed in SPECTRUM for the six evaluated participants. Finally, *ex ante* gross savings from the large energy user

capital projects listed in SPECTRUM were added for these six participants to provide an upper limit on the overall energy savings that could be attributed to the influence of the Pilot.

Because large energy user measures were evaluated separately, realization rates are reported only for the SEM operational and behavioral savings and the overall SEM claimed savings for these six participants (including capital projects). The Evaluation Team found MMBtu realization rates of 99% across the Pilot. The Strategic Energy Management Pilot achieved total program savings of 149,026 MMBtu, including operational and behavioral savings of 118,410 MMBtu

Table 257. Strategic Energy Management Annual Realization Rates by Measurement Type

Measurement Type	Annual Realization Rate		
	kWh	therms	MMBtu
Operational and Behavioral Savings	128%	97%	99%
Total Claimed Savings - SEM Pilot	110%	99%	99%

Table 258 lists the *ex ante* and verified annual gross savings for the Program for CY 2017.

Table 258. Strategic Energy Management Annual Gross Savings Summary by Measurement Type

Measure	*Ex Ante* Gross Annual				Verified Gross Annual			
	kWh	kW	therms	MMbtu	kWh	kW	therms	MMbtu
Operational and Behavioral Savings	1,756,165	-	1,136,311	119,623	2,241,361	-	1,107,626	118,410
Total Claimed Savings - SEM Pilot	4,648,326	499	1,343,787	150,239	5,133,522	499	1,315,102	149,026
SEM Pilot + Participant LEU Savings	17,593,434	1,883	1,522,182	212,247	18,078,630	1,883	1,493,497	211,034

Table 259 lists the *ex ante* and verified lifecycle gross savings for the Program for CY 2017.

Table 259. Strategic Energy Management Lifecycle Gross Savings Summary by Measurement Type

Measure	*Ex Ante* Gross Annual				Verified Gross Annual			
	kWh	kW	therms	MMbtu	kWh	kW	therms	MMbtu
Operational and Behavioral Savings	1,756,165	-	1,136,311	119,623	2,241,361	-	1,107,626	118,410
Total Claimed Savings - SEM Pilot	40,207,791	499	3,654,362	502,625	40,692,987	499	3,625,677	501,412
SEM Pilot + Participant LEU Savings	229,956,704	1,883	5,796,635	1,364,276	230,441,899	1,883	5,767,950	1,363,063

Process Evaluation

In CY 2017, the Evaluation Team conducted in-depth interviews as part of the process evaluation activities, focusing on these key topics:

- Program design
- Program management and delivery
- Program changes
- Program goals
- Program data management and reporting

Program Design, Delivery, and Goals

The Evaluation Team interviewed key Program Administrator and Program Implementer staff to get an overview of the Program design, delivery process, and any changes or challenges in implementation.

Program Design

Customers whose monthly demand is at least 1,000 kW of electricity or 100,000 therms of natural gas, and whose combined utility bill was at least $60,000 in any month of the preceding year, are eligible for prescriptive and custom incentives through the Large Energy Users Program. The incentives are for measures that reduce customers' energy use and demand. Custom incentives are available for more complex and site-specific projects. Appendix C contains information on the Large Energy Users Program incentive structure.

Each customer facility is assigned to an Energy Advisor (an employee of the Program Implementer, Leidos, or its subcontractor, CleanTech Partners). The 12 Energy Advisors (nine from Leidos and three from CleanTech Partners) coordinate with utility key account managers (KAMs) to help customers identify and quantify opportunities to save energy, apply for incentives, manage energy use fundamentals, and access other available resources. For custom measures, the customer must work with an Energy Advisor to estimate savings, determine eligibility requirements for measures, and take the steps to complete Program participation and receive an incentive. The KAM may lead project meetings and use the Energy Advisor as a resource.

Customers pursuing a custom incentive project must receive preapproval from Focus on Energy prior to beginning the project or purchasing equipment to be eligible.

Program Management and Delivery Structure

Energy Advisors work closely with KAMs, Trade Allies, and customers to identify potential projects and coordinate Program offerings that best meet each customer's needs.

Trade Allies have a key role in introducing project ideas, working through project implementation and savings calculations, and completing the project from initiation to closure with the large energy user.

Both the Program Administrator and Program Implementer said the Program is being delivered according to their expectations and is operating smoothly. In April 2017, the Large Energy Users Program was nationally recognized with the Inspiring Efficiency Award from the Midwest Energy Efficiency Alliance for being a Midwest leader that has delivered groundbreaking advancements in energy efficiency in the "Impact" category. This Impact category acknowledges organizations that have made significant contributions to market transformation.[169] As indicated on the Midwest Energy

[169] More information on the Midwest Energy Efficiency Alliance and the Inspiring Efficiency Award categories is available online: http://www.mwalliance.org/conference/inspiring-efficiency-awards

Efficiency Alliance website, the Program has met all goals and supported transforming new industrial technologies from "emerging" status to "best practice" status.[170]

Strategic Energy Management Pilot

The Strategic Energy Management Pilot launched in CY 2015 at the direction of the PSC to provide support for 30 large energy use customers looking to implement management systems and energy saving initiatives in their facility. In CY 2015, CY 2016, and continuing through CY 2017, the Strategic Energy Management Pilot received its own funding and energy savings goals and was fully operational under the Large Energy Users Program. A detailed process evaluation of the Strategic Energy Management Pilot was conducted in CY 2016.

Strategic Energy Management Partners

In CY 2017, a new SEM offering was launched, called Strategic Energy Management Partners (SEM Partners). This offering is not a pilot but is a permanent offering of the Large Energy Users Program. It is managed and implemented by the Program Implementer, delivers the same custom and prescriptive incentives as the Large Energy Users Program, and is currently available only for customers eligible for the Large Energy Users Program. The Program began conducting outreach for SEM Partners in 2017 to a new set of participants beyond the 30 customers already enrolled in the Pilot.

As a Strategic Energy Management Partner, the participant builds a foundation for continuous energy improvement by establishing energy baseline use and monitoring and pursuing improvement opportunities for six months. The second step, for the most ready and committed Strategic Energy Management Partners, is to become a Strategic Energy Management Leader, where the participants work on more complex projects, such as energy IT improvements and ISO implementation,[171] similar to the experience of the Strategic Energy Management Pilot participants.

An eligible large energy user may apply to become a SEM Partner, as it is an entry-level offering for customers who are ready and interested in adopting a continuous improvement approach to managing their energy.

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[170] A description of Focus on Energy's Inspiring Efficiency Award in the Impact Category is available online: http://www.mwalliance.org/conference/inspiring-efficiency-awards/2017-impact-focus-energy

[171] ISO 50001 is an internationally recognized energy management standard that helps organizations use energy more efficiently through the development of energy management systems.

During the initial six-month engagement period, the SEM Partner focuses on several tasks:

- Using energy and production data to develop a baseline energy use model and to track energy use performance
- Undertaking energy performance improvement opportunities as identified through a review of facilities, operations, and the performance tracker
- Understanding IT capabilities for measuring, monitoring, and controlling energy

After the initial six months, the SEM Partner has several options:

- Discontinuing their participation in the Strategic Energy Management Pilot
- Continuing as a SEM Partner
- Becoming a Strategic Energy Management Leader by committing to implement an ISO 50001-level energy management program.

The Program Administrator and the Program Implementer said they were pleased with the delivery of this offering so far, and specifically, the Program is experiencing a low rate of participation attrition. One participant is achieving ISO 50001 Certification,[172] potentially five other participants are seeking ISO Certifications, and up to eight participants are seeking to achieve ISO-Ready status.

Program Changes

Focus on Energy made several changes to Large Energy Users Program incentives and eligibility requirements in CY 2017 (shown in Table 260) to improve customers' ability to participate in the Program:

- Increased therm incentive payments from $0.40 to $0.60 per therm
- Increased the annual customer cap from $300,000 to $400,000
- Increased the maximum custom payback from five years to eight years
- Increased the single project cap from $150,000 to $200,000
- Reinstated eligibility of compressed air leak surveys and repairs, as well as compressed air heat recovery measures

[172] More information about the International Organization for Standardization and a description of ISO certification is available online: https://www.iso.org/iso-50001-energy-management.html

Table 260. CY 2016 and CY 2017 Program Incentives

Incentive Rates	CY 2016	CY 2017
Custom Incentive: per kW Demand	$100	$100
Custom Incentive: per kWh (Non-Lighting)	$0.03	$0.03
Custom Incentive: per kWh (Lighting)	$0.02	$0.02
Custom Incentive: per Annual Therm	$0.40	$0.60
Payback Eligibility	5 years maximum, 1.5 years minimum	8 years maximum, 1.5 years minimum
Maximum Incentive: Percentage of Actual Project Cost	30%	30%
Single Project Cap	$150,000	$200,000
Customer Annual Cap	$300,000	$400,000
Prescriptive Incentive Measures	Compressed air leak survey and repair (disallowed)	Compressed air leak survey and repair (allowed)
	Compressed air heat recovery (disallowed)	Compressed air heat recovery (allowed)

The Program Implementer also reported that it and the Program Administrator made efforts to refine the communication process for paperwork in CY 2017 in response to participant suggestions. The Program Implementer said that, although reducing the volume of required paperwork is difficult (most is standard Focus on Energy documentation), it has implemented steps to improve communication about the project process. The Program Implementer now sends immediate notifications of any delay in application processing to applicants and all other project stakeholders (such as KAMs and Trade Allies, if relevant). This notification includes prompts for the customer to resolve gaps or missing information if needed, along with a timeline to preserve their incentive eligibility, thus ensuring that paperwork moves along in a predictable manner.

Program Goals

The Large Energy Users Program has energy saving and demand reduction goals as well as internal KPIs set by the Program Administrator. In CY 2017, the Program met its electric and demand savings goals but did not achieve its therm goals. The Large Energy Users Program had the following CY 2017 performance targets:

- Gross annual savings goal: 14,000 kW
- Gross lifecycle goal: 1,620,000,000 kWh
- Gross lifecycle goal: 158 million therms

Table 261 shows the KPIs and CY 2017 results reported by the Program Implementer (and verified by the Evaluation Team through SPECTRUM, where possible).

Table 261. Large Energy Users Program CY 2017 Key Performance Indicators

KPI	Goal	CY 2017 Result	Source
Preapproval Processing Time	Program Implementer shall average 10 business days for preapproval of custom incentives and shall use all reasonable efforts to limit rush preapproval requests submitted to Program Administrator to no more than three requests per calendar month. The processing time begins on date the Program Implementer enters the completed application into SPECTRUM.	Unable to verify	No electric reports available to measure this KPI
UW-Milwaukee Industrial Assessment Center (IAC) Leads	Program Implementer shall enter a minimum of two projects per quarter into SPECTRUM from leads established through IAC.	The IAC did not send study reports, so there were no leads to pursue.	Program Administrator
Days Incentive Outstanding (DIO)	The Program shall annually average 45 DIO for standard incentive applications.	Met goal, average of 38 DIO.	SPECTRUM
Customer Satisfaction	Achieve 90% or higher satisfaction from participating customers, based on Program Implementer survey approved by Program Administrator or Program Administrator survey	Score of 8.9	CSAT Customer Survey
Claim-Only Savings	Contact at least three past customers per month that received a project assessment incentive, performance-based assessment study incentive, or biogas feasibility study grant, or that expected additional future energy savings associated with a completed project, seeking possible claim-only savings	Unable to verify	
Project/Savings/ Budget Forecasts	Provide updated forecast of CY 2017 annual energy efficiency savings and incentive budget expenditures and similar forecast for the CY 2018 pipeline, at least every three weeks	Met goal; updates typically provided on a weekly basis	Program Administrator email records
Emerging Technologies	Transfer a minimum of six technologies from the Emerging Technologies Program to the Large Energy Users Program over the CY 2015–CY 2018 contract term	Met goal (eight new technologies have been transferred)	Emerging Technologies Program Monthly Performance Report

Data Management and Reporting

The Large Energy Users Program Administrator and Program Implementer continued to manage Program data and generate reports through SPECTRUM, including SPECTRUM applications, customer records, reports, and opportunity tracking (under development).

In addition, these are tracking spreadsheets for functions that SPECTRUM does not serve:

- Project forecasting and custom project tracking spreadsheet
- Customer cap checklist
- Prescriptive application list and missing information notifications
- Market category spreadsheet

The Program Administrator said Focus on Energy has been consistently improving SPECTRUM, year after year, and the data tracking system is meeting its needs. In particular, the Program Administrator said data extracts provided through SPECTRUM efficiently provides useful analytical summaries.

The Program Implementer said the major shift in CY 2017 was to incorporate pre-project incentive opportunities in forecasts of incentive spending and savings before a customer submits any paperwork. Although implementing this procedure has had its challenges, the Program Implementer expects it to be fully functional for CY 2018 and useful for illustrating future opportunities.

The Program Implementer also discussed the days incentive outstanding (DIO) and repeated the comment made in CY 2016, that the calculations for this and for project approval times can be improved to more accurately reflect performance.

Marketing and Outreach

The Program Implementer uses a direct, customer-centered approach to market the Large Energy Users Program to the relatively small number of eligible customers (approximately 750 eligible customers as defined by the customer's tax ID). Because most projects are highly technical, Program marketing campaigns deliver services, technical support, and information to the targeted markets, in addition to providing incentives. The Program Implementer provides professional energy engineering expertise and a strong understanding of technologies, which contributes to customer satisfaction and achieving Program goals.

The Program is marketed through the Focus on Energy website, Energy Advisors, Trade Allies, customer contractors, and participation in external organizations by the Program Administrator and Program Implementer. The Energy Advisors have developed long-term relationships and achieved long-term commitment for large, time-consuming projects and these customers return to participate year after year.

Marketing Tactics

The Program Implementer uses several marketing tactics, as described below.

Frequent Communication

Although customers are generally very aware of the Large Energy Users Program (partly because of the manageable number of eligible customers), in CY 2017 the Program Implementer emphasized more frequent, quick check-in interactions with eligible customers.

Utility Involvement

Program actors noted that utilities throughout the state are becoming more involved with Program promotion, further marketing the value of technical expertise through the Program. In CY 2016, the Evaluation Team recommended considering ways to improve participants' trust of utility representatives as a source of information. The Program Implementer said this continues to be a challenge—Focus on Energy is often associated with energy efficiency, but the utility is often not. The Program Implementer

reported working on this issue by refining coordination and providing support to utility KAMs to ensure they are central to the process.

Energy Efficiency Excellence Awards

The Program Administrator said that in CY 2017 Focus on Energy's commercial programs continued to promote Energy Efficiency Excellence Awards to recognize commercial and industrial facilities for their hard work in advocating for energy efficiency. This interviewee said these awards are a huge opportunity for some companies because Wisconsin state legislators, mayors, and other notable regional leaders attend the events and ceremonies. The Program Implementer also said these awards are a way to thank energy champions for being such a huge part of the Program.

Barriers to Participation

Program actors noted several Program challenges and barriers and said the most prominent barrier for Program participation is low natural gas prices, which inhibits natural gas projects because of the short payback periods required by many companies. Tangentially related to the low natural gas prices, the Program Administrator observed that the overall custom track participation is not achieving levels from previous years; there are not as many large projects and the large projects that do exist are not as large as projects in CY 2014 and CY 2015.

In terms of future performance, the Program Administrator and the Program Implementer discussed the Program's maturity and concerns about baseline and stated some concern that the Program has been operating long enough for some measures installed in early Program years to be reaching the end of their useful life. For example, some VFDs that received Program incentives now need to be replaced. However, the prescriptive path requires that the previous motor not be a VFD, precluding this measure from being upgraded. In addition, replacing this measure under the custom path would yield trivial benefits, as the payback criteria with the new VFD will use the old VFD as a baseline.

The Program Administrator spoke about compressed air in a similar context; manufacturers are starting to sell prepackaged compressor systems built with meters and energy efficiency requirements as standard practice. The Program Administrator and the Program Implementer both had similar concerns regarding the saturation of high-efficiency commercial lighting measures.

Annual Results from Ongoing Customer Satisfaction Survey

Throughout CY 2017, the Evaluation Team surveyed participants to measure their satisfaction with various aspects of the Large Energy Users Program.[173] Respondents answered questions on a scale of 0 to 10, where 10 indicates the highest satisfaction or likelihood and 0 the lowest. [174]

Figure 159 shows that CY 2017 respondents gave the Program an average overall satisfaction rating of 8.9, which was not statistically different from the portfolio baseline of 8.8 (indicated by the purple line).[175] This rating was significantly above the portfolio baseline and significantly higher than CY 2016 during Q2 but was not higher for any other quarters in CY 2017.[176]

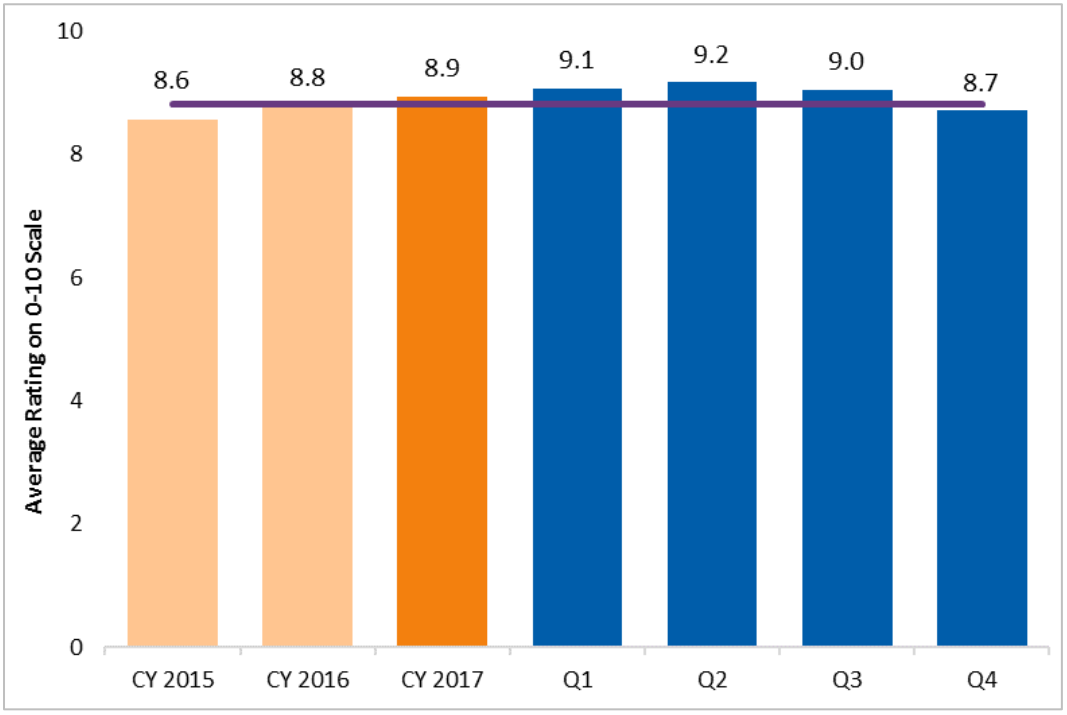
[173] The Evaluation Team found that some surveys did not include identifying information to allow matching survey responses to Program participation dates. The Team included survey responses without participation dates in the year-end total but not in the quarterly breakdown.

[174] The number of participants who completed a survey does not always match the number of responses for each question, as some participants skipped questions, did not know answers to questions, or did not qualify to answer questions based on previous answers or other known data about the participant.

[175] The portfolio baseline of 8.8 is a participation-weighted average of CY 2015 program satisfaction ratings from across the portfolio. This baseline value established a KPI for the Program Implementer (i.e., to meet or exceed the baseline value over the last three years of the 2015-2018 quadrennium).

[176] Q2 was significantly higher than the baseline ($p < 0.05$) and significantly higher than CY 2016 ($p < 0.05$) using binomial t-tests.

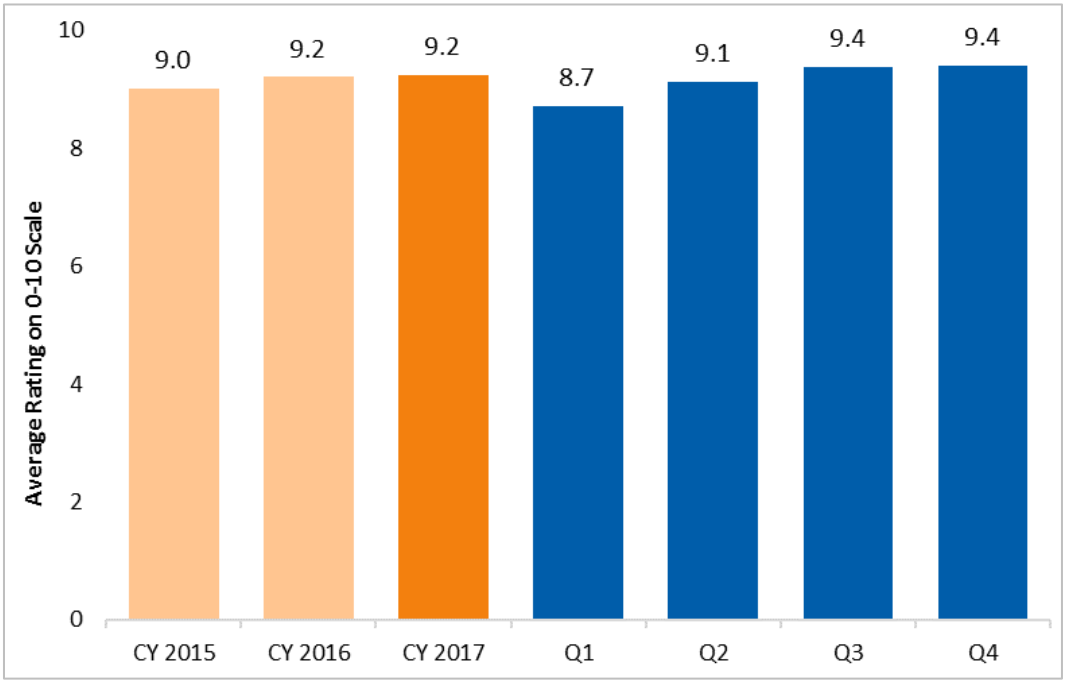
Figure 159. CY 2017 Overall Program Satisfaction



Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "Overall, how satisfied are you with the Program?" (CY 2015 n=129, CY 2016 n=170, CY 2017 n=149, Q1 n=14, Q2 n=42, Q3 n=22, Q4 n=64). The portfolio baseline (8.8) is indicated by a purple line.

As shown in Figure 160, respondents rated their satisfaction with the upgrades they received through the Program as an average of 9.2. The CY 2017 result is not statistically different from the CY 2016 rating (9.2), though during Q1 the average rating was significantly below CY 2016. [177]

Figure 160. CY 2017 Satisfaction with Program Upgrades

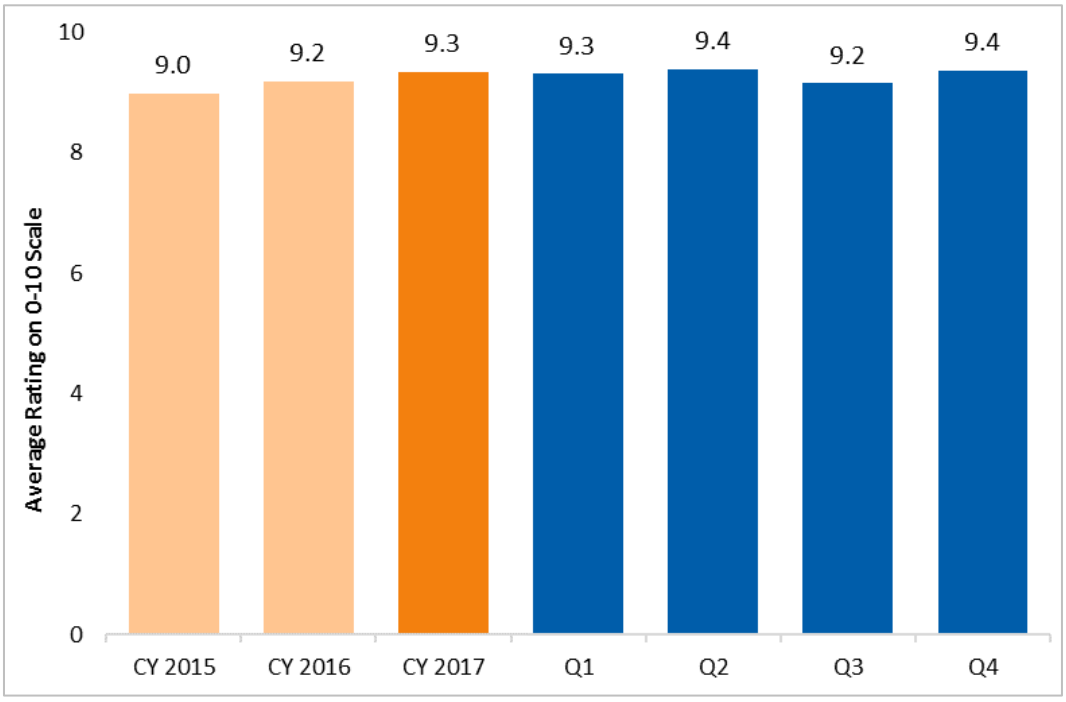


Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the energy-efficient upgrades you received?" (CY 2015 n=128, CY 2016 n=167, CY 2017 n=145, Q1 n=14, Q2 n=41, Q3 n=21, Q4 n=62)

[177] $p < 0.10$ using binomial t-test.

Participants gave the Focus staff who assisted them similarly high satisfaction ratings, averaging 9.3 for CY 2017 (Figure 161). This result is not statistically different from the rating of 9.2 in CY 2016.

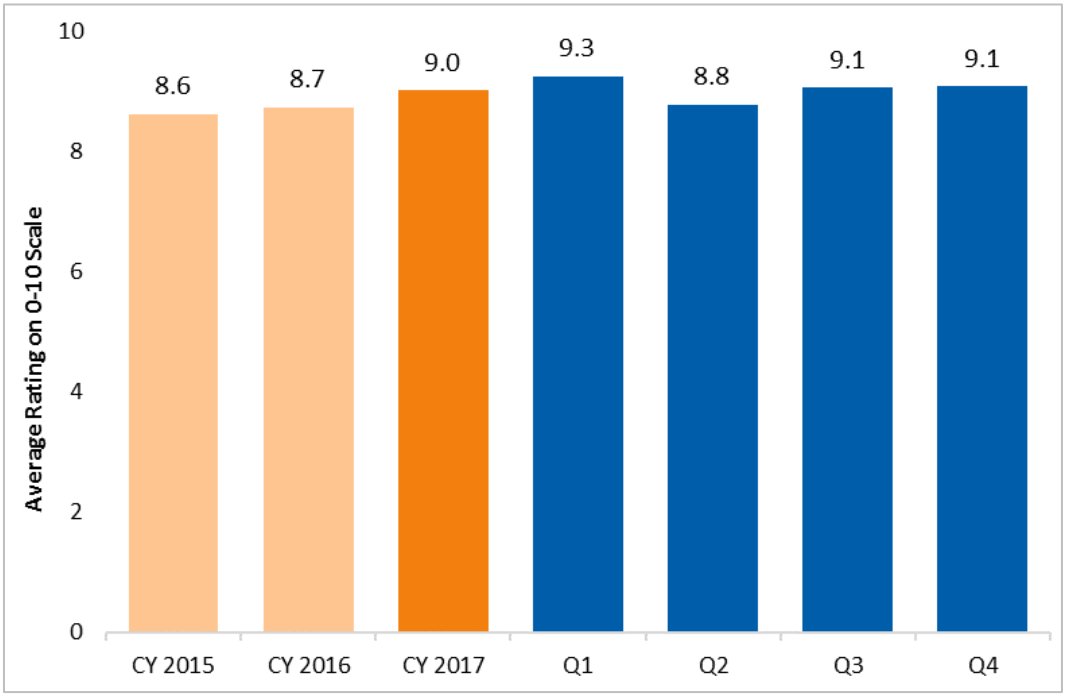
Figure 161. CY 2017 Satisfaction with Focus on Energy Staff



Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the Energy Advisor or Focus on Energy staff who assisted you?" (CY 2015 n=117, CY 2016 n=149, CY 2017 n=130, Q1 n=13, Q2 n=34, Q3 n=20, Q4 n=56)

Respondents gave an average rating of 9.0 for their satisfaction with the contractor who provided Program services (Figure 162). This is not statistically different from the average CY 2016 rating (8.7), though nearly so. The ratings from Q1 (9.3) and Q4 (9.1) were significantly higher than CY 2016. [178]

Figure 162. CY 2017 Satisfaction with Program Contractors

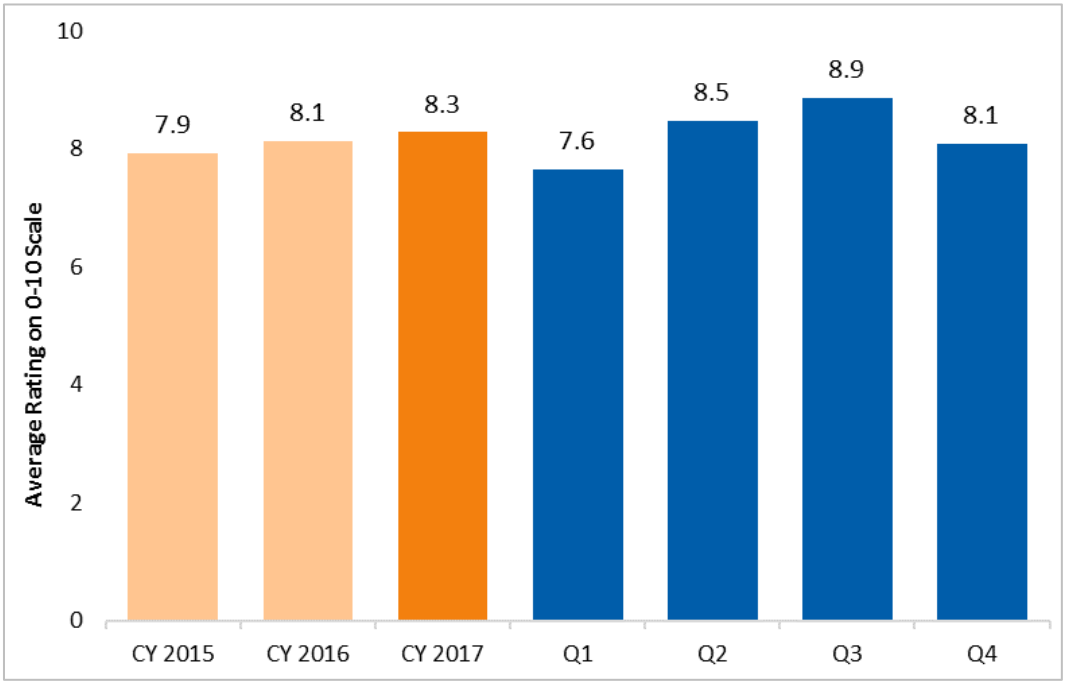


Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the contractor who provided the service?" (CY 2015 n=110, CY 2016 n=142, CY 2017 n=125, Q1 n=12, Q2 n=35, Q3 n=20, Q4 n=54)

[178] $p < 0.10$ using binomial t-tests.

Respondents gave an average rating of 8.3 for their satisfaction with the incentive they received (Figure 163). This rating was significantly higher in Q3 than in CY 2016, but it was not higher than the previous year for any other quarters or for CY 2017 overall.[179]

Figure 163. CY 2017 Satisfaction with Program Incentives

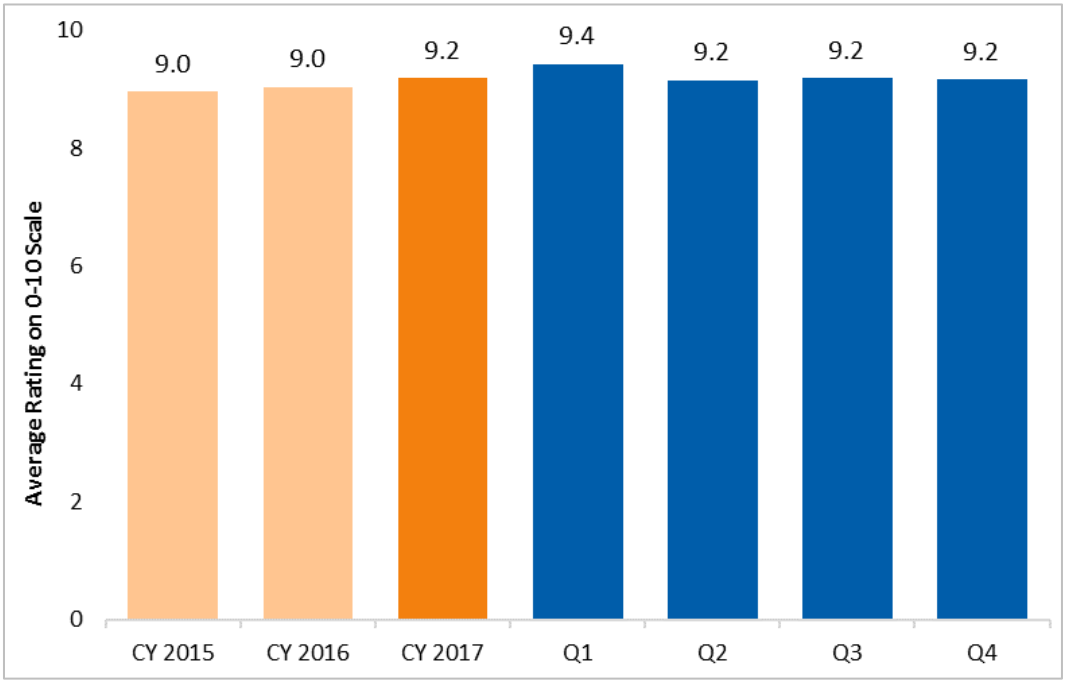


Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "How satisfied are you with the amount of incentive you received?" (CY 2015 n=129, CY 2016 n=166, CY 2017 n=148, Q1 n=14, Q2 n=42, Q3 n=22, Q4 n=63)

[179] $p < 0.05$ using binomial t-test.

As shown in Figure 164, respondents rated the likelihood that they will initiate another energy efficiency project in the next 12 months as 9.2, on average. The increase from the average CY 2016 rating (9.0) was not statistically significant.

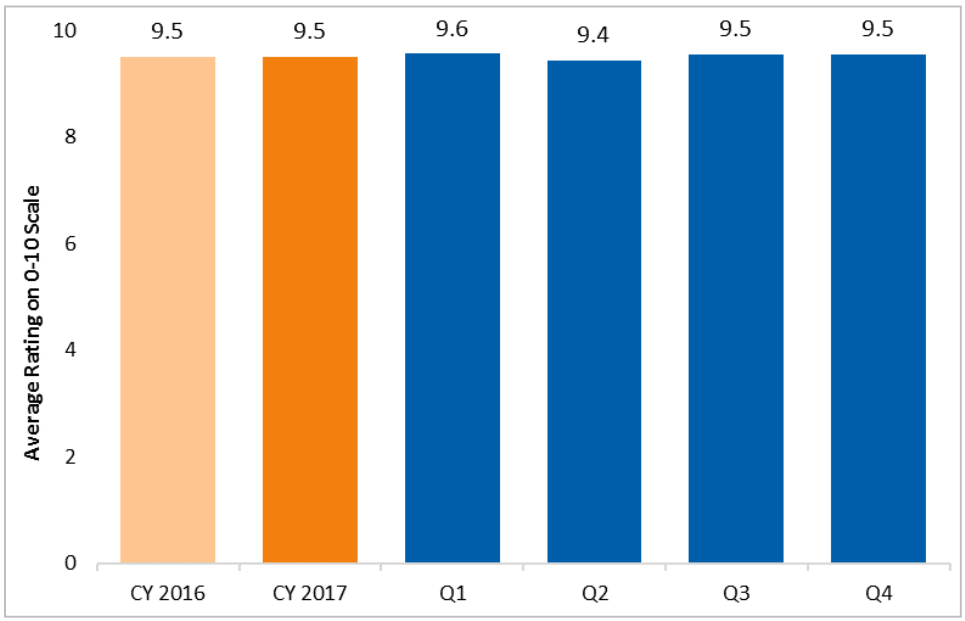
Figure 164. CY 2017 Likelihood of Initiating Energy Efficiency Improvement



Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "How likely are you to initiate another energy efficiency improvement in the next 12 months?" (CY 2015 n=120, CY 2016 n=162, CY 2017 n=145, Q1 n=14, Q2 n=39, Q3 n=22, Q4 n=64)

Figure 165 shows that respondents gave a rating of 9.5 for the likelihood they would recommend the Program to other businesses, the same as the average rating from CY 2016 participants.[180] Every quarter of CY 2017 was statistically equivalent to CY 2016.

Figure 165. CY 2016 Likelihood of Recommending the Program



Source: Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "How likely is it that you would recommend this Program to others?" (CY 2016 n=165, CY 2017 n=149, Q1 n=14, Q2 n=42, Q3 n=22, Q4 n=64)

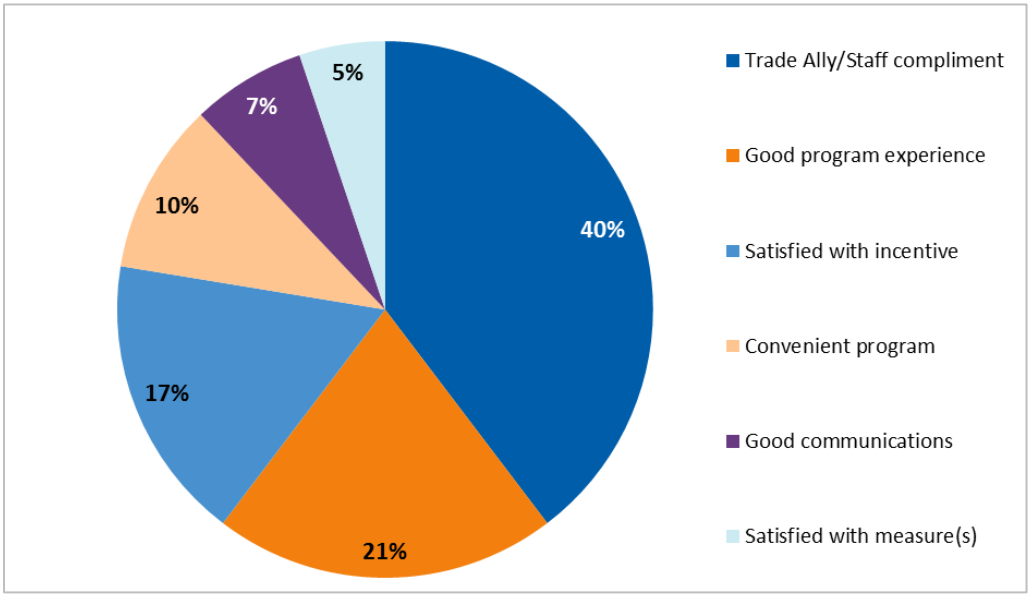
Using these survey data, the Evaluation Team calculated a NPS based on customers' likelihood to recommend the Program. The NPS is expressed as an absolute number between -100 and +100 that represents the difference between the percentage of promoters (respondents giving a rating of 9 or 10) and percentage of detractors (respondents giving a rating of 0 to 6). The Large Energy Users Program NPS is +85 for CY 2017, similar to +89 in CY 2016.

The ongoing participant satisfaction surveys also included a question about whether participants had any comments or suggestions for improving the Program. Of the 149 participants who responded to the survey, 55 (37%) provided open-ended feedback, which the Evaluation Team coded into a total of 75 categories. Of these open-ended responses, 58 (77%) were complimentary comments, and 17 (23%) were suggestions for improvement.

[180] Customers who said they already have recommended the Program were counted in mean ratings as a rating of 10 (most likely).

Respondents' positive comments are shown in Figure 166. Respondents most frequently complimented the Program Energy Advisors and Trade Allies (40%), as they had done in CY 2016. Respondents also commonly commented on a positive Program experience (21%) and satisfaction with incentives (17%).

Figure 166. CY 2017 Positive Comments about the Program

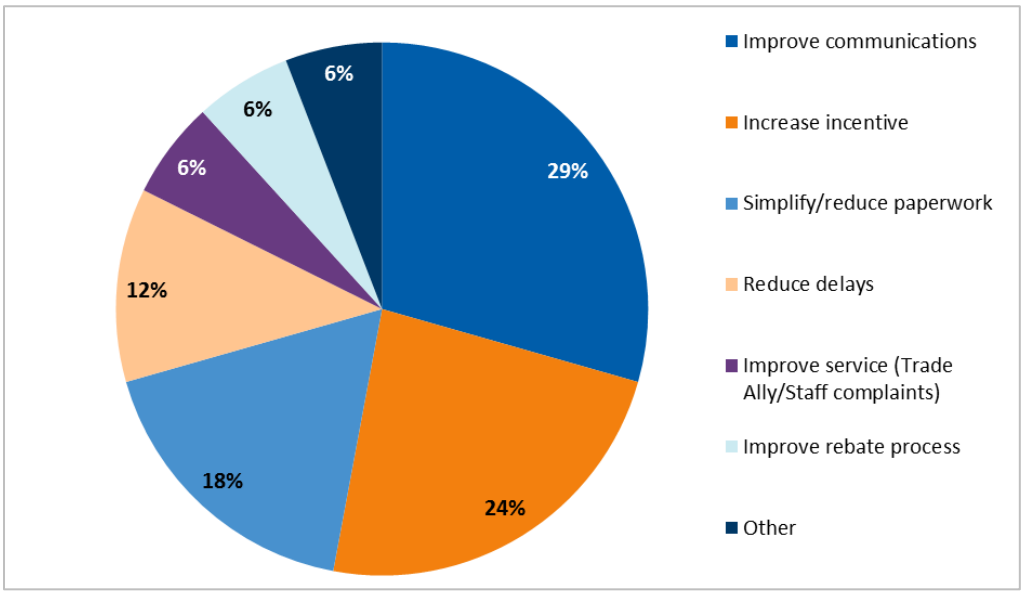


Source: CY 2017 Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total positive mentions: n=58)

Just 17 respondents reported suggestions for improving the program. These are shown in Figure 167. The four most frequent suggestion categories in CY 2017 were also the four most frequently mentioned in CY 2016. Suggestions to improve Program communications were mentioned most often (29% in CY 2017, or five responses), which was also true in CY 2016 (22%) and CY 2015 (38%). The other common suggestions were increasing the incentive (24%, or four responses), simplifying and reducing paperwork (18% or three responses), and reducing delays (12%, or two responses).

In CY 2017, suggestions concerning Program communications included providing better explanations of program requirements and requests to provide better documentation of incentives by project.

Figure 167. CY 2017 Suggestions for Improving the Program



Source: CY 2016 Large Energy Users Program Ongoing Participant Satisfaction Survey Question: "Please tell us more about your experience and any suggestions." (Total suggestions for improvement mentions: n=17)

Trade Ally Involvement

Both the Program Administrator and the Program Implementer reported that Trade Allies are satisfied with the Program so they have made few changes in their interactions with Trade Allies compared to CY 2016. The Program Implementer observed a reduction in training attendance for some measures, such as VFDs and compressed air, indicating a high level of knowledge with these technologies. The Implementer is currently exploring new training topics.

Both the Program Administrator and the Program acknowledged that making changes to the Program each year is difficult for Trade Allies and an ongoing challenge to manage. Because Trade Allies often work on projects that take months (or years) to plan, changes in incentives and eligibility requirements may alter planned projects. Although both interviewees acknowledged the importance of communicating Program changes as early as possible, the Program Administrator said it is difficult to improve this situation because so much of the final Program design is dictated by the final Program budget, an amount that is often unknown until late in the Program year.

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 262 lists the CY 2015, CY 2016, and CY 2017 incentive costs for the Large Energy Users Program.

Table 262. Large Energy Users Program Incentive Costs

	CY 2017	CY 2016	CY 2015
Incentive Costs	$9,097,292	$10,341,953	$13,920,708

The Evaluation Team found the CY 2016 Program was cost-effective (6.76). Table 263 lists the evaluated costs and benefits.

Table 263. Large Energy Users Program Costs and Benefits

Cost and Benefit Category	CY 2017	CY 2016	CY 2015
Costs			
Administration Costs	$1,164,121	$1,201,920	$1,048,361
Delivery Costs	$4,753,592	$4,907,942	$4,280,895
Incremental Measure Costs	$31,310,130	$49,792,860	$53,682,911
Total Non-Incentive Costs	**$37,227,843**	**$55,902,722**	**$59,012,167**
Benefits			
Electric Benefits	$132,259,787	$97,457,224	$132,363,885
Gas Benefits	$87,348,431	$124,834,595	$133,828,779
Emissions Benefits	$31,961,008	$31,688,806	$37,417,087
Total TRC Benefits	**$251,569,225**	**$253,980,625**	**$303,609,751**
Net TRC Benefits	**$214,341,382**	**$198,077,903**	**$244,597,584**
TRC B/C Ratio	**6.76**	**4.54**	**5.14**

Table 264 lists the incentive costs for the Strategic Energy Management Pilot for CY 2017.

Table 264. Strategic Energy Management Pilot Incentive Costs

	CY 2017
Incentive Costs	$875,573

The Evaluation Team found the CY 2017 Pilot was cost-effective (2.61). Table 265 lists the evaluated costs and benefits.

Table 265. Strategic Energy Management Pilot Costs and Benefits

Cost and Benefit Category	CY 2017
Costs	
Administration Costs	$220,367
Delivery Costs	$899,849
Incremental Measure Costs	$543,819
Total Non-Incentive Costs	**$1,664,035**
Benefits	
Electric Benefits	$2,006,117
Gas Benefits	$1,791,770
Emissions Benefits	$541,499
Total TRC Benefits	**$4,339,387**
Net TRC Benefits	**$2,675,352**
TRC B/C Ratio	**2.61**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Program.

Outcome 1. The Large Energy Users Program performed well in CY 2017, exceeded its CY 2017 verified gross demand and lifecycle electric savings goals, and nearly reached the lifecycle natural gas savings goal. In addition, large energy use customers are highly satisfied with the Program. The Program's NPS of 85 is one of the highest among Focus on Energy nonresidential programs, indicating strong customer engagement. The participant survey garnered a large number of optional, positive anecdotal comments from participants, more than twice the number of comments aimed at Program improvements and mostly centered on positive feedback for Energy Advisors and Trade Allies.

Outcome 2. Significant variances in evaluation site visit findings from reported project documentation were the major contributors to not achieving 100% realization rates. The Evaluation Team's on-site findings increased and decreased the electric and gas realization rates. The Team found differences in equipment ISRs, facility types, installed equipment types, and installed equipment operating parameters. In particular, Process measures carry more risk of volatility because they are not necessarily correlated to weather conditions and because savings estimates can vary widely from one facility to the next. One of the largest measures included in the evaluation sample represented 21% of the sampled energy savings, and a small unit conversion issue lowered the realization rate for the project to 92%.

Recommendation 2. Consider implementing additional scrutiny for project documentation and more in-depth post-installation inspections, especially for large custom projects and process measures.

Outcome 3. The accurate and timely accounting of claimed and verified savings for the SEM Pilot would benefit greatly from improvements in data collection and transmission. Claimed CY 2017 savings for the Strategic Energy Management Pilot were not available in SPECTRUM until April 2017, creating challenges in timely savings evaluation and reporting. In addition, shared data and models required numerous meetings and resources to parse, and in some cases relevant data may not have been consistently collected.

Recommendation 3a. Track all production variables from the beginning of the baseline period through the end of the performance period. This will allow the Evaluation Team to test all possible drivers of energy use.

Recommendation 3b. Upload all claimed savings to Spectrum (including regression model savings) by the end of the calendar year to ensure timely reporting and accurate record keeping.

Pilots and New Programs

This chapter summarizes programs and pilots that are unaffiliated with other residential or nonresidential programs. For CY 2017, these programs were the Networked Lighting Controls Pilot, the Seasonal Savings Pilot, the Midstream Commercial Kitchen Equipment Pilot, the Low-E Storm Windows Pilot, and the rural Digital Customer Engagement for Business Pilot.

The Evaluation Team evaluated savings from the Networked Lighting Controls Pilot and the Seasonal Savings Pilot; the findings are provided in this chapter.

Focus on Energy did not claim savings in CY 2017 for the Midstream Commercial Equipment Pilot or the Low-E Storm Windows Pilot. The Digital Customer Engagement for Business Pilot was scoped in 2017 and will launch in 2018. The Evaluation Team plans to verify *ex ante* savings and provide impact evaluation findings for the Midstream Commercial Equipment Pilot and the Low-e Storm Windows Pilot in the CY 2018 report.

The following sections provide pilot descriptions and *ex ante* and *ex post* verified gross savings and describe completed evaluation activities or descriptions of future evaluation plans. Table 266 lists the *ex ante* annual and lifecycle gross savings for the five new programs and pilots for CY 2017. *Ex ante* savings are only counted in 2017 program totals for those programs that also have evaluated verified savings; others will be included in 2018 when their savings are evaluated.

Table 266. CY 2017 Pilots and New Programs Annual and Lifecycle *Ex Ante* Gross Savings Summary

Program	*Ex Ante* Gross Annual			*Ex Ante* Gross Lifecycle		
	kWh	kW	Therms	kWh	kW	Therms
Networked Lighting Controls Pilot	914,071	166	-	14,618,437	166	-
Seasonal Savings Pilot	351,576	-	174,864	351,576	-	174,864
Subtotal, Evaluated Pilots	**1,265,647**	**166**	**174,864**	**14,970,013**	**166**	**174,864**
Midstream Commercial Kitchen Equipment Pilot	291,867	19	6,554	3,084,650	19	75,092
Low-E Storm Windows Pilot	9,125	15	16,692	137,709	15	250,380
Digital Customer Engagement for Business	-	-	-	-	-	-
Total	**1,566,639**	**200**	**198,110**	**18,192,372**	**200**	**500,336**

Table 267 lists the *ex post* annual and lifecycle verified gross savings for evaluated CY 2017 pilots.

Table 267. CY 2017 Pilots and New Programs Annual and Lifecycle Verified Gross Savings Summary

Program	*Ex Post* Verified Gross Annual			*Ex Post* Verified Gross Lifecycle		
	kWh	kW	Therms	kWh	kW	Therms
Networked Lighting Controls Pilot	317,096	47	-	5,073,544	47	-
Seasonal Savings Pilot	351,576	-	174,864	351,576	-	174,864
Total	**668,672**	**47**	**174,864**	**5,425,120**	**47**	**174,864**

Table 268 lists the annual and lifecycle verified net savings for evaluated CY 2017 pilots.

Table 268. CY 2017 Pilots and New Programs Annual and Lifecycle Verified Net Savings Summary

Program	*Ex Post* Verified Net Annual			*Ex Post* Verified Net Lifecycle		
	kWh	kW	Therms	kWh	kW	Therms
Networked Lighting Controls Pilot	49,235	18	-	787,756	18	-
Seasonal Savings Pilot	351,576	-	174,864	351,576	-	174,864
Total	**400,811**	**18**	**174,864**	**1,139,332**	**18**	**174,864**

Networked Lighting Controls Pilot

In CY 2017, Focus on Energy launched the Networked Lighting Controls Pilot.[181] The Pilot, implemented by Franklin Energy, targeted a wide variety of nonresidential facilities. The Pilot's objectives were to accelerate the adoption of networked lighting controls through the use of Integrated Luminaire Level Controls (ILLC),[182] position Focus on Energy to be a leader in the market evaluation and verification of this new technology, and determine the viability of a prescriptive networked lighting control offering. The Program Implementer plans to include networked lighting controls as a core program offering during CY 2018.

Pilot Offerings

The Pilot focused on networked lighting controls for noncommercial facilities to evaluate their cost-effectiveness and market potential. The Pilot provided nonresidential customers with these energy-efficient products and system capabilities:

- Networking of luminaires and devices
- Occupancy sensing
- Daylight harvesting
- High-end trim
- Software reconfigurable zoning
- Continuous dimming

The Pilot offers incentives for installing lighting systems by the square foot (Table 269).

Table 269. Networked Lighting Controls Measure Descriptions and Amounts

Measure Description	Incentive Amount	Unit
Low Lumen Fixtures (e.g., troffers, downlights)	$0.25	Square Foot
High Lumen Fixtures (e.g., high bays)	$0.125	Square Foot
Energy Monitoring Systems	$0.05	Square Foot

Pilot Results

The Pilot reached five nonresidential customers in CY 2017. Two customers implemented Pilot measures at multiple sites, for a total of 12 separate locations. The Pilot paid out more than $172,000 in incentives, across the five participants. Table 270 lists the participants by sector, measures installed, and total incentives received.

[181] Also known as the Commercial Advanced Lighting Controls Pilot

[182] The Implementer chose Integrated Luminaire Level Controls because of their simple installation features, programmability, and layered technologies.

Table 270. Networked Lighting Controls Participant and Incentive Summary

Participant Sector	Measures	Incentive Amount
Commercial		**$60,319.50**
Commercial Customer 1	Bonus, advanced lighting controls energy monitoring	$14,663.00
	Networked lighting controls, high lumen tier	$36,658.00
Commercial Customer 2	Networked lighting controls, low lumen tier	$8,998.50
Industrial		**$41,757.50**
Industrial Customer 1	Bonus, advanced lighting controls energy monitoring	$11,056.50
	Networked lighting controls, high lumen tier	$24,581.50
	Networked Lighting controls, low lumen tier	$6119.50
Schools and Government		**$70,168.50**
Schools and Government Customer 1	Networked lighting controls, low lumen tier	$50,124.00
Schools and Government Customer 2	Networked lighting controls, low lumen tier	$20,044.50
Total		**$172,245.50**

Table 271 lists the actual spending, savings, participation, and cost-effectiveness for the Pilot. The Pilot did not have any contract savings goals for CY 2017.

Table 271. Networked Lighting Control Pilot Summary

Item	Units	CY 2017
Incentive Spending	$	$172,246
Participation	Number of Participants[1]	5
Verified Gross Lifecycle Savings	kWh	5,073,544
	kW	47
	therms	-
Verified Gross Lifecycle Realization Rate	% (MMBtu)	35%
Net Annual Savings	kWh	49,235
	kW	18
	therms	-
Annual Net-to-Gross Ratio	% (MMBtu)	16%
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	0.80

[1] The pilot had five distinct customers and 12 installation sites.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted impact and process evaluations for the Pilot in CY 2017. The Team designed its EM&V approach to integrate multiple perspectives to assess Pilot performance. Table 272 lists the specific data collection activities and sample sizes used in the evaluations.

Table 272. Networked Lighting Controls Pilot Data Collection Activities and Sample Sizes

Activity	CY 2017 Sample Size (n)
Pilot Actor Interviews	1
Participant Surveys	5
Engineering Desk Review	12
System Energy Monitoring Data Collection	2
On-Site Logger Installation	3

Pilot Actor Interviews

The Evaluation Team spoke to the Pilot Implementer about the pilot design and progress toward goals.

Participant Surveys

The Evaluation Team used Focus' SPECTRUM database to locate each company that participated in the Pilot. For all but one of the interviews, the Team spoke to a single representative. For one of the schools and government participants, the Team spoke to the participant and the contractor who installed the system.

Engineering Desk Review

The Evaluation Team reviewed all available documentation for each of the installed projects, including available invoices, specification sheets, and control system configuration settings. The Team collected information from documents uploaded to SPECTRUM and from the Pilot Implementer.

System Energy Monitoring Data Collection

Two projects implemented system energy monitoring data collection and were eligible for the energy monitoring bonus. The Pilot Implementer forwarded requests from the Evaluation Team to the appropriate contact at each participating site to export data from the monitoring systems. Both participating systems were capable of exporting energy monitoring data at one-hour intervals. The Evaluation Team requested data for a four-week period, which overlapped with the period in which field technicians deployed loggers at each site.

On-Site Logger Installation

A field technician visited three of the project sites to install assorted loggers and meters. The Team selected these sites based on the available timeline for metering. These participants had completed their projects early enough in the year for the Team to install loggers and capture a period of at least three weeks of typical lighting system usage before and after the installation of the new control system.

Prior to installing the new controls, a field technician installed light state loggers on fixtures representing the most common space types in each building. The technician removed the loggers just prior to the controls installation and then installed light intensity level loggers on fixtures in the same spaces to capture the dimming behavior introduced by the new controls. The technician also installed a rooftop ambient lighting intensity sensor to correlate ambient daylight to the system's daylight harvesting controls behavior.

Impact Evaluation

The Pilot Implementer calculated *ex ante* savings as a flat 47% energy-use reduction based on a 2015 Lighting Research Center literature review of existing networked lighting control systems. The Implementer calculated the baseline energy consumption using an assumed lighting power density (LPD)—measured in watts per square foot—by building type, and multiplied that by the square footage within each building with the newly installed lighting controls, using an assumed annual hours of use based on the Wisconsin Focus on Energy 2017 TRM.

There are three primary control strategies used by commercially available network lighting control systems. These include task tuning, which dims fixture brightness to an appropriate level for each space and usage; daylight harvesting, which dims or turns off fixtures in response to ambient daylight in the space; and occupancy sensing, which uses ceiling-mounted or fixture-mounted occupancy sensors to dim or turn off fixtures when a room or zone is unoccupied for a set period of time.

The Evaluation Team used several different methods to determine the verified savings for each project. Because the sample size was small, the Team analyzed each project individually. Pilot savings vary significantly from site to site based on many factors including the particular control strategies enabled, the setpoints used for each control strategy, building characteristics such as the amount of daylight aperture, and occupant preferences and behaviors.

Evaluation of Baseline Consumption

The Evaluation Team estimated the connected controlled lighting load for each project by reviewing invoices and engineering drawings uploaded to the SPECTRUM database. For sites with energy monitoring data, the Team also reviewed the data to determine the full connected load of the system. These estimates are much more precise then an assumed LPD because they use site-specific data. To calculate baseline energy consumption, the Team used the connected lighting load and either a metered or an assumed baseline hours of use.

One school district participated in the Pilot with five schools (constituting five separate projects). The Evaluation Team collected logger data for one school to determine the typical hours of use for each major space type then used the distribution of space types in the other four schools to extrapolate the hours of use to those schools. The Team used these hours of use values with the baseline consumption results to calculate verified energy usage. This methodology is detailed in Appendix H. The Team also installed loggers at two other sites—a parking garage and a commercial building with office and warehouse space. For all other sites, the Team used hours of use assumptions by building type according to the Wisconsin Focus on Energy 2017 TRM.

Evaluation of Energy Savings with Networked Lighting Controls

Table 273 lists the savings evaluation methods used and how many projects the Team evaluated using each method. The calculation methodology used depended on the data available for each site. Appendix H includes a detailed description of each methodology.

Table 273. Calculation Methodologies Used for Networked Lighting Controls Pilot Projects

Savings Calculation Methodology	Number of Projects
System Energy Monitoring Data Modeling	2
Logger Data Analysis	3
Engineering Review Using Logger Data Analysis from Related Sites	4
Engineering Review Without Logger Data	5

In addition to the five school projects described above, two projects had system energy monitoring data available. The Team used these systems to report and model the actual energy consumption and behavior of the networked lighting controls system. These projects included a municipal parking garage structure and a commercial building with a warehouse area and an office area. A total of five projects had no logger data available. This included a second school district with projects at three schools, an office building (where the lighting controls were installed in a newly constructed addition), and a school administration building.

At the office building and the administration building, the Evaluation Team assumed an energy usage reduction of 47%, as used in the original Pilot estimates. This was because there was no verified site-specific information regarding the actual hours of use reduction introduced by the controls. For these two projects, the Evaluation Team used the hours of use assumptions from the Wisconsin Focus on Energy 2017 TRM, based on sector.

The Pilot Implementer reported that the controls configuration at the three schools in the second participating school district only had task tuning and occupancy controls enabled. Therefore, the Evaluation Team applied task tuning savings of 20% to all three schools for this participant. Savings from occupancy controls alone are typically low in facilities where occupants tend to have lights on for most of the day or are already diligent about turning lights off when not in use. In some cases—including some spaces within the metered school from District 1 and in prior studies conducted for other clients—the Evaluation Team has observed that the hours of use actually increase with the addition of networked occupancy controls. The occupancy timeout at these three schools was set to 15 minutes. Based on its experience with networked lighting controls systems, the results from the metered school project in this Pilot, and the occupancy patterns of a typical school, the Evaluation Team did not find sufficient evidence to support applying savings for the occupancy controls on this system.

Evaluation of Peak Demand Savings

The Evaluation Team estimated peak demand savings for projects with system energy monitoring data from the annual energy model for that site. For all other projects, the Team calculated the peak demand reduction from the average connected load reduction and multiplied that by a coincidence factor as specified in the Wisconsin Focus on Energy 2017 TRM.

Verified Savings Results and Realization Rates

Table 274 lists the *ex post* verified savings for each measure in the Pilot using the analysis methodologies described above. Table 275 lists the realization rates for each Pilot measure. There are

no savings associated with the energy monitoring bonus measure, because the addition of energy monitoring does not directly lead to decreased energy usage. Realization rates were low for both the High Lumen Tier and Low Lumen Tier measures. Several factors, described below, led to low realization rates in this Pilot.

Table 274. CY 2017 Networked Lighting Controls Pilot *Ex Post* Verified Savings

Measure	kWh	kW	Therms	MMBtu
NLC Energy Monitoring Bonus	-	-	-	-
NLC High Lumen Tier	231,621	17	-	790
NLC Low Lumen Tier	85,475	30	-	292
Total	**317,096**	**47**	**-**	**1,082**

Table 275. CY 2017 Networked Lighting Controls Pilot Annual Realization Rates

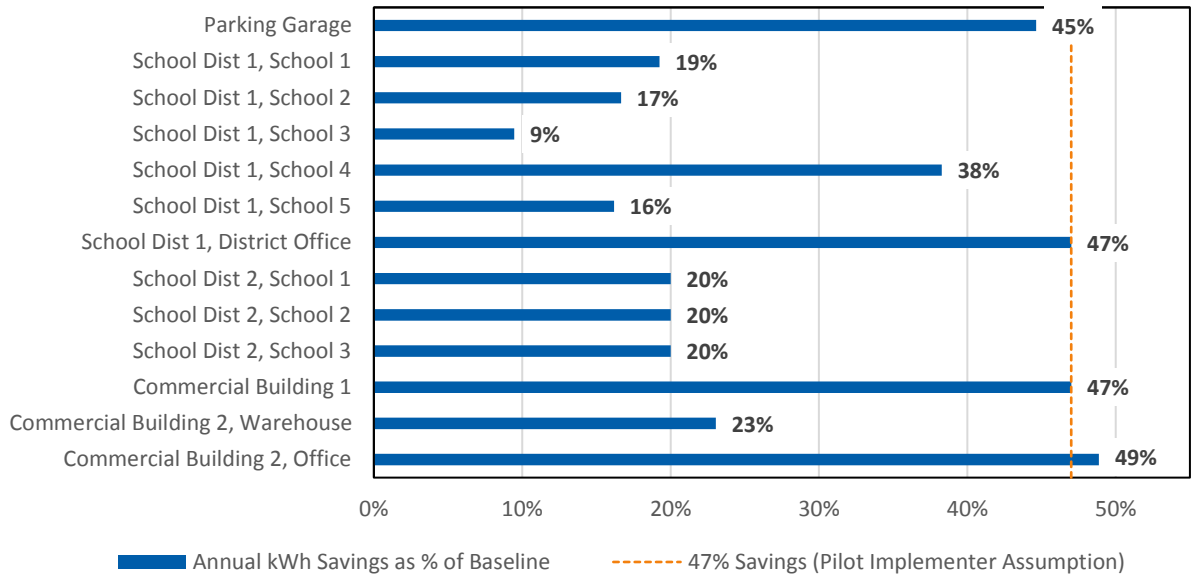
Program	kWh	kW	Therms	MMBtu
NLC Energy Monitoring Bonus	-	-	-	-
NLC High Lumen Tier	40%	17%	-	40%
NLC Low Lumen Tier	26%	45%	-	26%
Total	**35%**	**28%**	**-**	**35%**

Baseline connected lighting load assumptions based on LPD estimates and measured square footage were very high. The assumed LPD and connected load for each project were not reported in SPECTRUM; however, based on discussions with the Pilot Implementer about the LPD-based estimation methodology, it was clear that the actual connected lighting load varied significantly from the LPD-based assumptions.

LPD is a useful metric for making comparisons between projects or areas within a building, but is often ineffective for estimating energy usage because of its wide variability based on the design, layout, and usage of a particular building or space. Connected load can be quickly estimated from the quantity and wattage of lighting fixtures which the networked lighting controls system will control. Networked lighting controls systems are usually installed concurrently with new luminaires, making this information readily available in most cases.

The actual reduction in lighting usage attributable to networked lighting controls varied significantly as well. Figure 168 shows the annual verified kWh savings for each participating project as a percentage of the baseline annual kWh consumption for that project. The savings estimates entered into SPECTRUM for all projects were assumed to have a flat 47% reduction from baseline. The verified annual savings range from 9% up to 49% of baseline consumption.

Figure 168. CY 2017 Networked Lighting Controls Pilot Verified Annual kWh Savings as Percentage of Baseline Annual Energy Consumption



Although *ex ante* savings were established using a flat 47% energy-use reduction based on a Lighting Research Center literature review, the above findings are consistent with other studies that suggest that savings can vary significantly based on building function, hours of use, and other factors. In particular, Cadmus recently completed a (confidential) study of seven commercial advanced lighting control systems with a comprehensive M&V study at every site, including extended power metering of individual lighting circuits and complete on-site fixture count and specification verification. The savings as a percentage of baseline annual consumption from that study are in the same range as the results of this Pilot study.

Evaluation of Net Savings

The Evaluation Team used participant interviews to assess net savings for the Networked Lighting Controls Pilot and calculated an NTG percentage of 16% for CY 2017.

Freeridership

Three of the five participants said they would have installed the same controls system even in the absence of the Pilot. The remaining two participants were both low lumen customers responsible for comparatively small projects. Using this information, the Evaluation Team determined an average self-reported freeridership of 84%, weighted by evaluated savings for the CY 2017 Program.

Verified Net Savings Results

To calculate the Program's NTG, the Evaluation Team used the following equation:

$$NTG = 1 - Freeridership\ Ratio + Participant\ Spillover\ Ratio$$

Spillover analysis was not conducted for this Pilot. This yielded an overall NTG estimate of 16% for the Pilot. Table 276 shows total savings net of freeridership, total annual gross and net savings in MMBtu, and the overall Pilot NTG.

Table 276. CY 2017 Networked Lighting Controls Pilot Annual Net Savings and NTG Ratio

Total Annual Gross Verified Savings (MMBtu)	Total Annual Net Savings (MMBtu)	Program NTG Ratio
1,082	168	16%

Table 277 shows the annual Pilot net demand and energy impacts (kWh, kW, and therms) by measure category. The Evaluation Team attributed these savings as net of what would have occurred naturally without the presence of the Pilot.

Table 277. CY 2017 Networked Lighting Controls Pilot Annual Net Savings

Measure Category	Annual Net Savings		
	kWh	kW	therms
High Lumen Tier	0	0	-
Low Lumen Tier	49,235	18	-
Total Annual	**49,235**	**18**	**-**

Table 278 lists the lifecycle Pilot net demand and energy impacts (kWh, kW, and therms) by measure category.

Table 278. CY 2017 Networked Lighting Controls Pilot Lifecycle Net Savings

Measure Category	Lifecycle Net		
	kWh	kW	therms
High Lumen Tier	0	0	-
Low Lumen Tier	787,756	18	-
Total Lifecycle	**787,756**	**18**	**-**

Process Evaluation

In CY 2017, the Evaluation Team conducted interviews as part of the process evaluation activities. The findings from these interviews are described below.

Pilot Design, Delivery, and Goals

The Pilot is designed to leverage the rapidly growing technology areas of Networked Lighting Controls (NLC) through a partnership with a Focus on Energy partner organization, DesignLights Consortium (DLC), which is working with organizations nationwide to launch networked lighting controls projects.

Focus on Energy is also considering launching a quarterly lighting newsletter through the Business Incentive Program that targets Trade Allies. The newsletter will present lighting Program information, including featured projects, training, and relevant information, and can also be used to provide general

Program updates regarding lighting, such as qualified product list changes and coordinated policy announcements.

Training for networked lighting controls will be coordinated primarily through the manufacturer representatives and/or manufacturer direct utility contacts. The Program Administrator plans to utilize as many of these resources as possible for recruiting attendees, providing a venue, and presenting information. Initial conversations at national trade shows have indicated support and willingness to participate, with offers for demonstrations already occurring. The Program Administrator intends to use DLC's training materials for structure and curriculum and for educating attendees on system design, functionality, and qualified systems. Details on DLC's training resources were still forthcoming at the time of the interview but were expected to be ready in Q4.

The Program Administrator will also use lighting collaboration meetings to introduce networked lighting controls to Trade Allies. Manufacturers have demonstrated their willingness to attend and demo how their particular systems work, giving Trade Allies more hands-on information for how these systems can be promoted. Through these meetings, the Program Administrator will work with other Trade Allies to identify what, if any, additional training their teams will need.

Pilot Design

The Pilot is designed to increase awareness of energy-efficient lighting technologies and controls by decreasing the barriers for installation. One of the main techniques the Pilot Implementer used to lower these barriers was to offer the incentive based on square footage, instead of by fixture. This approach decreases the likelihood of overlighting a space.

Pilot Goals

Key performance indicators for the Pilot are shown in Table 279.

Table 279. Pilot CY 2017 Key Performance Indicators

KPI	Goal	CY 2017 Result
Increase customer participation with networked lighting controls	Minimum of ten customers initiate and/or complete a networked lighting controls project in 2017	Five customers (but 12 sites) completed networked lighting controls projects in 2017
Increase Trade Ally, distributor, and manufacturer awareness of networked lighting controls	Minimum of three manufacturer/manufacturer representative hosted Trade Ally trainings utilizing both DLC and manufacturer curriculum	Four completed

Marketing and Outreach

Focus on Energy has multiple registered lighting Trade Allies targeted for participation in this Pilot. Initial outreach targeted manufacturer representative agencies, whose roles are to call on architects and engineers that specify lighting equipment (specifiers) and distributors to introduce them to new products and assist them with lighting control specification and design. These agencies represent

multiple control manufacturers and will provide some of the key contacts for manufacturer-sponsored training and/or product demonstrations**.** Additional Trade Ally engagement will be done through regular Trade Ally visits, website updates, and newsletter communication.

Marketing and Outreach Findings

Participants typically learned about the Pilot through their contractors. One of the five participants had completed the project before learning it would be part of the Pilot. The contractor for this project said this was because he did not think he would make the deadline, and he did not want to confuse the participants by telling them that they would not receive an incentive if his team did not work fast enough. Most of the participants reported they had first decided to do a lighting upgrade (although not necessarily a lighting controls upgrade) in either late 2016 or early 2017. One participant had been planning the lighting upgrade project for more than five years.

Customer Experience

Decision Making Process

All of the participants had already been planning a lighting upgrade, but not necessarily a lighting controls upgrade, when they first learned about the pilot. Three of the five participants said they would have installed the exact same controls system, and two said they would have installed the same lights but would not have installed the controls.

Customer Experiences

All of the participants spoke positively about the Pilot. The Evaluation Team asked participants about the impact that the networked lighting controls have had on various aspects of their businesses, including workplace safety, energy savings, aesthetics, comfort, productivity, and maintenance. These questions were relevant only to four of the five participants. One participant had new construction and had no basis for comparison.

Workplace Safety

Participants reported that the controls had a low impact on workplace safety. One of the schools and government participants said, “Most of the areas were over-lit per engineering recommendations anyway.” One of the participants operated a parking garage that benefited from the upgrades and said the local police force had high hopes that the new lights would help reduce crime rates in the area, although there was no empirical evidence to show that the lighting had had that impact.

Energy Savings

All participants reported that their lighting upgrades had a high impact on facility energy savings (altogether, not specific to the control system). One participant was saving at least $7,000 per month. Another participant saved 85% of the previous energy bill. During the interviews, participants frequently mentioned that they were able to have fewer fixtures in each area and could control brightness for each area, which helped them save additional energy.

Aesthetics

Participants also reported a high impact on facility aesthetics. One said, "Previously, light was being thrown around the side of the building. The [new] fixtures look much cleaner and much better."

Comfort

Participants reported a medium impact on facility comfort. One participant said, "Some people in the offices have been able to have customized changes. Individuals are more comfortable." Another participant reported a high impact, saying that "[employees] are much more comfortable. They can turn the lights down to 10% output if there is a day where maybe there's a little extra sensitivity." The major factor influencing comfort appears to be localized customization points.

Productivity

None of the participants reported a measurable impact on productivity. One participant's organization was actively looking for metrics to measure the impact of the lighting upgrade on productivity but had not yet found anything.

Maintenance

All but one of the participants reported a high impact on facility maintenance, an expected result of LED technology. One participant, talking about the facility's previous system, said, "The florescent systems needed constant supervision." Another, talking about the effect of the lighting system on facility maintenance, said, "[We] haven't had to swap any lights yet. Usually we would swap one or two per month but we haven't had to do any yet."

Non- Energy Benefits

The Team also asked the participants if they had encountered any other, non-energy benefits, of the lighting upgrades. Some participants said that daylight harvesting was a great benefit, and they liked the versatility of the systems with integrated occupancy sensors. The participants reported the controls were easy to use, and they enjoyed being able to use zones to set different lighting themes for different areas. For example, one participant talked about using lighting controls in classrooms that feature smartboards. Previously, there was glare on the smartboards or the classroom had to be very dim. Now, the teacher can switch to "smart board mode" and all of the lights dim; only the lights right in front of the smart board shut off entirely.

Barriers

Participants said the biggest barrier to participating in the Pilot was the timeline. As mentioned above, most participants started planning their lighting upgrades in late 2016 or early 2017. To be eligible for the incentive, all projects needed to be completed before November 30, 2017. The Program Administrator reported this was going to be a problem midway through 2017, saying, "… none of the projects have closed yet. [We have] 13 projects and 10 could evaporate with slipping timelines. Right now we're tracking well towards goal, but project closing is a challenge."

Pilot Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 280 lists the incentive costs for the Networked Lighting Controls Pilot for CY 2017.

Table 280. Networked Lighting Controls Pilot Incentive Costs

	CY 2017
Incentive Costs	$172,246

The Evaluation Team found the CY 2017 Pilot was not cost-effective (0.80). Table 281 lists the evaluated costs and benefits.

Table 281. Networked Lighting Controls Pilot Costs and Benefits

Cost and Benefit Category	CY 2017
Costs	
Administration Costs	$7,249
Delivery Costs	$29,599
Incremental Measure Costs	$352,394
Total Non-Incentive Costs	**$389,242**
Benefits	
Electric Benefits	$263,575
Gas Benefits	$0
Emissions Benefits	$46,540
Total TRC Benefits	**$310,115**
Net TRC Benefits	**($79,127)**
TRC B/C Ratio	**0.80**

Evaluation Outcomes and Recommendations

The Evaluation Team identified the following outcomes and recommendations to improve the Networked Lighting Controls Pilot.

Outcome 1. Collection of energy monitoring data benefits multiple stakeholders. Energy monitoring data is very useful for the Evaluation Team when verifying savings for audited projects. It also helps facilities managers visualize the performance of their system, quickly identify if the control system is not behaving as expected, and make controls adjustments.

Recommendation 1: Continue to encourage participation in energy data collection. The Evaluation Team recommends that the Pilot Implementer discuss data sharing with participants while the project is being

initiated, request a sample of the exported data after the controls are installed and commissioned, and proactively request data before the end of the program year.

Outcome 2. Overestimated baseline loads contributed to low realization rates. Controlled lighting load estimates have a significant effect on savings realization rates. Because of the vast variation in lighting layout, even between buildings of the same use type, estimating controlled load from LPD produces high levels of uncertainty.

Recommendation 2. Consider using invoices or collecting data on fixture counts and specifications to calculate a more accurate controlled lighting load.

Outcome 3. Savings as a percentage of the baseline varied significantly, from approximately 10% to 50%. Several factors contributed to this reduced savings factor, most notably differences in task tuning and occupancy savings, which are explained in greater detail in Outcome 4 and Outcome 5.

Recommendation 3. Reevaluate application of a blanket 47% savings and consider collecting additional participant data to tailor savings estimates to specific building types, occupancy patterns, existing non-networked lighting controls, and anticipated control strategies and networked lighting control features to be enabled at each project.

Outcome 4. Task tuning savings are sometimes the result of dimming luminaires that are brighter than the space requires. A recent Design Lights Consortium report gave an average networked lighting control savings of 47% of baseline energy,[183] but it specifically notes that projects with high savings often have a significant contribution from task tuning. This skews the average; projects with appropriate fixture lumen output are likely to have lower networked lighting control savings because they do not require as much task tuning.

Recommendation 4. The Evaluation Team recommends a conservative approach to task tuning savings. Most projects participating in this Pilot had 20% task tuning or less, which indicates that projects currently participating in the Pilot are generally installing fixtures with an appropriate lumen output. The Team suggest that the Pilot Implementer discuss appropriate fixture lumen levels with participants if they are installing new fixtures along with their networked lighting controls system.

Outcome 5. Occupancy control savings can be minimal or even negative in facilities where non-networked occupancy controls were already installed, or in facilities where occupants are already diligent about switching off lights when not in use. The Evaluation Team has observed a trivial reduction or even slight increase in lighting usage from occupancy controls in some metered spaces in this study and in other networked lighting control studies performed for previous clients.

[183] DesignLights Consortium. "Report: Energy Savings from Networked Lighting Control (NLC) Systems." Accessed April 2018: https://www.designlights.org/lighting-controls/reports-tools-resources/nlc-energy-savings-report/

Recommendation 5. Consider reducing the projected savings for spaces that already have occupancy sensors prior to retrofit. The Team also recommends considering the usage patterns of a space when estimating occupancy sensor savings. For example, classrooms and open office spaces often have frequent use that leads to lower occupancy savings, whereas private offices and conference rooms tend to have higher occupancy savings.

Outcome 6. Networked lighting controls systems in the Pilot performed well, with weighted average savings of 27% compared to baseline usage.

Recommendation 6. The Evaluation Team recommends that Focus on Energy continue to develop the Networked Lighting Controls Pilot offering, taking into consideration these recommendations to improve the accuracy of projected energy savings. The Program Administrator, Evaluation Team, and Pilot Implementer are already in the process of working toward this goal.

Seasonal Savings Pilot

The Seasonal Savings Pilot, implemented by Nest Labs, was offered in the winter and summer of 2017. It used an algorithm to make small, energy-saving adjustments to thermostat setpoints during peak summer and/or winter months in qualifying homes with Nest thermostats. The Pilot's objective was to generate kWh and therm savings through these minor setpoint changes without affecting homeowner comfort. The Pilot Implementer enlisted 10,491 customers for the winter program and 7,669 customers for the summer program.

Other than zip codes, the Pilot Implementer did not collect any customer information during the Pilot. Nest algorithms used customer temperature setpoints and schedules, along with additional information gathered from Nest thermostats, to determine eligibility for the Pilot. Qualifying participants opted in to the Seasonal Savings Pilot through their Nest thermostat. An algorithm was then applied remotely over a period of three weeks, which adjusted temperature settings slightly up or down during the winter and summer seasons.

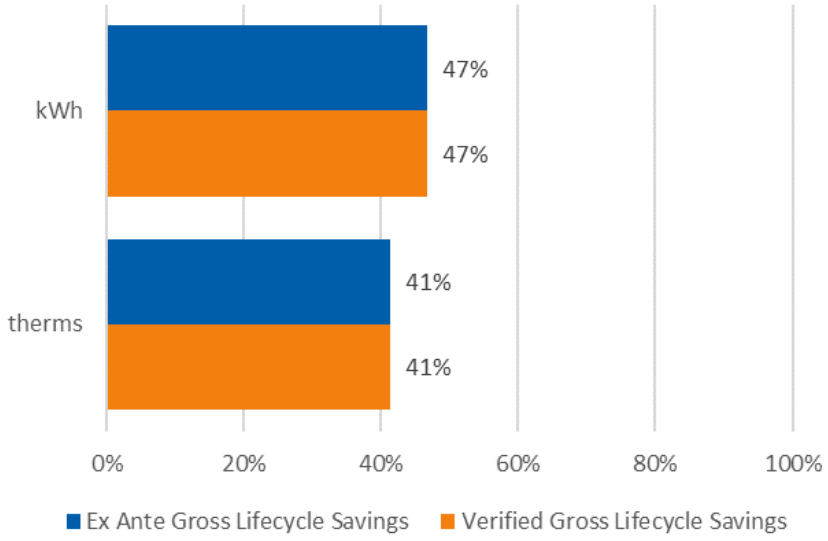
Table 282 lists the spending, savings, participation, and cost-effectiveness for the Seasonal Savings Pilot. No demand savings were claimed for the Pilot.

Table 282. CY 2017 Seasonal Savings Pilot Summary

Item	Units	Winter 2017	Summer 2017
Incentive Spending	$	-	-
Participation	Number of Participants	10,491	7,669
Verified Gross Lifecycle Savings	kWh	134,135	226,588
	kW	-	-
	therms	177,363	-
Verified Gross Lifecycle Realization Rate	% (MMBtu)	100%	100%
Net Annual Savings	kWh	134,135	226,588
	kW	-	-
	therms	177,363	-
Annual Net-to-Gross Ratio	% (MMBtu)	100%	100%
Cost-Effectiveness	TRC Benefit/Cost Ratio	2.34	

Figure 169 shows the percentage of gross lifecycle savings goals achieved by the Seasonal Savings Pilot in CY 2017. The Pilot achieved less than 50% of both its kWh and therm savings goals.

Figure 169. Seasonal Savings Pilot Percentage of CY 2017 Gross Lifecycle Savings Goals Achieved[1]



[1] For *ex ante* gross lifecycle savings, 100% reflects the Seasonal Savings Pilot implementation contract goals for CY 2017: 772,737 kWh, and 429,337 therms.

Pilot Accomplishments

The Pilot established goals and KPIs, as shown in Table 283. The Pilot did not have stated numeric energy or demand savings goals but did have performance metrics for a percentage of reduced energy and therms compared to the baseline. The Pilot nearly reached its customer opt-in goal but fell short of its energy savings goals by more than 20%.

Table 283. Seasonal Savings Pilot KPIs and Goals

KPI or Goal	Goal	CY 2017 Results
Customer Opt-in Rate	At least 75% of customer products receiving an invitation to participate in the Pilot accept the invitation and participate in the Program ("opt-in")	Opt-in rate was 76% in winter and 72% in summer
% cooling savings (kWh)	5%	3.7% cooling savings were achieved
% heating savings (kWh and therms)	5%	3.5% heating savings was achieved

EM&V Approach

The Evaluation Team conducted an impact evaluation of the Seasonal Savings Pilot in 2016 that found that *ex post* and *ex ante* savings were nearly identical. Based on that analysis, for the FY 2017 evaluation the Team used a realization rate of 100%.[184]

[184] https://focusonenergy.com/sites/default/files/Evaluation%20Report%20-%202016%20Volume%20II.pdf

Pilot Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost test used in Wisconsin is a modified version of the TRC test. Appendix F includes a description of the TRC test.

Table 284 lists the incentive costs for the Seasonal Savings Pilot for CY 2017.

Table 284. Seasonal Savings Pilot Incentive Costs

	CY 2017
Incentive Costs	$0

The Evaluation Team found the CY 2017 Pilot was cost-effective (2.34). Table 285 lists the evaluated costs and benefits.

Table 285. Seasonal Savings Pilot Costs and Benefits

Cost and Benefit Category	CY 2017
Costs	
Administration Costs	$19,932
Delivery Costs	$45,453
Incremental Measure Costs	$0
Total Non-Incentive Costs	**$65,385**
Benefits	
Electric Benefits	$12,394
Gas Benefits	$120,831
Emissions Benefits	$19,755
Total TRC Benefits	**$152,980**
Net TRC Benefits	**$87,595**
TRC B/C Ratio	**2.34**

Midstream Commercial Kitchen Equipment Pilot

The Midstream Commercial Kitchen Equipment Pilot, launched in 2017 and implemented by Franklin Energy, provides incentives for distributors to increase sales of energy-efficient commercial kitchen equipment. The Pilot targets increased sales of ENERGY STAR-qualified and other energy-efficient equipment, including dishwashers, fryers, hot food holding cabinets, steam cookers, griddles, refrigerators, freezers, ice makers, rack ovens, combination ovens, coffee brewers, pre-rinse sprayers, and ventilation controls.

The intent of the Pilot is to accelerate the adoption of energy-efficient commercial kitchen equipment through increased program participation and to transform the market through increased awareness of energy-efficient equipment options for the targeted participating distributors and the end-use customers they serve. The Midstream Commercial Kitchen Equipment Pilot relies on existing Focus on Energy personnel who work on the Business Incentive and Small Business programs.

Pilot Offerings

The Pilot has the following program goals:

- Provide greater long-term, cost-effective savings for the portfolio
- Reduce Focus on Energy's administrative burden in processing commercial kitchen equipment applications, reduce customer administrative burdens in applying for the Pilot, and increase customer satisfaction scores
- Accelerate market transformation of energy-efficient commercial kitchen equipment
- Increase dealer stock of qualifying commercial kitchen equipment

Table 286 provides the available incentives for the Pilot.

Table 286. Incentives Available Through Midstream Commercial Kitchen Equipment Pilot

Measure	Incentive
ENERGY STAR Steam Cooker	$350-$700/Unit
ENERGY STAR Fryer	$120-$250/Fry Pot
ENERGY STAR Griddle	$30-$50/linear foot
ENERGY STAR Hot Holding Cabinet	$160/Cabinet
ENERGY STAR Convection Oven	$160/Oven
ENERGY STAR Combination Oven	$300-$500/Oven
ENERGY STAR Rack Oven	$300-$500/Unit
ENERGY STAR Commercial Coffee Brewers	$50/Coffee Brewer
ENERGY STAR Commercial Dishwasher	$40-$800/Unit
CEE Tier II Pre-Rinse Sprayer Valve	$25/Valve
Kitchen Hood Ventilation Controls – Temperature and Optical Sensing	$80-$600/HP Controlled
Kitchen Hood Ventilation Controls – Temperature Sensing Only	$40-$200/HP Controlled
ENERGY STAR Commercial Refrigerators	$40-$160/Refrigerator
ENERGY STAR Commercial Freezers	$40-$160/Freezer
ENERGY STAR Commercial Ice Machines	$50/Ice Machine
Food Service Multiple Equipment Bonus, 2 Types	$100
Food Service Multiple Equipment Bonus, 3 Types	$300

Pilot Accomplishments

The Pilot established goals and KPIs, as shown in Table 287. The Pilot did not have stated numeric energy or demand savings goals but did have energy and demand performance metrics in relation to previous calendar years. The planned CY 2018 evaluation of the Pilot will assess its progress toward these goals.

Table 287. Midstream Commercial Kitchen Equipment Pilot KPIs and Goals

KPI or Goal	Goal
Energy Savings	Increase lifecycle kWh and therm savings from participating distributors by 100% over the average 2013-2015 baseline
Accelerate Market Transformation	See an overall increase in stocking of energy-efficient qualifying equipment of participating distributors in comparison to prior calendar years.
Days Incentive Outstanding	Annually, average 30 days to process Standard Incentive Applications (consistent with other business program metrics)
Customer Satisfaction	8.5/10 in customer satisfaction

Participant counts by measure, incentive amounts, and available *ex ante* savings are shown in Table 288. This does not include the bonus incentives provided to midstream kitchen equipment distributors for

carrying additional types of equipment or increasing energy-efficient sales. The Pilot claimed savings from 81 measures in CY 2017, amounting to *ex ante* savings of 291,867 kWh, 19 kW, and 6,554 therms.

Table 288. CY 2017 Midstream Commercial Kitchen Equipment Pilot Annual and Lifecycle Gross Savings Summary

Measure	Summary Data		*Ex Ante* Gross Annual			*Ex Ante* Gross Lifecycle		
	n	Incentives	kWh	kW	therms	kWh	kW	therms
Ventilation Controls	3	$440	7,942.5	1.4	482	79,425	-	4,820
Dishwasher, Commercial	20	$6,330	163,666.7	0.4	1,296	1,636,666.57	-	12,960
Fryer	2	$500	-	-	1,188	0	-	14,256
Hot Holding Cabinet	2	$320	6,140.0	1.1	-	73,680	-	-
Ice Machine	6	$300	5,462.6	0.6	-	54,625.7	-	-
Oven	11	$1,760	-	-	3,588	0	-	43,056
Pre-Rinse Sprayer	1	$25	798.5	-	-	3,992.6925	-	-
Refrigerator / Freezer - Commercial	33	$3,200	49,853.0	5.7	-	598,236	-	-
Steam Cooker	3	$2,000	58,002.0	10.0	-	638,022	-	-
Total	**81**	**$14,875**	**291,867**	**19**	**6,554**	**3,084,650**	**-**	**75,092**

Future Evaluation Plan

Because the Pilot had relatively low uptake in CY 2017 and the Program Implementer planned to make significant changes at the beginning of CY 2018, the Evaluation Team did not complete a full evaluation for the CY 2017 program year.

The Team has proposed an engineering review using the Wisconsin Focus on Energy 2017 TRM for qualifying measures along with customer and distributor surveys to determine gross and net savings for this Pilot for CY 2018. Because 2017 *ex ante* savings are not included in CY 2017 totals, the CY 2018 evaluation will include CY 2017 *ex ante* savings as well.

Low-E Storm Windows Pilot

The Low-E Storm Windows Pilot, implemented by D+R International and its manufacturer partners (Larson Manufacturing and Quanta Technologies, Inc.) adds low-emissivity (Low-E) storm windows to Focus on Energy's measure portfolio. Low-E storm windows have Low-E glass and offer the benefits of replacement windows at a fraction of the cost.

The goal of this Pilot is to test the potential for targeted promotion and discounts to increase sales and installations of Low-E storm windows in the Milwaukee area's residential single-family and multifamily sectors and enable Focus on Energy to accurately assess the achievable savings from a full-scale Low-E storm window program.

Pilot Offerings

The Pilot offered incentives on Low-E storm windows through the upstream sales and targeted multifamily markets as well as a multichannel marketing campaign to promote the measure. Table 289 provides incentives that were available for the Pilot.

Table 289. Incentives Available Through Low-E Storm Windows Pilot

Measure	Incentive
Upstream Sales (Larson Manufacturing) of Low-E Windows	25% markdown on eligible windows
Targeted Multifamily Sales (Quanta Technologies Inc) of Low-E Windows	$3.00 per square foot per window / maximum per-customer incentive of $1,000

Pilot Accomplishments

The Pilot established goals and KPIs, as shown in Table 290. The Pilot aimed to increase sales penetration of eligible units by 28% in specific zip codes covering the Milwaukee metro area and increase market share of Low-E windows by 25%. The planned CY 2018 evaluation of the Pilot will assess its progress toward these goals.

Table 290. Low-E Storm Windows Pilot KPIs and Goals

KPI or Goal	Goal
Low-E Storm Window Sales	28% increase in total unit sales in the pilot region by manufacturers
General Product Category Market Growth	Increase in market share of Low E storm windows in pilot region by 25 percentage points
Low E Storm Window Market Share	Accelerate market transformation in pilot area

Participant counts by measure, incentive amounts, and available *ex ante* savings are shown in Table 291. The Pilot claimed savings from two participants in CY 2017, amounting to *ex ante* savings of 9,125 kWh.

Table 291. CY 2017 Low-E Storm Windows Pilot Annual and Lifecycle Gross Savings Summary

Measure	Summary Data		*Ex Ante* Gross Annual			*Ex Ante* Gross Lifecycle		
	Participants	Average Incentive	kWh	kW	therms	kWh	kW	therms
Low-E Storm Windows	Two Retailers (The Home Depot and Menards)	n/a	9,125	15	16,692	137,709	15	250,380

Future Evaluation Plan

The 2017 Low-E Storm Windows Pilot ran from September 1 through October 31, 2017. Concurrently, Focus on Energy and the Evaluation Team began work on an TRM workpaper to determine the appropriate inputs and savings methodology for measures included in the Pilot. Focus on Energy opted to postpone the CY 2017 evaluation in anticipation of the finalized workpaper.

For CY 2018, the Evaluation Team has proposed an engineering review and point of sales data analysis to determine program gross and net savings. Because CY 2017 *ex ante* savings are not included in CY 2017 totals, the CY 2018 evaluation will include CY 2017 *ex ante* savings as well.

Digital Customer Engagement for Business

The Digital Customer Engagement for Business Pilot, implemented by FirstFuel, uses a digital customer engagement platform called FirstEngage to engage small and medium-sized business customers and create energy efficiency program opportunities. FirstEngage will be provided to Alliant Energy small and medium-sized business customers.

The Pilot is an enterprise-class, software-as-a-service (SaaS) white-label application that helps utilities and energy providers drive adoption of energy efficiency programs, enhance sales effectiveness, improve customer engagement, and reduce and improve renewal rates. Detailed technical requirements of the platform are defined in a technical engagement document.

Pilot Offerings

FirstFuel will provide the following services to Alliant Energy's nonresidential customer segment, which includes 60,000 meters:

- Focus on Energy- and Alliant-branded stand-alone solution
- Data normalization and integration that includes mapping of multiple meter points to physical building premise IDs for comparative analysis
- Branding and customized user experience
- Customer energy management
- Portfolio customer targeting and reporting
- Training

Pilot Accomplishments

The Pilot established goals and KPIs, as shown in Table 292. The program does not have specific energy or demand savings goals for CY 2017. The planned CY 2018 evaluation of the Pilot will assess its progress toward these goals.

Table 292. Digital Customer Engagement for Business Pilot KPIs and Goals

KPI or Goal	Goal
Increased Customer Engagement	Total number customers with repeat logins
Energy Efficiency Program Leads	Percentage of customers logging in who select "I'll do this" for an individual energy conservation measure
Increased Customer Self-Service Activity	Average customer duration on platform
Customer Initial Engagement	Total number of customers with initial login
Increased Customer Engagement	Total number of customers who receive each report type
Customer Satisfaction	Customer satisfaction with the platform, with Alliant, with Focus on Energy

Presently, the Pilot has gone through setup and testing (utility administrator test [UAT]) and is moving into a live stage in which the solution will be made available to a subset of Alliant customers, internal Alliant employees, and APTIM staff. The solution will include data analytics.

Future Evaluation Plan

Because Focus on Energy did not fully implement the Pilot this year, the Evaluation Team did not conduct either a process or impact analysis. As part of the CY 2018 evaluation, the Team has planned a process analysis using a participant online survey as well as an impact evaluation using a participating customer billing analysis.