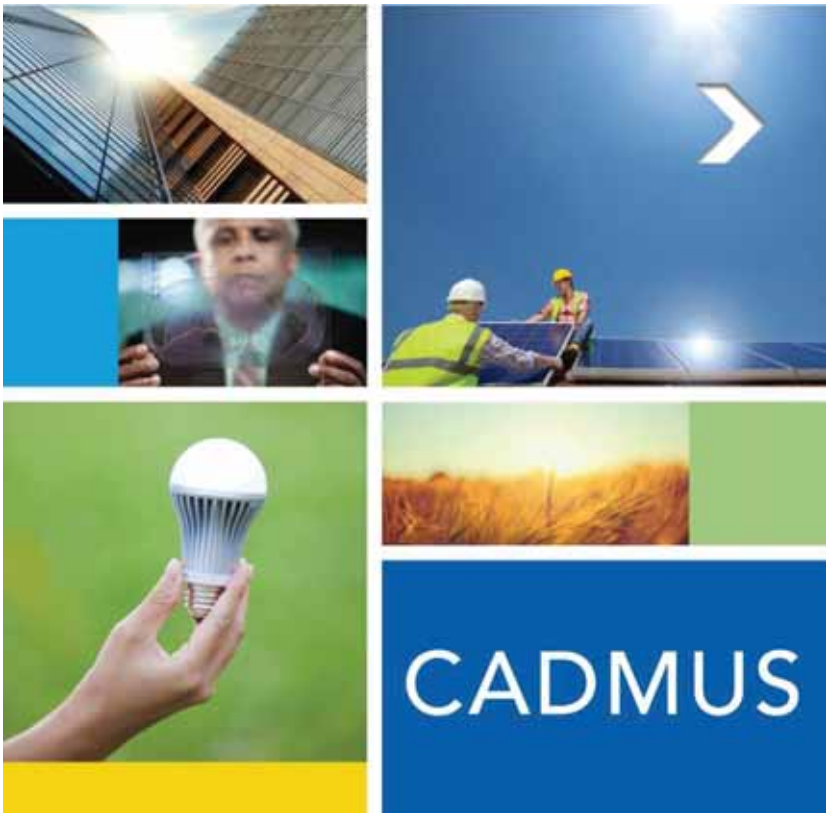

Focus on Energy
Calendar Year 2014 Evaluation Report
Volume II

May 27, 2015

Public Service Commission of Wisconsin
610 North Whitney Way
P.O. Box 7854
Madison, WI 53707-7854

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Prepared by:
Cadmus
Nexant, Inc.
St. Norbert College Strategic Research Institute

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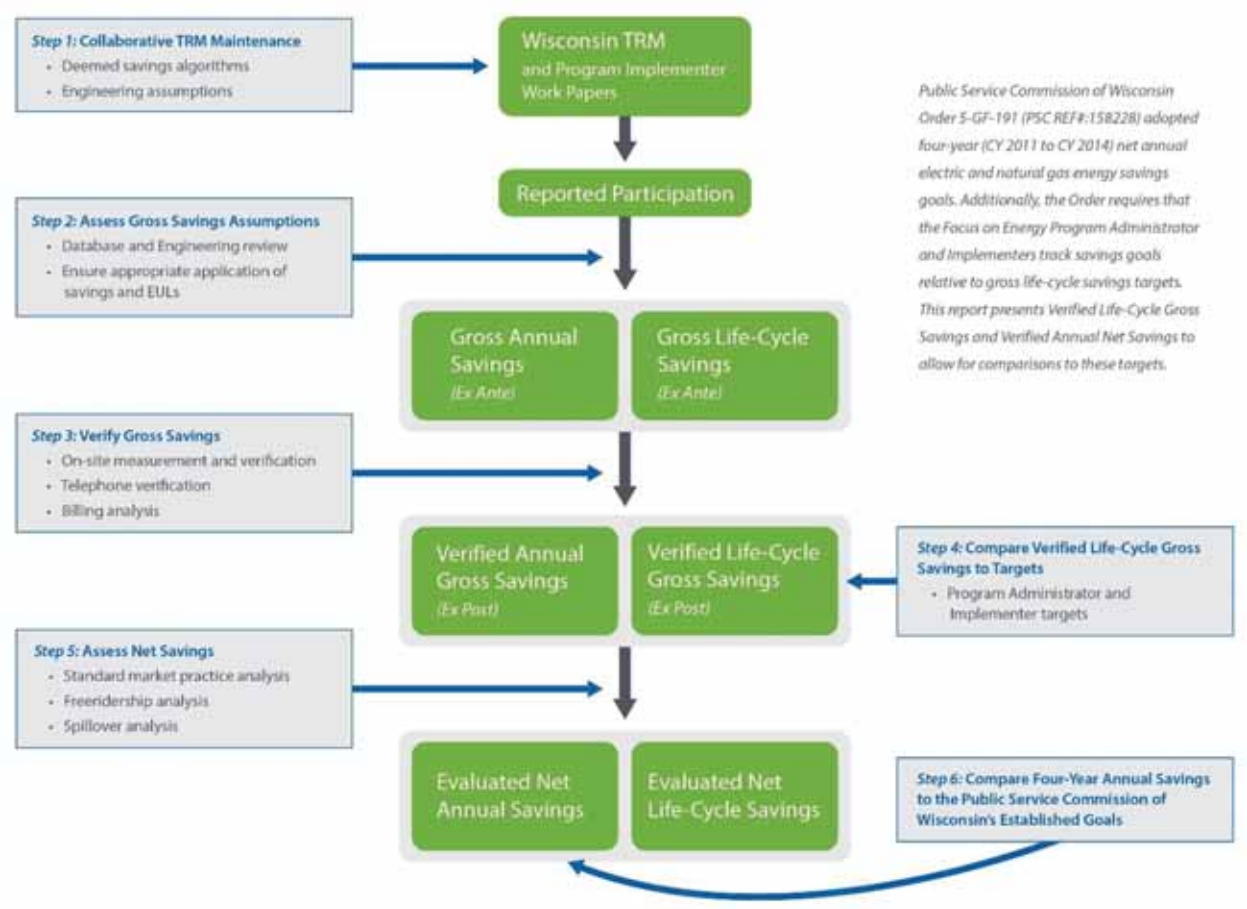
Introduction

The diagram presented in Figure 3 of Volume I, and repeated below as Figure 1 of Volume II of the 2014 and 2011-2014 Quadrennium Evaluation Report, is a useful summary of the steps involved in the calculation of net savings from the gross savings recorded in 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. This section presents some additional details on the overall roles and responsibilities of the Evaluation Team, as well as providing descriptions of some of the standard evaluation practices and approaches that are used across multiple program evaluations.

Figure 1. Quadrennium Evaluation Steps



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 that are expected to be installed across programs in future years. To determine priorities for additional research, the Evaluation Team also reviews the deemed savings values or algorithms contained in the Technical Reference Manual (TRM) and entered into SPECTRUM, the

program tracking database. Measures that are either new to the programs, are expected to contribute an increasing share of savings, have experienced technical or other market changes (such as increased energy codes or standards), or have significant uncertainty around the savings calculation (independent measurement of key assumptions are dated) are prioritized for evaluation, measurement, and verification (EM&V). The findings from these activities are applied to the savings calculations that are summarized in the Evaluation Report and ultimately end up in the TRM.

Technical Reference Manual

The TRM is a document compiled by the Evaluation Team in coordination with the Program Administrator, Program Implementers, 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.[1]

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

- **Deemed Savings.** Specific per unit savings (or demand reduction) values that have been accepted as reliable by the Program Administrator, Program Implementer, the Evaluator, and the PSC. These values are accepted because the measures, and the uses for the measures, are consistent, and because sound research supports the savings achieved.
- **Savings Algorithms.** Equations 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 measures are classified in SPECTRUM, the programs' tracking database. The document is revised annually to account for any changes to the programs and/or technologies.

Deemed Savings Report

Changes or updates to deemed savings or savings algorithms based upon evaluation measurement and verification activities are detailed in an annual Deemed Savings Report. This document is prepared by the Evaluation Team and is circulated among the primary Focus on Energy team including the PSC, the Program Administrator, and the Program Implementers. After this review process, the findings are incorporated into the next iteration of the TRM.

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[1] Public Service Commission of Wisconsin. *Focus on Energy, Wisconsin Focus on Energy Technical Reference Manual.* Prepared by Cadmus. January 2015. Available online at: http://www.focusonenergy.com/about/evaluation-reports

Work Papers

Although updates to the TRM that are initiated by evaluation activities are made 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 issue work papers to present the savings assumptions for new measures or, when appropriate, revisions to the savings calculations for existing measures. Work papers are submitted to the Program Administrator, which then sends them to the PSC and the Evaluation Team for review, comment, and approval. Once approved, the Evaluation Team incorporates the savings assumptions into the next iteration of the TRM.

Standard Evaluation Methods

The Evaluation Team uses several standard methods across evaluation cycles to assess the net 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 the period of payment approved dates (January 1 to December 31 for each calendar year).
- 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

The residential segment encompasses single-family and multifamily housing. For the CY 2014 evaluation, the Evaluation Team reviewed these 10 residential programs in the Residential Portfolio:[2]

- Multifamily Energy Savings Program
- Multifamily Direct Install Program
- Appliance Recycling Program
- Lighting and Appliance Program
- Home Performance with ENERGY STAR® Program
- Assisted Home Performance with ENERGY STAR Program
- New Homes Program
- Residential Rewards Program (including residential and nonresidential renewable rewards)
- Enhanced Rewards Program
- Express Energy Efficiency Program

The Evaluation Team designed the CY 2014 Focus on Energy residential evaluation to meet two primary objectives:

- Assess the 2014 residential segment energy and demand savings
- Report the cumulative results of the 2011 to 2014 quadrennium

The following program chapters summarize impact evaluation findings from all tasks conducted during the quadrennium (CY 2011 to CY 2014). Focus on Energy redesigned all programs between the CY 2011 and CY 2012 program years. Most CY 2011 programs were either discontinued or substantially redesigned, so these chapters include only the programs launched after the redesign. Savings and costs from the discontinued CY 2011 programs are included in Volume I of this report in the Residential Sector totals for the quadrennium.

Four programs from CY 2011, however, were rolled into the CY 2012 program cycle as the same (or very similar) programs and, hence, the CY 2011 savings for these programs are included in the following chapters. These programs include the following:

- Home Performance with ENERGY STAR Program
- Assisted Home Performance with ENERGY STAR Program
- Lighting and Appliance Program (formerly ENERGY STAR Lighting Program)
- New Homes Program

[2] The Evaluation Team consists of Cadmus, Nexant, and St. Norbert College Strategic Research Institute.

Cost-effectiveness results reported in the program chapters include only benefits and costs from CY 2012 through CY 2014. Cost-effectiveness results for all programs active in CY 2011 (including the programs listed above) are included in Volume I in the Residential Sector totals for the quadrennium.

Multifamily Energy Savings Program and Multifamily Direct Install Program

The Focus on Energy Multifamily Energy Savings Program and Multifamily Direct Install Program (collectively referred to as the Multifamily Programs) provide education and energy-saving opportunities to multifamily customers by offering incentives for efficiency measures and no-cost, direct install measures. Franklin Energy delivers both programs.

The Multifamily Energy Savings Program offers two types of rewards: prescriptive rebates for eligible measures and incentives for performance-based custom projects. The Multifamily Direct Install Program offers free, direct installations of CFLs, LEDs, pipe insulation, faucet aerators, and showerheads inside individual living units as well as LED exit signs in hallways.

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

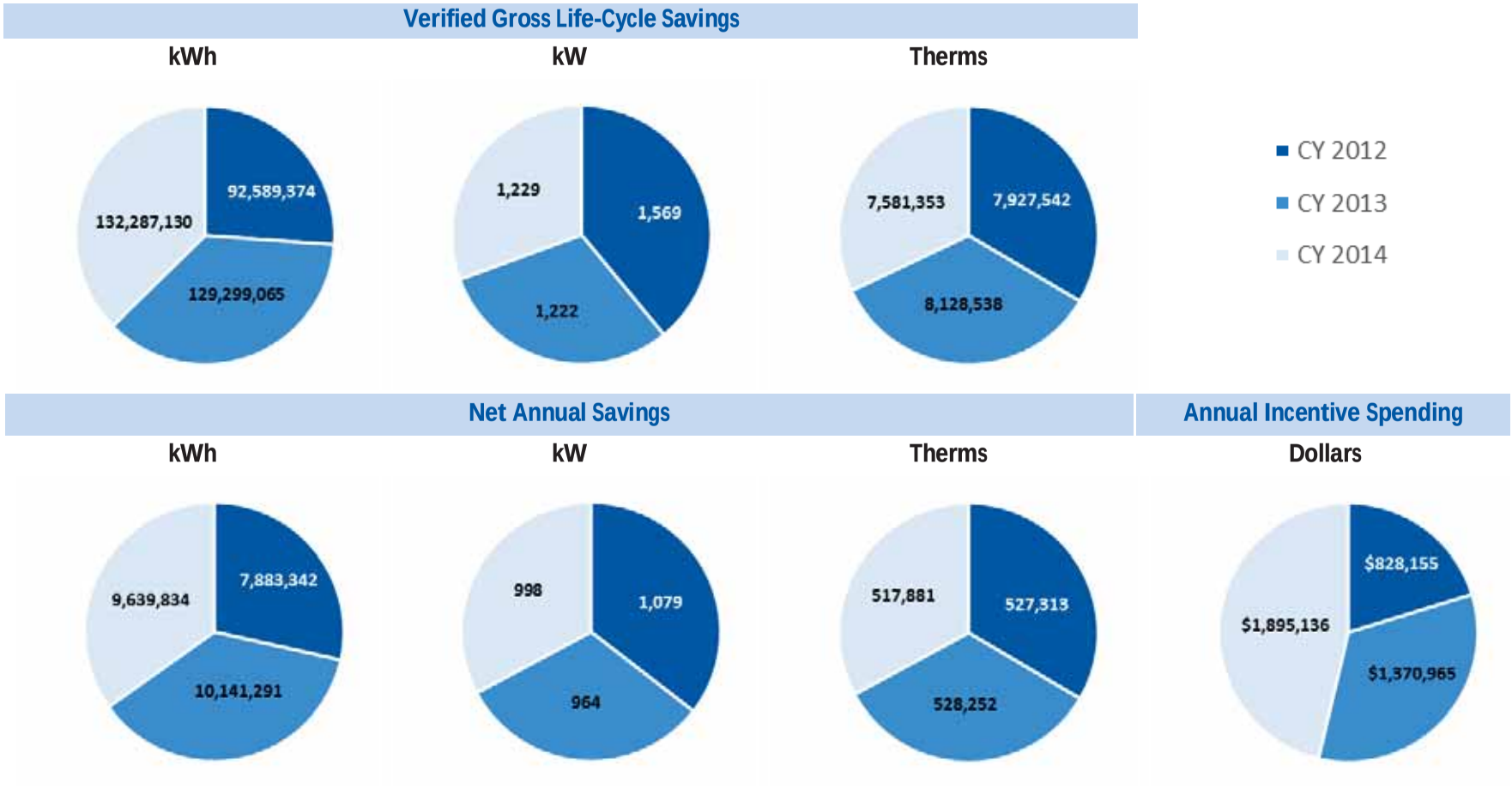
Table 1. Multifamily Programs Summary

Item	Units	CY 2014 Actual Amount	CY 2012-CY 2014 Actual Amount
Incentive Spending	$	$1,895,136	$4,094,257
Verified Gross Life-Cycle Savings	kWh	132,287,130	354,175,569
	kW	1,229	4,020
	therms	7,581,353	23,637,433
Net Annual Savings	kWh	9,639,834	27,664,467
	kW	998	3,041
	therms	517,881	1,573,446
Participation	Number of Participants	413	1,323[1]
Cost-Effectiveness	TRC B/C Ratio	3.34	2.94

[1] The CY 2012-2014 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.

Figure 2 shows a summary of savings and spending by year from CY 2012 through CY 2014 across both Multifamily Programs.

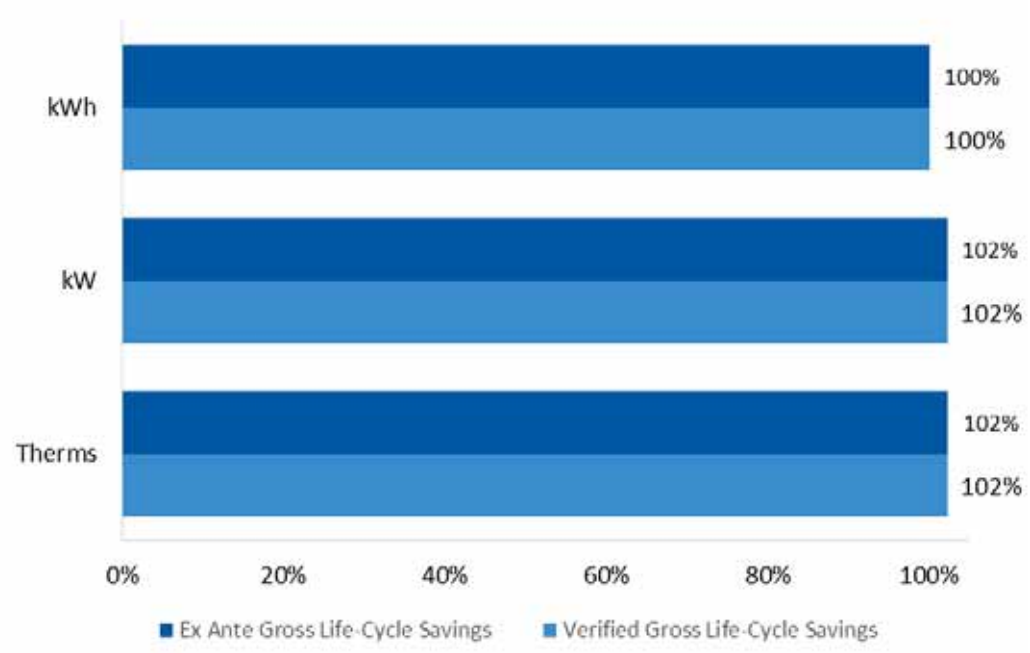
Figure 2. Multifamily Programs Three-Year (CY 2012–CY 2014) Savings and Spending Progress



[1] CY 2013 Net Annual therm savings values differ from those reported in the CY 2013 report due to a correction made to the net savings calculation.

Figure 3 shows the percentage of gross life-cycle savings goals achieved by the Multifamily Energy Savings Program in CY 2014. The Program exceeded all CY 2014 goals for both *ex ante* and verified gross savings.

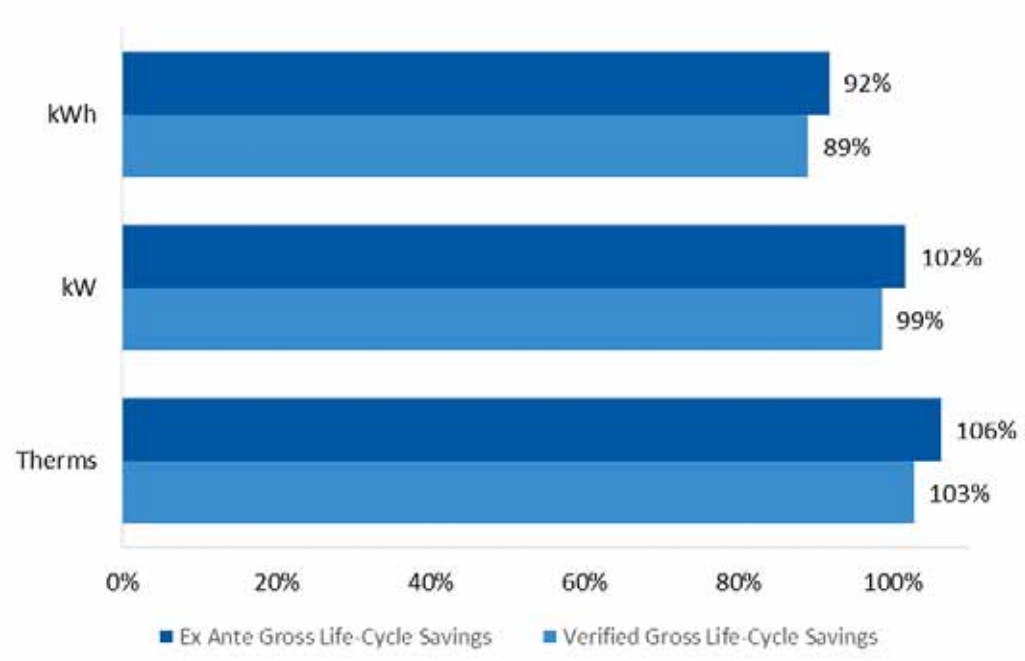
Figure 3. Multifamily Energy Savings Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 102,000,000 kWh, 990 kW, and 5,800,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Figure 4 shows the percentage of gross life-cycle savings goals achieved by the Multifamily Direct Install Program in CY 2014. The Program exceeded the CY 2014 electric demand and gas savings goals, achieving *ex ante* gross savings equal to 102% and 106% respectively. The Program fell short of the electric energy savings goals, achieving *ex ante* gross savings equal to 92% of its CY 2014 goal. The Evaluation Team verified the achievement of 89%, 99%, and 103% of the electric energy, electric demand and gas goals respectively. Verified gross savings were lower than *ex ante* savings due to installation adjustments that reflect the Evaluation Team's findings that some customers remove direct install measures after program participation.

Figure 4. Multifamily Direct Install Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1]For *ex ante* gross life-cycle savings, 100% reflects Program Implementation contract goals for CY 2014: 34,000,000 kWh, 220 kW, and 1,600,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation in CY 2014. Over the course of the quadrennial period; 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.

Table 2. Multifamily Programs Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Tracking Database Review	Census	Census
Materials Review	0	Census
Participant Tenant Surveys	0	119
Program Actor Interviews	2	7
Owner/Manager Surveys	0	104
Participating Contractor Interviews	0	6
Nonparticipating Contractor Interviews	0	5

More information regarding Program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied CY 2013 installation rates to all measures. To calculate CY 2014 net savings, the Evaluation Team applied a net-to-gross (NTG) ratio of 1 for all direct install measures and a combination of standard market practice (SMP) and self-report NTG ratios for all prescriptive and custom measures (using the same methodology as CY 2013).

Evaluation of Gross Savings

In CY 2014, the Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Multifamily Programs and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

CY 2014 and Quadrennium Realization Rates

Overall, the Multifamily Programs achieved a realization rate of 99%.[3] Thus, the Evaluation Team concluded that the gross savings reported in SPECTRUM were mostly achieved in accordance with the Multifamily Programs' operating criteria and previously agreed upon evaluation metrics. The Evaluation Team applied installation rates to direct install measures that tenants removed for various reasons. These adjustments caused the 3% reduction in Multifamily Direct Install Program savings in Table 3, which lists the realization rate separately for the two programs.

Table 3. CY 2014 Multifamily Programs Realization Rates by Measure Type

Program	Realization Rate			
	kWh	kW	Therms	MMBtu
Multifamily Energy Savings	100%	100%	100%	100%
Multifamily Direct Install	97%	97%	97%	97%
Total	**99%**	**99%**	**99%**	**99%**

Figure 5 shows the Multifamily Energy Savings Program realization rates by fuel type across three calendar years. The program realized close to 100% of *ex ante* savings over all three program years.

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

Figure 5. CY 2012–CY 2014 Multifamily Energy Savings Programs Realization Rate by Fuel Type

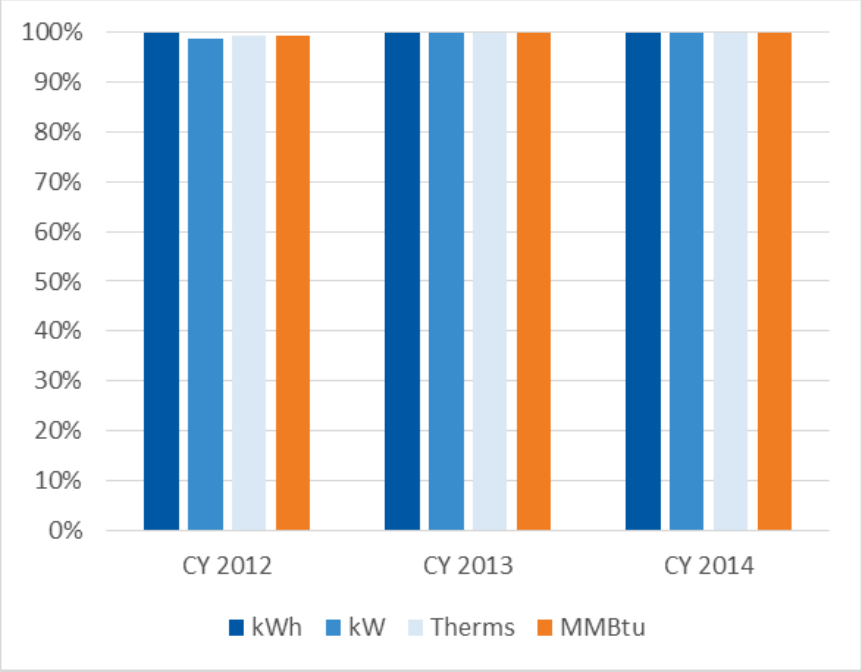
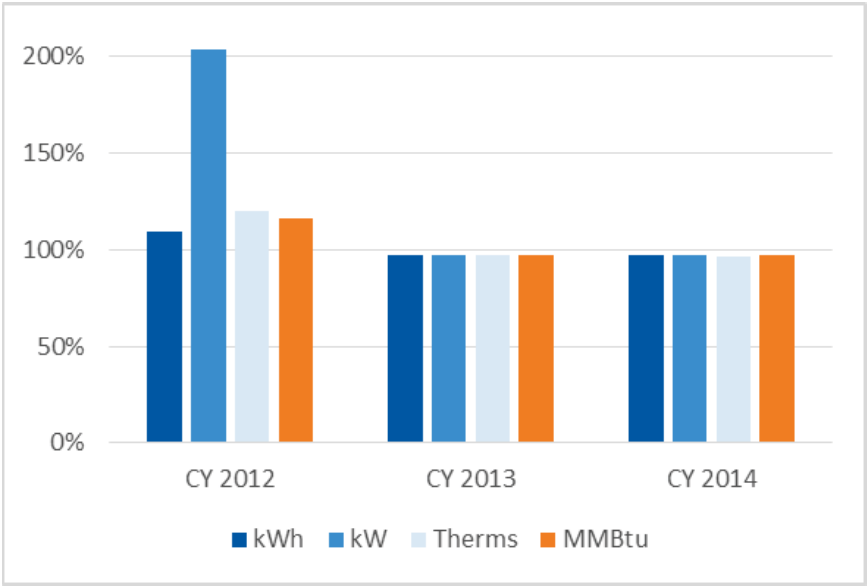


Figure 6 shows the Multifamily Direct Install Program realization rates by fuel type across three calendar years. The program realized savings over 100% in CY 2012 and 97% of *ex ante* savings over the remaining two program years.

Figure 6. CY 2012–CY 2014 Multifamily Direct Install Program Realization Rate by Fuel Type[1]



[1]Demand realization rates were high in CY 2012 because because *ex ante* demand savings were not attributed to showerheads for homes with electric water heaters, while the Evaluation Team applied a verified per unit demand savings value to all electric showerheads.

CY 2014 and Quadrennium Gross and Verified Savings Results

Table 4 lists the combined *ex ante* and verified gross savings by subprogram in CY 2014.

Table 4. CY 2014 Multifamily Programs Gross Life-Cycle Savings Summary by Measure Type

Program	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Multifamily Energy Savings	102,019,689	1,012	5,936,806	102,019,689	1,012	5,936,806
Multifamily Direct Install	31,209,990	224	1,699,976	30,267,441	217	1,644,547
Total Life-Cycle	**133,229,679**	**1,236**	**7,636,781**	**132,287,130**	**1,229**	**7,581,353**

Table 5 lists the combined *ex ante* and verified gross savings for the Multifamily Programs from CY 2012 through CY 2014.

Table 5. Multifamily Programs CY 2014 and Three-Year (CY 2012–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	11,527,501	1,236	581,839	11,451,328	1,229	576,751
	Life-Cycle	133,229,679	1,236	7,636,781	132,287,130	1,229	7,581,353
2012-2014	Annual	33,992,155	3,849	1,838,625	34,123,656	4,020	1,866,787
	Life-Cycle	352,526,711	3,849	23,138,512	354,175,569	4,020	23,637,433

Evaluation of Net Savings

The Multifamily Energy Savings Program relied on research conducted in CY 2013 (survey data and the Market Baseline Study) for development of net savings. The Multifamily Direct Install Program received a stipulated NTG ratio of 1, resulting from the Public Service Commission of Wisconsin direction that a NTG ratio of 1 be applied to all direct install measures.

In order to calculate the Program NTG ratios, the Evaluation Team combined the SMP, self-report freeridership, and spillover results. Table 6 shows the program-level NTG ratios applied for CY 2012 through CY 2014.

Table 6. Multifamily Programs NTG Ratios

Program	Adjustment	CY 2012	CY 2013	CY 2014	CY 2012–CY 2014
Multifamily Energy Savings	NTG Ratio	0.61	0.81	0.84	0.75
Multifamily Direct Install	NTG Ratio	0.97	1.00	1.00	0.99
Multifamily Programs	**NTG Ratio (savings weighted)**	**0.75**	**0.88**	**0.88**	**0.83**

The Multifamily Energy Savings Program's overall NTG ratio varied slightly between CY 2013 and CY 2014 due to changes in the measure mix and quantities of program measures. For example, steam trap repairs contribute a large portion of gas savings compared to other program measures, and in

CY 2014, the number of steam trap repair projects doubled compared to CY 2013. Since steam trap repairs have one of the highest NTG ratios of the program measures (from self-report), the overall NTG ratio for the Program is weighted upwards.

For CY 2012 through CY 2014, the Multifamily Direct Install Program has an average weighted NTG ratio less than 1 because, in CY 2012, the Evaluation Team conducted a self-report survey with building owners and managers resulting in a lower NTG ratio. The policy to stipulate NTG ratios as 1 for all direct install measures was adopted in CY 2013.

Multifamily Energy Savings Program Freeridership Methodology

Freeriders are participants who would have purchased the same efficient measure at the same time without any influence from the Program. For CY 2014, the Evaluation Team pulled forward CY 2013 freeridership findings using two different methodologies:

- For measures included in the Market Baseline Study, or where adequate market baseline data were available from other sources, the Evaluation Team applied an SMP methodology to determine freeridership.
- For measures not included in the Market Baseline Study, the Evaluation Team calculated a weighted average freeridership using self-report methodology from the participant survey.

Multifamily Energy Savings Program Spillover Methodology

Spillover results when customers invest in additional efficient measures or make additional energy-efficient behavior choices beyond those rebated through the Program. Participants in the CY 2013 building owner and manager survey reported that the Program was highly influential in their purchase and installation of energy-efficient clothes washers, furnaces, LEDs, pipe insulation, and windows, resulting in an estimated 19.4% spillover of the Multifamily Energy Savings Program's CY 2013 evaluated gross savings. The Evaluation Team applied the same spillover percentage to the CY 2014 savings.

CY 2014 and Quadrennium Net Savings Results

Table 7 lists the net energy impacts (kWh, kW, and therms) for the Multifamily Programs. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 7. Multifamily Programs CY 2014 and Three-Year (CY 2012–CY 2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	9,639,834	998	517,881
	Life-Cycle	119,909,612	998	7,086,378
2011-2014	Annual	27,664,467	3,041	1,573,446
	Life-Cycle	302,762,625	3,041	20,329,767

Program Cost-Effectiveness

Evaluators commonly use cost-effectiveness tests to compare the benefits and costs of a demand-side management program. The benefit/cost (B/C) test used in Wisconsin is a modified version of the total resource cost (TRC) test. Appendix I includes a description of the TRC test. Table 8 lists the CY 2012–CY 2014 incentive costs for the Multifamily Programs.

Table 8. Multifamily Programs Incentive Costs

	CY 2014	CY 2012-2014
Incentive Costs	$1,889,760	$4,845,695

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 9 lists the evaluated costs and benefits.

Table 9. Multifamily Programs Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012-2014
Costs		
Administration Costs	$387,119	$1,241,628
Delivery Costs	$882,804	$2,831,465
Incremental Measure Costs	$2,446,279	$9,928,280
Total Non-Incentive Costs	$3,716,203	$14,001,373
Benefits		
Electric Benefits	$4,905,935	$15,879,880
Gas Benefits	$4,707,495	$16,161,658
Emissions Benefits	$2,805,645	$9,181,022
Total TRC Benefits	$12,419,075	$41,222,561
Net TRC Benefits	**$8,702,873**	**$27,221,188**
TRC B/C Ratio	**3.34**	**2.94**

Appliance Recycling Program

The Appliance Recycling Program was launched in March 2012 to expedite the retirement of old, inefficient appliances to reduce peak demand and increase energy savings. JACO Environmental is the Program Implementer.

Table 10Table lists a combined summary of Appliance Recycling Program's actual spending, savings, participation, and cost-effectiveness.

Table 10. Appliance Recycling Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012–CY 2014 Actual Amount
Incentive Spending	$	$799,870	$2,375,010
Verified Gross Life-Cycle Savings	kWh	143,181,962	381,886,554
	kW	2,374	6,840
	therms	0	0
Net Annual Savings	kWh	9,483,162	25,214,201
	kW	1,258	3,613
	therms	0	0
Participation	Number of Participants	17,992	51,665[1]
Cost-Effectiveness	TRC B/C Ratio	2.77	2.51

[1] The CY 2012-2014 total number of participants represents the sum of unique participants in each year.

Figure 7 shows a summary of Program savings and spending by year from CY 2012 through CY 2014.

Figure 7. Appliance Recycling Program Three-Year (CY 2012–CY 2014) Savings and Spending Progress

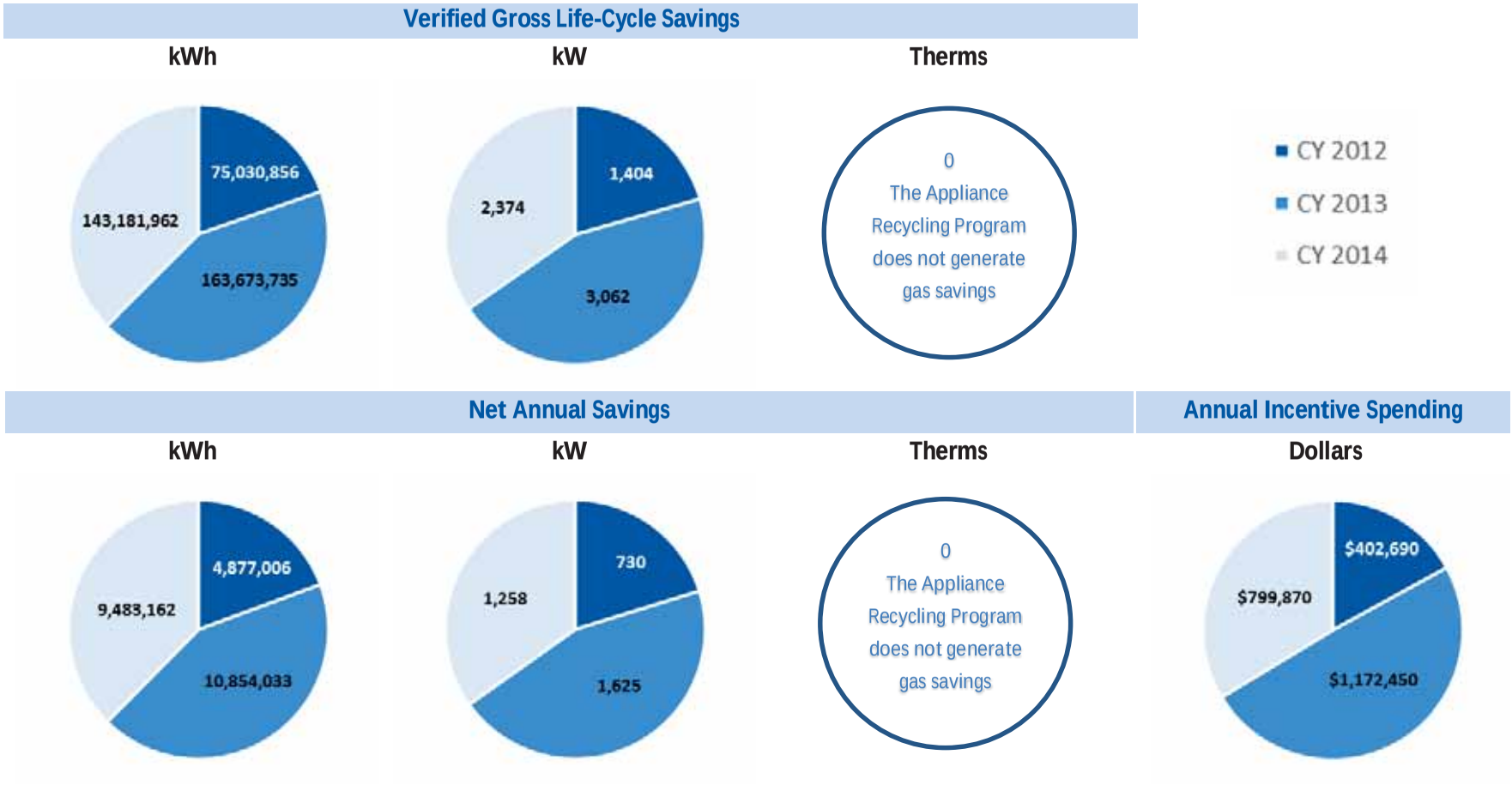
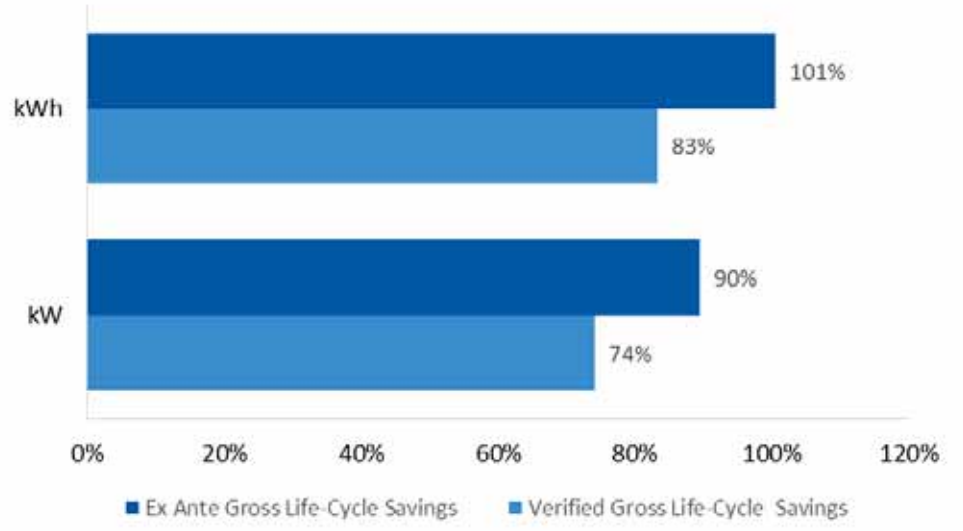


Figure 8 shows the percentage of gross life-cycle savings goals achieved by the Appliance Recycling Program in CY 2014. The Program achieved *ex ante* gross savings equal to 101% and 90% of its CY 2014 electric energy and demand goals respectively.

Figure 8. Appliance Recycling Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementer's contract goals for CY 2014: 171,872,400 kWh and 3,200 kW. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

The Evaluation Team verified the achievement of 83% and 74% of the electric energy and demand goals. Verified gross savings were lower than *ex ante* savings due to adjustments for measured energy consumption and the application of part-use factors.

Evaluation, Measurement, and Verification Approach

Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Appliance Recycling Program's performance. Table 11 lists the specific data collection activities and sample sizes used in the evaluations.

Table 11. Appliance Recycling Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Program Database Review	Census	Census
Metering Site Visits	0	28
Participant Surveys	70	263
Materials Review	0	Census
Stakeholder Interviews	2	6

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported participation in the tracking database and calculated a verified per-unit savings using analysis from the CY 2013 impact evaluation as well as from a new participant survey conducted in 2014. To calculate CY 2014 net savings, the Evaluation Team applied NTG ratios estimated in CY 2013.

Evaluation of Gross Savings

The Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings described below. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Appliance Recycling Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

Verified Unit Energy Savings

In CY 2014, the Evaluation Team combined impact findings from CY 2013 and CY 2014 to generate the per-unit savings estimates for refrigerators and freezers. The CY 2013 analysis involved estimating consumption using meter data and multivariate regression models. In CY 2014, the Evaluation Team updated the part-use factor (derived through participant surveys) for refrigerators and freezers recycled through the program.

Applying the CY 2014 part-use factor to the CY 2013 modeled annual unit energy consumption in Table 12 yields the average per-unit gross savings for the CY 2014 appliances. A more detailed explanation of the multivariate regression modeling can be found in the CY 2013 Evaluation Report.[4] More detail about the part-use factor methodology and results can be found in Appendix K.

Table 12. CY 2014 Appliance Recycling Program Gross Per-Unit Savings by Measure

Appliance	UEC (kWh/Year)	CY 2014 Part-Use Factors	Gross Energy Savings (kWh/Year)
Freezers	1,215	0.79	962
Refrigerators	1,081	0.82	886

CY 2014 and Quadrennium Realization Rates

Overall, the Appliance Recycling Program achieved an evaluated realization rate of 83% (Table 13).[5]

[4] Cadmus. *Wisconsin Focus on Energy CY 2013 Evaluation Report*. January 20, 2015. Available online at: https://focusonenergy.com/about/evaluation-reports

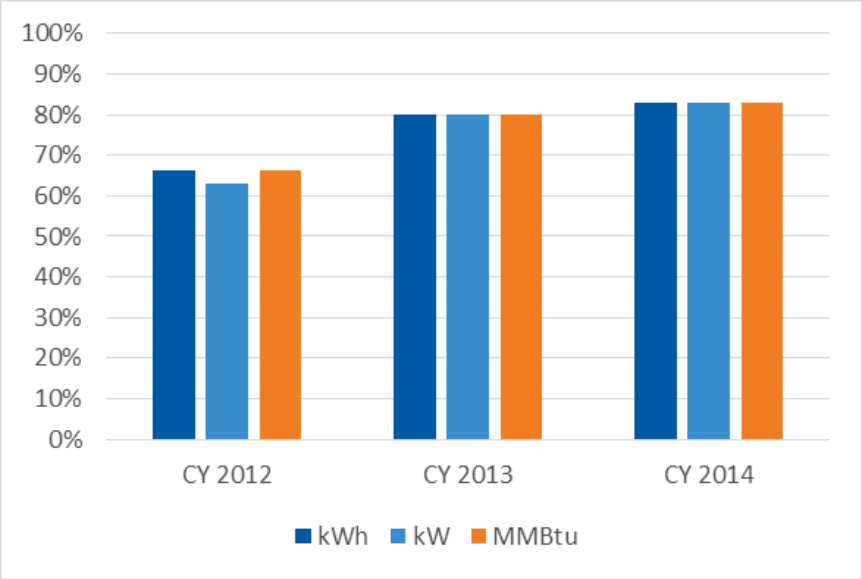
[5] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

Table 13. CY 2014 Appliance Recycling Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
Freezer	83%	83%	N/A	83%
Refrigerator	83%	83%	N/A	83%
Total	**83%**	**83%**	**N/A**	**83%**

Figure 9 shows the realization rates by fuel type across three calendar years. The program realized 78% of *ex ante* savings over all three program years.

Figure 9. CY 2012-2014 Appliance Recycling Program Realization Rate by Fuel Type



CY 2014 and Quadrennium Gross and Verified Savings Results

Table 14 lists the combined *ex ante* and verified gross savings by measure type in CY 2014.

Table 14. CY 2014 Appliance Recycling Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Freezer	42,346,920	713	0	35,255,725	594	0
Refrigerator	130,447,800	2,152	0	107,926,237	1,780	0
Total Life-Cycle	**172,794,720**	**2,865**	**0**	**143,181,962**	**2,374**	**0**

Table 15 lists the combined *ex ante* and verified gross savings from CY 2012 through CY 2014.

Table 15. Appliance Recycling Program CY 2014 and Three-Year (CY 2012–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	21,599,340	2,865	0	17,897,745	2,374	0
	Life-Cycle	172,794,720	2,865	0	143,181,962	2,374	0
2012-2014	Annual	61,309,027	8,920	0	47,735,819	6,840	0
	Life-Cycle	490,472,219	8,920	0	381,886,554	6,840	0

Evaluation of Net Savings

For the Appliance Recycling Program, the Evaluation Team applied net adjustments determined through the CY 2013 evaluation. Table 16 lists the program-level NTG ratio applied for CY 2012 through CY 2014: the total NTG ratio represents the weighted average of the CY 2013 measure-level NTG ratios, updated to reflect the CY 2014 measure mix.

Table 16. Appliance Recycling Program NTG Ratios

Adjustment	CY 2012	CY 2013	CY 2014	CY 2012–CY 2014
NTG Ratio	0.52	0.53	0.53	0.53

Net savings are generated only when the recycled appliance would have continued to operate absent program intervention (either within the participating customer's home or at the home of another utility customer).

In order to calculate the NTG ratio in CY 2013, the Evaluation Team used the following equation to combine all of the net impacts; Table 17 lists these results. The Evaluation Team applied CY 2013 NTG ratios to the CY 2014 gross savings, as described below.

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

Table 17. Appliance Recycling Program Final NTG Ratio by Appliance

Appliance	CY 2013 Gross Per-Unit Savings (kWh)	Freeridership and Secondary Market Impacts (kWh)	Induced Replacement (kWh)	Induced Additional Savings (Spillover) (kWh)	Net Savings (kWh)	NTG
Refrigerator	843	380	29	0	434	51%
Freezer	975	372	45	4	562	58%

The Evaluation Team employed a decision-tree approach, described in the Uniform Methods Project (UMP),[6] to calculate and present net Program savings. The decision tree—populated by the responses of surveyed 2013 Program participants and information gathered from interviewed market actors from other appliance recycling program evaluations—presents all of the Program's possible savings scenarios.

In CY 2013, the Evaluation Team used a weighted average of these savings scenarios to calculate the net savings attributable to the Program. The decision tree accounts for both 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 finds an alternate unit instead. The Evaluation Team applied the measure-level NTG ratios developed in CY 2013 to the CY 2014 appliance recycling measures.

CY 2014 and Quadrennium Net Savings Results

Table 18 lists the net energy impacts (kWh and kW). The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 18. Appliance Recycling Program CY 2014 and Three-Year (CY 2012-2014) Net Savings Summary

Savings Type		Verified Net	
		kWh	kW
2014	Annual	9,483,162	1,258
	Life-Cycle	75,865,296	1,258
2011-2014	Annual	25,214,201	3,613
	Life-Cycle	201,713,606	3,613

6 U.S. Department of Energy. "Uniform Methods Project for Determining Energy Efficiency Program Savings for Specific Measures Chapter 7: Refrigerator Recycling Evaluation Protocol." Accessed March 13, 2014. http://www1.eere.energy.gov/wip/pdfs/53827-7.pdf

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 I includes a description of the TRC test.

Table 19 lists the incentive costs for the Appliance Recycling Program for CY 2014 and CY 2012 through CY 2014.

Table 19. Appliance Recycling Program Incentive Costs

	CY 2014	CY 2012-2014
Incentive Costs	$799,950	$2,377,130

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 20 lists the evaluated costs and benefits.

Table 20. Appliance Recycling Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012-2014
Costs		
Administration Costs	$679,847	$1,910,220
Delivery Costs	$1,550,355	$4,356,153
Incremental Measure Costs	$0	$382,852
Total Non-Incentive Costs	$2,230,202	$6,649,225
Benefits		
Electric Benefits	$4,449,947	$12,101,410
Gas Benefits	$0	$0
Emissions Benefits	$1,730,172	$4,600,250
Total TRC Benefits	$6,180,119	$16,701,659
Net TRC Benefits	**$3,949,918**	**$10,052,435**
TRC B/C Ratio	**2.77**	**2.51**

Lighting and Appliance Program

Through the Lighting and Appliance Program, Focus on Energy partners with retailers throughout Wisconsin to mark down the cost of CFLs to offer instant discounts to residential customers on qualified products in participating stores. The Program also provides a wide range of retail support activities such as training, promotional events, and display materials, as well as offering CFL recycling at select participating retailers. Additionally, the Program includes coupon-based offerings for CFLs if the retailer partner is unable to support an upstream markdown. CLEAResult is the Program Implementer.

Focus on Energy has offered an upstream residential lighting program since 2006. In CY 2012, the Program Administrator renamed it the Lighting and Appliance Program, because it combined both lighting and efficient showerheads. In CY 2013, Focus on Energy added high-efficiency clothes washers. In CY 2014, incentives for efficient showerheads and high-efficiency clothes washers were discontinued.

Table 21 lists a summary of Lighting and Appliance Program's actual spending, savings, participation, and cost-effectiveness. Spending, savings, and participation totals for CY 2011 through CY 2014 include the CY 2011 ENERGY STAR Lighting Program, but the cost-effectiveness result includes costs and benefits from CY 2012 through CY 2014 only. Cost-effectiveness results for the former ENERGY STAR Lighting program active in CY 2011 are reported in Volume I.

Table 21. Lighting and Appliance Program Summary

Item	Units	CY 2014 Actual Amount	CY 2011–CY 2014 Actual Amount
Incentive Spending	$	$8,310,005	$24,746,573
Verified Gross Life-Cycle Savings	kWh	1,856,176,874	5,278,396,115
	kW	30,510	93,041
	therms	217,922	1,603,786
Net Annual Savings	kWh	198,241,011	580,024,559
	kW	22,141	67,570
	therms	5,553	50,951
Lighting Participation	Number of Participants	919,876	1,747,945[1]
Lighting Transactions[2]	Number of Purchases	1,447,383	4,008,611
Appliance Participation[3]	Number of Participants	3,168	13,994
Cost-Effectiveness	TRC B/C Ratio	6.38	5.53

[1] Due to the upstream nature of the program, total participants are not recorded through program tracking. The total number of participants represents the sum of estimated unique customers in each year for CY 2013 and CY 2014 using Homescan survey data, and does not include estimated participation for CY 2011 and CY 2012. See following section for methods used to determine annual participation.

[2] These values represent the estimated number of transactions (as opposed to unique customers) occurring over all four years. The Team relied on data obtained from customers who used coupons for compact fluorescent lamp or other bulb purchases through the Program which allowed the Team to estimate the number of purchase transactions. See following section for methods used to determine annual transactions.

[3] Due to the upstream nature of the program, total participants are not recorded through program tracking. The Evaluation Team assumed one measure per participant for appliance measures (clothes washers and showerheads).

Participation

The CY 2014 Program provided incentives for a total of 6,590,496 measure units, of which 6,587,328 were light bulbs, 2,894 were clothes washers, and 274 were showerheads. To estimate the number of individuals who purchased showerheads and clothes washers in each calendar year in absence of precise data, the Evaluation Team assumed that participants only bought one clothes washer and one showerhead annually.

Determining participation for lighting is challenging because the program's practice of providing retail discounts does not allow it to collect information on individual customers. For previous evaluation years, the Team has relied on data obtained from customers who used coupons for compact fluorescent lamp or other bulb purchases through the Program. While this data contained program-specific information and was the best data available at the time, the coupon sample only represented roughly 0.03% of program sales annually. Moreover, the coupon method only provided an estimate of the number of bulbs per package purchased. This method allowed the Team to estimate the number of purchase transactions, but did not allow the program to develop a clear estimate of the number of unique customers participating in the Program. For example, a transaction count does not provide clear information on the frequency by which customers make multiple bulb transactions in the same year.

For CY 2014, the Evaluation Team determined participation using newly available data from a Wisconsin Homescan survey panel of randomly recruited households. The data contained all purchases made by households that purchased CFLs over two 52-week periods (in CY 2013 and CY 2014). Because the Homescan data tracks the same people over time, the Evaluation Team could estimate the number of unique participating customers by calculating the average number of CFL packages each household purchased in each calendar year. Table 22 lists the results of the Homescan survey analysis.

Table 22. Lighting Homescan Survey Results

Year of Purchase	Packages Purchased per Household	Packages Purchased per Occasion	Purchase Occasions per Household
CY 2013	2.6	1.8	1.5
CY 2014	2.0	1.5	1.3

Using the average packages purchased per household from the Homescan analysis, and the total number of packages purchased from the implementer tracking system, the Evaluation team estimated the number of households that participated in the Program in CY 2013 and CY 2014. Due to data limitations, the Evaluation Team could not estimate participation using the Homescan method for CY 2011 and CY 2012. Table 23 lists the estimated number of package purchase transactions and participants for the quadrennium and shows participation gradually increasing over the four years.

Table 23. Upstream Lighting Four-Year (CY 2011–CY 2014) Participation[1]

Program Year	Transactions (Coupon Method)	Participants (Homescan Method)
CY 2011	34,166	N/A
CY 2012	926,000	N/A
CY 2013	1,601,063	828,069
CY 2014	1,447,383	919,876
Total	**4,008,611**	**1,747,945[2]**

[1] Table does not include clothes washer and showerhead sales and participants (included in Table 21)
[2] Total participants for this method does not include CY 2011 or CY 2012 due to Homescan data limitations.

Figure 10 shows a summary of savings and spending by year from CY 2011 through CY 2014. In 2011, only lighting products were offered, which did not produce any therm energy savings. The Program began achieving therm savings by offering rebates on showerheads in CY 2012 and clothes washers in CY 2013. These measures both had limited quantities in CY 2014: showerheads were discontinued but still achieved limited savings resulting from the processing of late CY 2013 incentives early in CY 2014, and clothes washer rebates slowed down beginning in July.

Figure 10. Lighting and Appliance Program Four-Year (CY 2011–CY 2014) Savings and Spending Progress

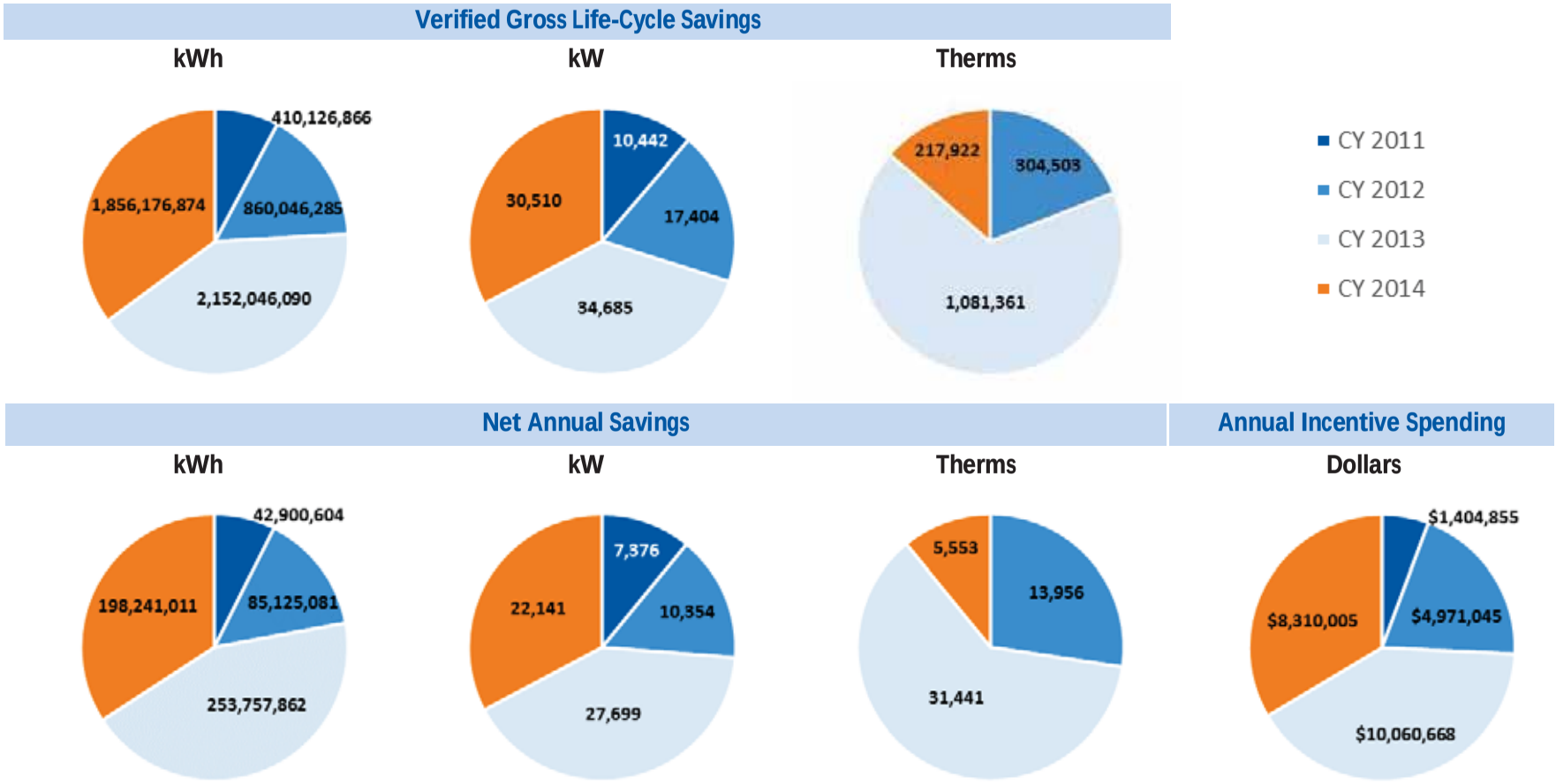
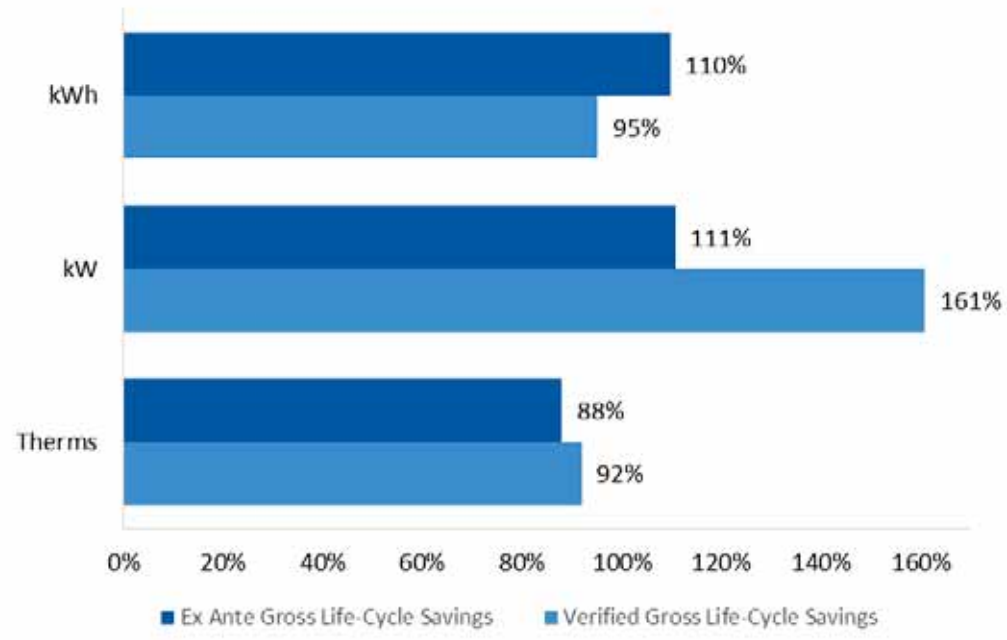


Figure 11 shows the percentage of gross life-cycle savings goals achieved by the Lighting and Appliance Program in CY 2014. The Program achieved *ex ante* gross savings equal to 110% and 111% of the electric energy and demand goals respectively. The Program fell short of the gas goal, by achieving *ex ante* gross savings equal to 88% of the CY 2014 gas goal.

Figure 11. Lighting and Appliance Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementer's contract goals for CY 2014: 1,950,000,000 kWh, 18,981 kW, and 236,720 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

The Evaluation Team verified the achievement of 95%, 161%, and 92% of the electric energy, electric demand and gas goals respectively. Verified gross electric energy savings were lower than *ex ante* savings due to the application of ISR adjustments, and verified gross electric demand savings were higher than *ex ante* savings due to the assignment of commercial bulb installation described below. Verified gross gas savings were higher than *ex ante* due to the reassignment of water heater fuel type to showerheads, also described below.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation in CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Lighting and Appliance Program's performance. Table lists the specific data collection activities and sample sizes used in the evaluations.

Table 24. Lighting and Appliance Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Program Database Review	Census	Census
Single-Family Data Logger Sites	0	62
Multifamily Data Logger Sites	0	72
Clothes Washer Telephone Surveys	0	17
Lighting Telephone Surveys	0	474
Stakeholder Interviews	2	4

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

The Evaluation Team conducted impact activities for the impact evaluation. To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied findings from the CY 2013 engineering reviews. To calculate CY 2014 net savings, the Evaluation Team applied measure-level NTG ratios calculated in CY 2013.

Evaluation of Gross Savings

The Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Lighting and Appliance Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

Verified Unit Energy Savings

The Evaluation Team cited the most recent research to estimate the verified unit energy savings for CFLs, showerheads, and clothes washers.[7]

CFLs

In CY 2013, the Evaluation Team determined an in-service rate (ISR) of 85.5% for all CFLs from data collected from 62 single-family homes and 72 multifamily homes during site visits and continued to apply the same ISR in CY 2014.

To determine per-unit electric savings in CY 2013, the Evaluation Team used the Program Implementer's savings assumptions and algorithms to recalculate bulb savings. The Evaluation Team found small discrepancies, possibly due to rounding or calculation errors, between the assumed values reported in

[7] In CY 2013, the Evaluation Team assigned an ISR of 1 to all LEDs and used the Program Implementer's savings assumptions and algorithms to recalculate bulb savings. In CY 2015, the Evaluation Team plans to conduct additional research on LEDs to update these assumptions.

the work papers provided by the Program Implementer and the Evaluation Team's recalculated per-unit kWh values.

Since the *ex ante* per-unit savings (and the distribution of wattages) have changed since CY 2013, the Evaluation Team applied the same proportional change to the average unit savings in CY 2014. The Evaluation Team adjusted the weighted verified unit energy savings for CFLs down by 2.3% in CY 2014 to an average of 39.53 kWh and 0.0032 kW per bulb (before the ISR adjustment).

The Evaluation Team continued to recategorize 7% of the total CFL bulbs as commercial-use bulbs (results from a CY 2012 intercept study with 178 customers in 24 different Wisconsin stores), which receive higher per-unit savings due to the longer hours-of-use in a commercial setting.

Showerheads

The Evaluation Team continued to assume an ISR of 100% for showerheads. The Evaluation Team did not apply the 90% ISR from the most recent showerhead installation survey because that survey was conducted for direct install showerheads, which are more likely to be removed than showerheads purchased by customers.

For water heater fuel type, the Program Implementer attributed 67.4% of the weighted savings to gas and 32.6% to electric based on assumptions made from 2009 Residential Energy Consumption Survey data. In CY 2013, the Evaluation Team applied findings from audits performed as part of the Home Performance with ENERGY STAR Program by Conservation Services Group (CSG) in Wisconsin. Of the 3,281 water heaters observed, 2,776 were fueled by natural gas, 10 by liquid petroleum, and 495 by electricity. The Evaluation Team continued to apply the CY 2013 findings—84.6% of the weighted savings to gas, 15.1% to electric, and the remaining 0.3% to liquid propane—to CY 2014.

Clothes Washers

Clothes washers contributed a relatively small proportion of savings to the Residential portfolio in CY 2013 and CY 2014; therefore, the Evaluation Team did not conduct an engineering review to verify the unit savings. In CY 2014 (as in CY 2013), the Evaluation Team carried the *ex ante* savings through as *ex post* gross savings.

CY 2014 and Quadrennium Realization Rates

Overall, the Lighting and Appliance Program achieved an evaluated realization rate of 102% weighted by energy (see Table 25).[8] These realization rates include savings achieved by bulbs installed in commercial applications, which drives the program realization rate over 100% given the high per-unit savings attributed to commercial CFL installations (due to higher hours-of-use). Thus, the gross savings reported

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

in SPECTRUM have been verified to have been achieved and exceeded, in accordance with the Program operating criteria and previously agreed upon evaluation criteria.

The low kWh and kW realization rates for showerheads are due to the Evaluation Team's use of different assumptions for water heater fuel type distribution and are offset by the high therm realization rate.

Table 25. CY 2014 Lighting and Appliance Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
CFL	102%	146%	N/A	102%
Clothes Washer	100%	100%	100%	100%
Showerheads	46%	45%	126%	103%
Total	**102%**	**145%**	**105%**	**102%**

Figure 12 shows the realization rates by fuel type across four calendar years. The program realized 98% of *ex ante* savings over all four program years.

Figure 12. CY 2011–CY 2014 Lighting and Appliance Program Realization Rate by Fuel Type

CY 2014 and Quadrennium Gross and Verified Savings Results

Table 26 lists the combined *ex ante* and verified gross savings by measure type for the Lighting and Appliance Programs in CY 2014.

Table 26. CY 2014 Lighting and Appliance Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
CFL	2,133,285,704	20,831	0	1,656,549,624	17,024	0
CFL (Commercial)[1]	0	0	0	193,182,748	13,293	0
Clothes Washer	6,251,040	193	171,325	6,251,040	193	171,325
Showerheads	419,220	0	37,127	193,462	0	46,597
Total Life-Cycle	**2,139,955,964**	**21,024**	**208,452**	**1,856,176,874**	**30,510**	**217,922**

[1] All CFL *ex ante* savings are categorized under the CFL measure type. The Evaluation Team reassigned 7% of CFL bulbs to a commercial category in verified gross; therefore, there are no *ex ante* savings listed for these commercial bulbs.

Table 27 lists the combined *ex ante* and verified gross savings for the Lighting and Appliance Program from CY 2011 through CY 2014.

Table 27. Lighting and Appliance Program CY 2014 and Four-Year (CY 2011-2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	267,271,017	21,024	19,282	272,050,680	30,510	20,229
	Life-Cycle	2,139,955,964	21,024	208,452	1,856,176,874	30,510	217,922
2011-2014	Annual	800,414,927	72,958	130,451	786,687,645	93,041	151,051
	Life-Cycle	6,032,962,033	72,958	1,390,399	5,278,396,115	93,041	1,603,786

Evaluation of Net Savings

For the Lighting and Appliance Program, the Evaluation Team applied freeridership and spillover adjustments (from the standard market baseline study, the saturation study, and the clothes washer NTG survey) determined by the CY 2013 evaluation. In CY 2014, the Evaluation Team updated the lighting saturation study, resulting in a decrease in the spillover adjustment for CFLs.

Table 28 lists the program-level NTG ratio applied for CY 2011 through CY 2014. The NTG ratio represents the weighted average of the CY 2013 measure-level NTG ratios (with the exception of the spillover adjustment for CFLs), updated to reflect the CY 2014 measure mix.

Table 28. Lighting and Appliance Program NTG Ratios

Adjustment	CY 2011	CY 2012	CY 2013	CY 2014	CY 2011–CY 2014
NTG Ratio	0.72	0.59	0.81	0.73	0.74

Freeridership Methodology

Freeriders are participants who would have purchased the same efficient measure at the same time without any influence from the Program. In CY 2013, the Evaluation Team used two different methodologies to assess freeridership, the results of which were carried forward in CY 2014:

- For CFL lighting measures, the Evaluation Team applied results an econometric price-response model populated with sales tracking data and marketing event information from the Program Implementer. A detailed description of the price-response model can be found in the Focus on Energy Calendar Year 2012 Evaluation Report Volume II. [9]
- For showerhead and clothes washer measures that were included in the Market Baseline Study, or where adequate market baseline data were available from other sources, the Evaluation Team applied a SMP methodology. See Appendix L for additional discussion of this method.

Overall, in CY 2014, the Program had an average freeridership of 41%, weighted by measure-type savings.

Table 29. CY 2014 Lighting and Appliance Program Net-of-Freeridership Percentage Estimates by Measure Group

Measure Group Name	Net-of-Freeridership Percentage Estimate[1]	Source of Freeridership Adjustment
Lighting CFLs	60%	Price Response Model
Showerheads	48%	SMP
Clothes Washers	25%	SMP
Overall	**59%**	**Weighted Average**

[1] Based on MMBtu Savings.

Spillover Methodology

Spillover results when customers invest in additional efficiency measures or make additional energy-efficient behavior choices beyond those rebated through the Program. For CY 2014, the Evaluation Team used two different methodologies to assess spillover:

[9] Cadmus. *Focus on Energy Calendar Year 2012 Evaluation Report Volume II.* August 28, 2013.

- For CFL lighting measures, the Evaluation Team applied an updated saturation analysis to determine spillover. This analysis compared the change in CFL bulb saturation levels in Wisconsin to sales of Program bulbs over the same time period to determine spillover. In CY 2014, the Evaluation Team updated several of the sources feeding into the saturation analysis, resulting in a decrease of lighting spillover from 20% to 13%.[10]
- For clothes washer measures, the Evaluation Team applied a self-report methodology. The 17 participants from the CY 2013 Clothes Washer NTG survey reported that the Program had no influence on their decisions to purchase and install other energy efficiency products.
- For showerheads, the Evaluation Team assumed 0% spillover.

As shown in Table 30, the Evaluation Team estimated spillover as 13% of the Program's savings.

Table 30. Lighting and Appliance Program Spillover Estimates by Measure Group

Measure Group Name	Spillover Estimate	Source of Spillover Adjustment
Lighting CFLs	13%	Saturation Analysis
Showerheads	0%	Assumed
Clothes Washers	0%	Self-Report
Overall	**13%**	**Weighted Average**

CY 2014 and Quadrennium Net Savings Results

Table 31 shows the net energy impacts (kWh, kW, and therms) for the Lighting and Appliance Program. The Evaluation Team attributed these savings net of what would have occurred without the Program. Of the CY 2014 net annual savings reported in Table 31, the Evaluation Team found that 46,986,111 kWh and 9,700 kW occurred in commercial applications.

Table 31. Lighting and Appliance Program CY 2014 and Four-Year (CY 2011–CY 2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	kW	Therms
2014	Annual	198,241,011	22,141	5,553
	Life-Cycle	1,351,457,962	22,141	59,659
2011-2014	Annual	580,024,559	67,570	50,951
	Life-Cycle	3,931,594,835	67,570	548,642

[10] In CY 2014, the Evaluation Team updated the sources from the 2008 PA self-report survey (n=345) to the 2009 NMR/PA Consulting report for on-site visits (n=82) for the variables number of sockets per household, baseline

Program Cost-Effectiveness

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

Table 32 lists the incentive costs for the Lighting and Appliance Program in CY 2014 and CY 2012 through CY 2014.

Table 32. Lighting and Appliance Program Incentive Costs

	CY 2014	CY 2012-2014
Incentive Costs	$8,310,005	$23,522,228

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 33 lists the evaluated costs and benefits.

Table 33. Lighting and Appliance Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012-2014
Costs		
Administration Costs	$959,866	$2,815,423
Delivery Costs	$2,188,922	$6,420,419
Incremental Measure Costs	$13,358,531	$43,943,301
Total Non-Incentive Costs	$16,507,319	$53,179,143
Benefits		
Electric Benefits	$74,269,646	$206,605,750
Gas Benefits	$56,252	$403,257
Emissions Benefits	$30,987,046	$86,941,974
Total TRC Benefits	$105,312,944	$293,950,980
Net TRC Benefits	**$88,805,625**	**$240,771,837**
TRC B/C Ratio	**6.38**	**5.53**

The Residential Sector cost-effectiveness results reported in Volume I also include the costs and benefits of the CY 2011 ENERGY STAR Lighting Program.

Home Performance with ENERGY STAR Program

The Home Performance with ENERGY STAR Program encourages homeowners to make energy efficiency upgrades to their homes. Homeowners face barriers to making such upgrades on their own, including cost and lack of information about how to save energy. The Program helps participants overcome these barriers by performing a home energy assessment and offering homeowners a home energy report and instant discount cash incentives to implement key assessment recommendations.

Participants receive instant discounts of 33%, up to $1,250, toward the cost of air sealing and insulation improvements. Participants who achieve 25% or greater energy savings compared to pre-installation levels are eligible for a $250 savings bonus.

In CY 2013, the Home Performance with ENERGY STAR Program and the Assisted Home Performance with ENERGY STAR Program were combined under a single program, with two reward levels. The original Home Performance benefits are labeled Reward Level 1, and the Assisted Home Performance benefits are labeled Reward Level 2. The Home Performance with ENERGY STAR Program Implementer is CSG, and the Program is delivered through a network of authorized contractors (trade allies).

Although the reward levels are offered under a single, combined program, for consistency with previous reports, in CY 2014 (as in CY 2013), the Evaluation Team reviewed and reported on each program in two separate chapters.

Table 34 lists a summary of Home Performance with ENERGY STAR Program's actual spending, savings, participation, and cost-effectiveness. Spending, savings, and participation totals for CY 2011 through CY 2014 include the CY 2011 Home Energy Savings Program, while the cost-effectiveness result includes costs and benefits from CY 2012 through CY 2014 only. Cost-effectiveness results for the former Home Energy Savings Program active in CY 2011 are reported in Volume I.

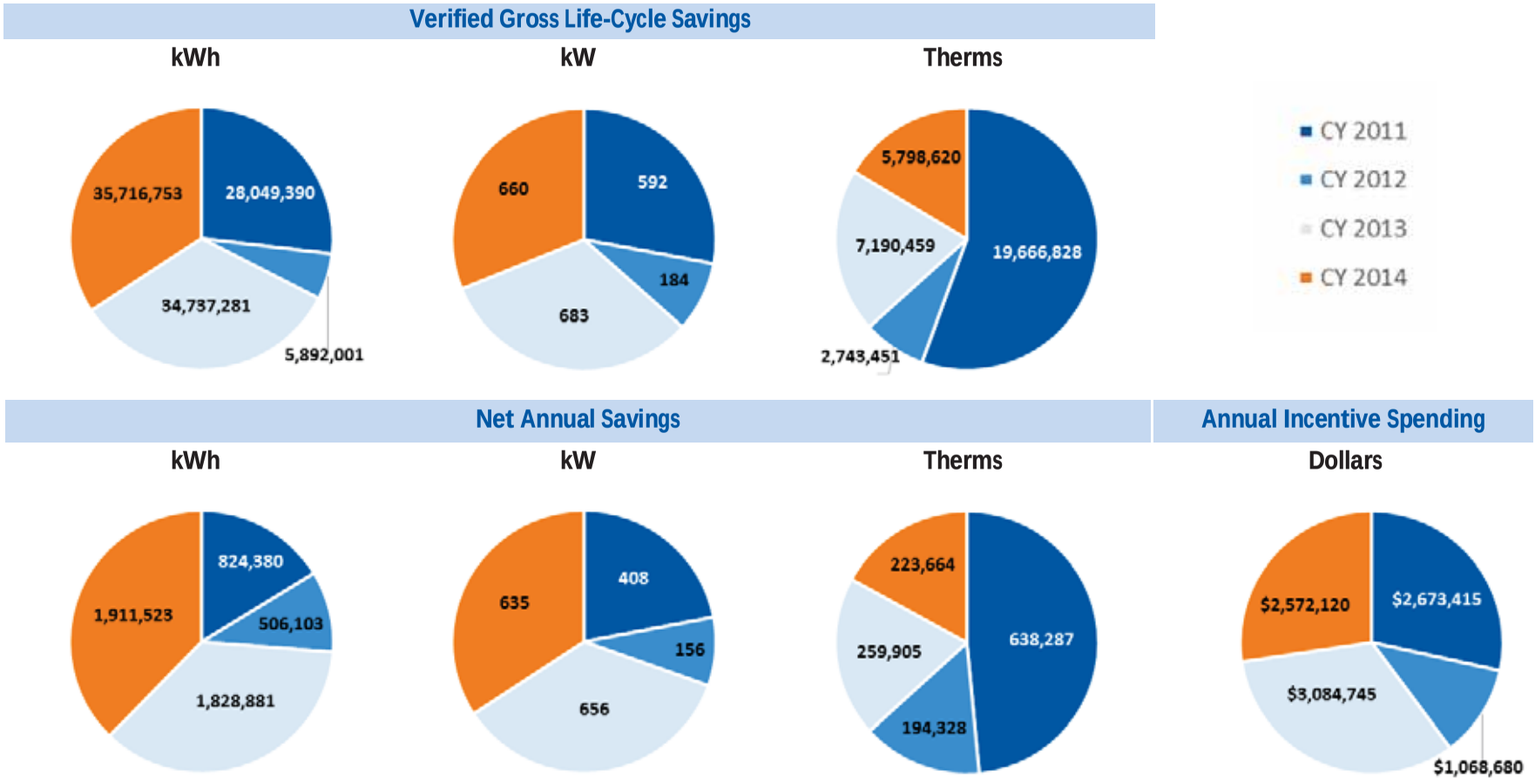
Table 34. Home Performance with ENERGY STAR Program Summary

Item	Units	CY 2014 Actual Amount	CY 2011–CY 2014 Actual Amount
Incentive Spending	$	$2,572,120	$9,398,960
Verified Gross Life-Cycle Savings	kWh	35,716,753	104,395,425
	kW	660	2,118
	therms	5,798,620	35,399,358
Net Annual Savings	kWh	1,911,523	5,070,887
	kW	635	1,855
	therms	223,664	1,316,184
Participation	Number of Participants	2,339	13,305[1]
Cost-Effectiveness[2]	TRC B/C Ratio	1.18	0.94

[1] The CY 2011–CY 2014 total number of participants represents the sum of unique participants in each year.

Figure 13 shows a summary of savings and spending by year from CY 2011 through CY 2014.

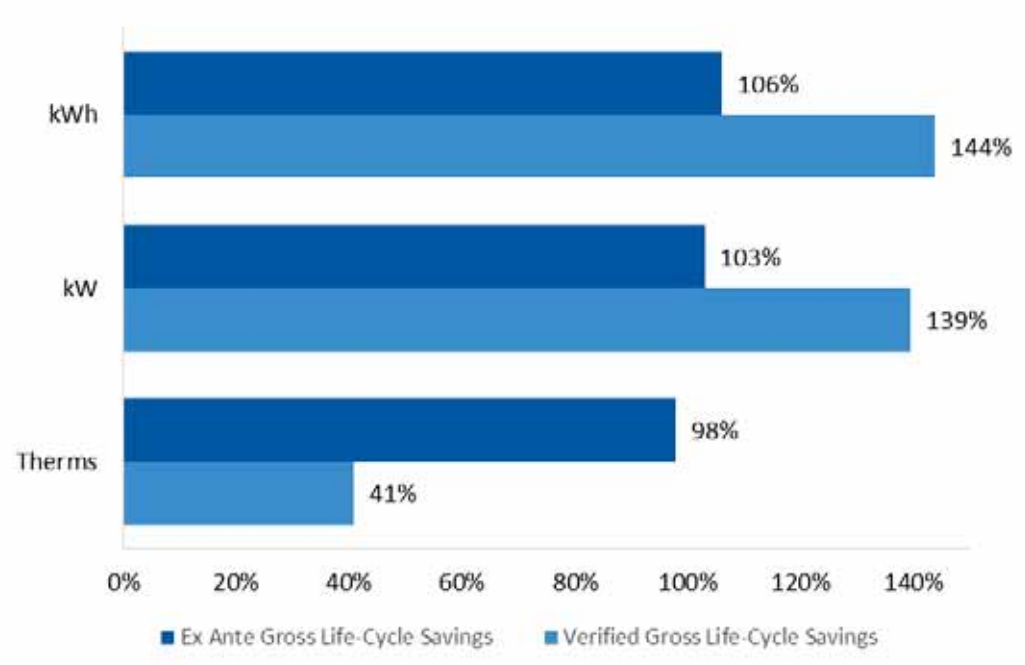
Figure 13. Home Performance with ENERGY STAR Program Four-Year (CY 2011–CY 2014) Savings and Spending Progress



[1] CY 2013 net annual savings values differ from those reported in the CY 2013 report due to a correction made to the net savings calculation.

Figure 14 shows the percentage of gross life-cycle savings goals achieved by the Home Performance with ENERGY STAR Program in CY 2014. The Program achieved *ex ante* gross savings equal to 106%, 103% and 98% of its CY 2014 electric energy, electric demand, and gas savings goals respectively.

Figure 14. Home Performance with ENERGY STAR Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementer's contract goals for CY 2014: 24,852,491 kWh, 473 kW, and 14,168,110 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

The Evaluation Team verified the achievement of 144%, 139%, and 41% of the electric energy, electric demand, and gas goals respectively. Verified gross savings were higher than *ex ante* savings for electric savings and lower for gas savings due to results from the billing analysis.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted a billing analysis of the Program's savings in CY 2013, which has been applied to CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Home Performance with ENERGY STAR Program's performance. Table 35 lists the specific data collection activities and sample sizes used in the evaluations.

Table 35. Home Performance with ENERGY STAR Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Program Database Review	Census	Census
Electric Billing Analysis	0	184
Gas Billing Analysis	0	265
On-Site Verification	0	15
Participant Surveys	20	143
Program Actor Interviews	2	8
Participant Trade Ally Interviews	0	20

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the program records and applied the CY 2013 realization rates to all measures. To calculate CY 2014 net savings, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

Evaluation of Gross Savings

The Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Home Performance with ENERGY STAR Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

Billing Analysis

The Evaluation Team reviewed the tracking database and applied a realization rate to the *ex ante* electric and gas energy savings based on the CY 2013 billing analysis results. A billing analysis uses regression models to measure the impact of energy efficiency measures on consumption. By evaluating the pre- and post-installation energy consumption, and accounting for variables such as weather, the Evaluation Team can measure an impact for an installation. A billing analysis is a particularly useful method of evaluating building shell measures because their impacts are very difficult to measure from an engineering perspective. The Evaluation Team's CY 2013 billing analysis was based on billing data from a sample of 184 participant electric accounts and 265 participating gas accounts. The results of the CY 2013 analysis are robust (the electric billing analysis achieved ±20% precision at 90% confidence, and the gas billing analysis achieved ±11% precision at 90% confidence). The Evaluation Team plans to continue building on this research to provide increasingly robust findings in future evaluation years.

CY 2014 and Quadrennium Realization Rates

Using the billing analysis, electric energy savings had a realization rate of 135% and natural gas savings had a realization rate of 42%.[11] Since the majority of the Program's impacts are from natural gas savings, the weighted average of the electric and gas realization rates is 49% (Table 36).[12] Therefore, the gross savings that the Evaluation Team verified as having been achieved by the Program are less than the gross savings reported in the Program tracking database.

Table 36. CY 2014 Home Performance with ENERGY STAR Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
CFL	135%	135%	N/A	135%
Faucet Aerator	135%	135%	42%	60%
Insulation	135%	135%	42%	73%
LED	135%	135%	N/A	135%
Project Completion	135%	135%	42%	47%
Showerhead	135%	135%	42%	67%
Total	**135%**	**135%**	**42%**	**49%**

Figure 15 shows the realization rates by fuel type across four calendar years. The Program realized 57% of *ex ante* savings over all three program years.

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

[12] The Evaluation Team set gas savings for the measure "Faucet Aerator, Non PI Direct Install, 1.0 gpm, Bathroom, Electric" to zero, after finding a small amount of gas savings reported in SPECTRUM. These savings are believed to be a data entry error because there should not be gas savings associated with this measure when installed in homes with an electric water heater. The change had a minimal effect on total verified savings or realization rates.

Figure 15. CY 2011-2014 Home Performance with ENERGY STAR Program Realization Rate by Fuel Type

CY 2014 and Quadrennium Gross and Verified Savings Results

Table 37 lists the combined *ex ante* and verified gross savings by measure type for the Home Performance with ENERGY STAR Programs in CY 2014.

Table 37. CY 2014 Home Performance with ENERGY STAR Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
CFL	2,968,205	59	0	4,020,184	80	0
Faucet Aerator	191,761	2	30,291	259,724	3	12,639
Insulation	4,516	415	304	6,116	562	127
LED	431,744	4	0	584,761	5	0
Project Completion	22,008,608	1	13,772,963	29,808,804	1	5,756,396
Showerhead	765,765	6	70,482	1,037,164	8	29,458
Total Life-Cycle	**26,370,598**	**487**	**13,874,040**	**35,716,753**	**660**	**5,798,620**

Table 38 lists the combined *ex ante* and verified gross savings for the Home Performance with ENERGY STAR Program from CY 2011 through CY 2014.

Table 38. Home Performance with ENERGY STAR Program CY 2014 and Four-Year (CY 2011–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	1,450,062	487	559,390	1,963,987	660	233,795
	Life-Cycle	26,370,598	487	13,874,040	35,716,753	660	5,798,620
2011-2014	Annual	4,581,074	1,765	2,187,930	5,573,355	2,118	1,520,944
	Life-Cycle	86,439,811	1,765	51,393,418	104,395,425	2,118	35,399,358

Evaluation of Net Savings

The Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

Table 39 lists the program-level freeridership and spillover ratios applied for CY 2011 through CY 2014. The freeridership ratio represents the weighted average of the CY 2013 measure-level freeridership ratios, updated to reflect the CY 2014 measure mix.

Table 39. Home Performance with ENERGY STAR Program NTG Ratios

Adjustment	CY 2011	CY 2012	CY 2013	CY 2014	CY 2011–CY 2014
NTG Ratio	0.81	0.85	0.96	0.96	0.87

In CY 2013, the Evaluation Team analyzed the data collected during the participants' phone surveys to estimate the NTG ratio associated with the insulation measure types. The Evaluation Team also assigned a NTG ratio of 1 to all direct install measures. The Team assume that directly installed measures were provided to customers who were unlikely to purchase the measures on their own in the near future. Lastly, the Team assumed the NTG ratio for the air sealing measure was 1 given the difficulty a person has in independently evaluating the need for an upgrade.

CY 2014 and Quadrennium Net Savings Results

Table 40 lists the net energy impacts (kWh, kW, and therms) for the Home Performance with ENERGY STAR Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 40. Home Performance with ENERGY STAR Program CY 2014 and Four-Year (CY 2011–CY 2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	kW	Therms
2014	Annual	1,911,523	635	223,664
	Life-Cycle	34,405,166	635	5,545,339
2011-2014	Annual	5,070,887	1,855	1,316,184
	Life-Cycle	93,353,806	1,855	30,708,794

Program Cost-Effectiveness

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

Table 41 lists the incentive costs for the Home Performance with ENERGY STAR Program in CY 2014 and CY 2012 through CY 2014.

Table 41. Home Performance with ENERGY STAR Program Incentive Costs

	CY 2014	CY 2012–CY 2014
Incentive Costs	$2,572,207	$8,091,402

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 42 lists the evaluated costs and benefits.

Table 42. Home Performance with ENERGY STAR Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012–CY 2014
Costs		
Administration Costs	$326,550	$1,149,847
Delivery Costs	$744,680	$2,622,165
Incremental Measure Costs	$4,980,467	$14,118,153
Total Non-Incentive Costs	$6,051,697	$17,890,165
Benefits		
Electric Benefits	$1,486,996	$3,322,255
Gas Benefits	$4,226,390	$10,316,902
Emissions Benefits	$1,440,993	$3,216,149
Total TRC Benefits	$7,154,379	$16,855,306
Net TRC Benefits	**$1,102,682**	**-$1,034,859**
TRC B/C Ratio	**1.18**	**0.94**

The Residential Sector cost-effectiveness results reported in Volume I also include the costs and benefits of the CY 2011 Home Performance with ENERGY STAR Program.

Assisted Home Performance with ENERGY STAR Program

The Assisted Home Performance with ENERGY STAR Program helps income-eligible residential customers make efficiency upgrades to their homes. As with the Home Performance with ENERGY STAR Program, the cost of making upgrades and a lack of information about how to save energy are the main barriers to homeowners making these upgrades on their own. For the customers who are eligible for this Program—customers who have an annual household income that is 80% of the state median income (SMI) or less—the costs of upgrades are an even greater barrier than for other customers.

Assisted Home Performance Program participants receive instant discounts of 75%, up to $2,000, toward the cost of air sealing and insulation improvements. To qualify for the reward, the improvements must reduce the home's energy use by 10% or greater. Additionally, the home energy assessment is offered free of charge to the participant.

In CY 2013, the Home Performance with ENERGY STAR Program merged with the Assisted Home Performance with ENERGY STAR Program. Under this combined program, the original Home Performance benefits are labeled Reward Level 1, and the Assisted Home Performance benefits are labeled Reward Level 2. The Assisted Home Performance with ENERGY STAR Program Implementer is CSG and the Program is delivered through a network of authorized auditors and contractors.

Although the reward levels are offered under a single, combined program, for consistency with previous reports, in CY 2014 (as in CY 2013), the Evaluation Team reviewed and reported upon each program separately.

Table 43 lists a summary of Assisted Home Performance with ENERGY STAR Program's actual spending, savings, participation, and cost-effectiveness. Spending, savings, and participation totals for CY 2011 through CY 2014 include the CY 2011 Targeted Home Performance Program, while the cost-effectiveness result includes costs and benefits from CY 2012 through 2014 only. Cost-effectiveness results for the former Targeted Home Performance Program active in CY 2011 are reported in Volume I.

Table 43. Assisted Home Performance with ENERGY STAR Program Summary

Item	Units	CY 2014 Actual Amount	CY 2011–CY 2014 Actual Amount
Incentive Spending	$	$1,187,733	$4,750,564
Verified Gross Life-Cycle Savings	kWh	8,128,703	25,958,914
	kW	150	411
	therms	4,536,239	9,727,836
Net Annual Savings	kWh	431,706	1,298,794
	kW	150	411
	therms	182,610	478,154
Participation	Number of Participants	629	1,527[1]
Cost-Effectiveness[2]	TRC B/C Ratio	2.75	2.58

[1] The CY 2011-2014 total number of participants represents the sum of unique participants in each year.

Figure 16 shows a summary of savings and spending by year from CY 2011 through CY 2014. In 2011, the Program was offered under the name Targeted Home Performance. In CY 2012, the Program was restructured and rebranded as the Assisted Home Performance with ENERGY STAR Program. This new Program had a slow uptake, and in CY 2013 the Program experienced a surge in participation due, in part, to cross-promotion with grant-funded programs in Madison and Milwaukee.

Figure 16. Assisted Home Performance with ENERGY STAR Program Four-Year (CY 2011–CY 2014) Savings and Spending Progress

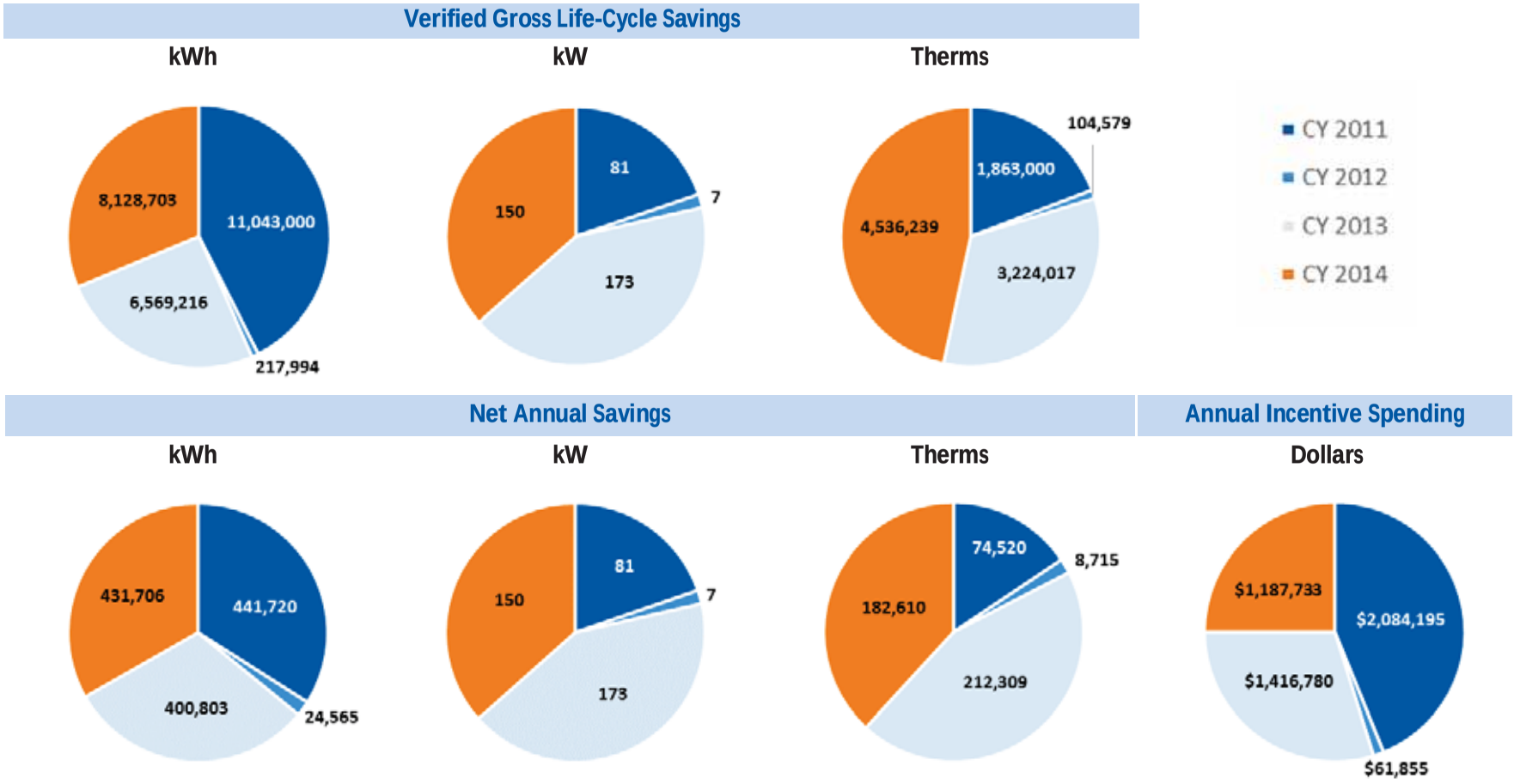
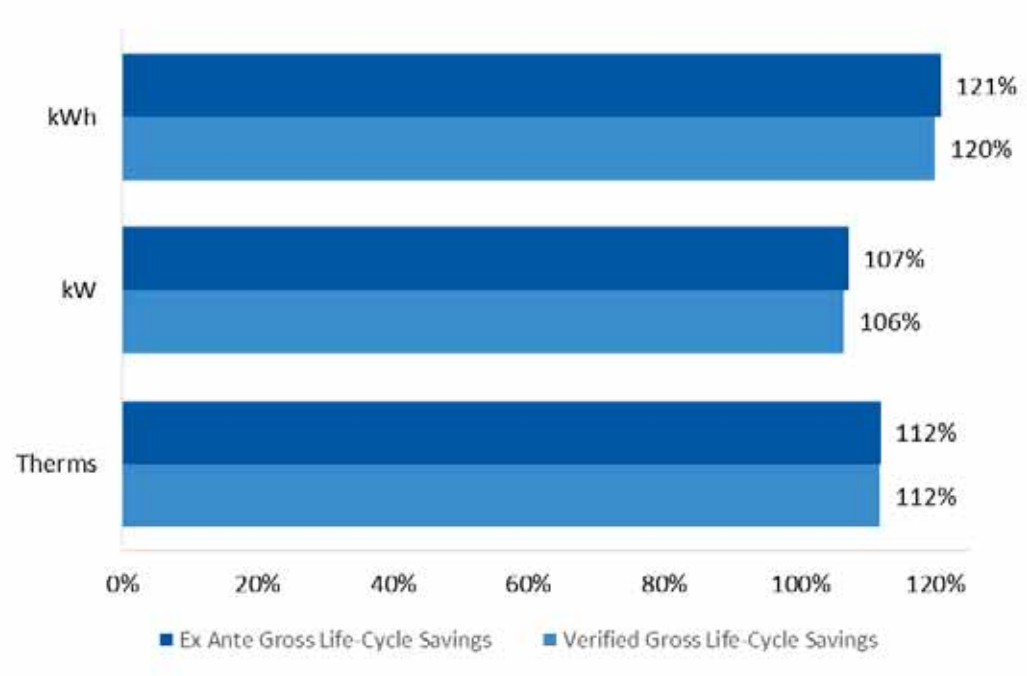


Figure 17 shows the percentage of gross life-cycle savings goals achieved by the Assisted Home Performance with ENERGY STAR Program in CY 2014. The program exceeded all goals, achieving *ex ante* savings equal to 121%, 107% and 112% of electric energy, electric demand, and gas savings goals respectively. Verified gross savings were lower than *ex ante* savings due to installation adjustments that reflect the Evaluation Team's findings that some customers remove direct install measures after program participation.

Figure 17. Assisted Home Performance with ENERGY STAR Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementer's contract goals for CY 2014: 6,780,187 kWh, 141 kW, and 4,056,370 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team carried forward the results of the CY 2013 evaluation, which have been applied to CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Assisted Home Performance with ENERGY STAR Program's performance. Table 44 lists the specific data collection activities and sample sizes used in the evaluations.

Table 44. Assisted Home Performance with ENERGY STAR Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2011–CY 2014 Sample Size (n)
Program Database review	Census	Census
Participant Surveys	20	137
Participant Trade Ally Interviews	0	22
Stakeholder Interviews	2	6

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the program records and applied CY 2013 in-service rates to all measures, with the exception of the showerhead in-service rate calculated from new research conducted in 2014. To calculate CY 2014 net savings, the Evaluation Team applied a NTG ratio of 1.

Evaluation of Gross Savings

The Evaluation Team reviewed the tracking database, and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Assisted Home Performance with ENERGY STAR Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

In-service Rates

The ISR represents the percentage of measures still installed, in use, and operating properly following the installation by the Program Implementer. In CY 2012, the Evaluation Team conducted engineering reviews and reviewed secondary-source data to verify the ISRs for the program measures. The Evaluation Team carried these ISRs forward in CY 2014, except for showerheads.

In CY 2014, the Evaluation Team conducted a survey with 100 participants from three Focus on Energy programs—Assisted Home Performance with ENERGY STAR, Express Energy Efficiency, and Home Performance with ENERGY STAR. The Team weighted the samples per program by the contribution of savings that each program represents, with the Express Energy Efficiency Program contributing the majority of the savings.

The primary goal of the survey was to determine the rate at which CY 2013 and CY 2014 program showerheads were installed, and remained installed, up to the date of the survey. The Evaluation Team also wanted to apply the data collected from site visits for the Express Energy Efficiency Program in CY 2013. Using both sets of data, the Evaluation Team calculated a residential direct install ISR for energy-efficient showerheads for CY 2014. Table 45 lists the combined results of the survey and site visits.

Table 45. CY 2014 Showerhead In-Service Rate Study Results

Showerheads Received	Showerheads Persisted	In-Service Rate
208	187	90%

CY 2014 and Quadrennium Realization Rates

Overall, the Assisted Home Performance with ENERGY STAR Program achieved an evaluated realization rate of 100% (Table 46).[13]

Table 46. CY 2014 Assisted Home Performance with ENERGY STAR Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
Air Sealing	N/A	100%	N/A	N/A
CFL	96%	96%	N/A	96%
Faucet Aerator	89%	89%	89%	89%
Insulation	N/A	100%	N/A	N/A
LED	96%	96%	N/A	96%
Project Completion	100%	N/A	100%	100%
Showerhead	90%	90%	90%	90%
Total	**98%**	**99%**	**100%**	**100%**

Figure 18 shows the realization rates by fuel type across four calendar years. The Program realized 100% of *ex ante* savings over all four program years.

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

Figure 18. CY 2011–CY 2014 Assisted Home Performance with ENERGY STAR Program Realization Rate by Fuel Type

CY 2014 and Quadrennium Gross and Verified Savings Results

Table lists the combined *ex ante* and verified gross savings by measure type in CY 2014.

Table 47. CY 2014 Assisted Home Performance with ENERGY STAR Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Air Sealing[1]	0	0	0	0	0	0
CFL	863,440	17	0	828,989	16	0
Faucet Aerator	64,115	1	9,498	57,364	1	8,498
Insulation	0	131	0	0	131	0
LED	101,810	1	0	97,747	1	0
Project Completion	7,004,421	0	4,511,388	7,004,421	0	4,511,388
Showerhead	155,925	1	18,190	140,183	1	16,353
Total Life-Cycle	**8,189,710**	**151**	**4,539,076**	**8,128,703**	**150**	**4,536,239**

[1] Air sealing has 0.12 kW *ex ante* gross and verified gross life-cycle savings, despite appearing as zero savings (due to rounding).

Table 48 lists the combined *ex ante* and verified gross savings from CY 2011 through CY 2014.

Table 48. Assisted Home Performance with ENERGY STAR Program CY 2014 and Four-Year (CY 2011–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	439,262	151	182,856	431,706	150	182,610
	Life-Cycle	8,189,710	151	4,539,076	8,128,703	150	4,536,239
2012-2014	Annual	1,301,485	412	478,125	1,298,794	411	478,154
	Life-Cycle	25,948,433	412	9,728,046	25,958,914	411	9,727,836

Evaluation of Net Savings

The Public Service Commission of Wisconsin and the Evaluation Work Group have concluded that NTG ratios and spillover are not likely to have significant influence on income-eligible programs, and have therefore directed the Evaluation Team to apply a NTG ratio of 1 for all income-qualified programs.

CY 2014 and Quadrennium Net Savings Results

Table 49 shows the net energy impacts (kWh, kW, and therms).

Table 49. Assisted Home Performance with ENERGY STAR Program CY 2014 and Four-Year (CY 2011–CY 2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	431,706	150	182,610
	Life-Cycle	8,128,703	150	4,536,239
2011-2014	Annual	1,298,794	411	478,154
	Life-Cycle	25,820,234	411	11,586,882

Program Cost-Effectiveness

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

Table 50 lists the incentive costs for the Assisted Home Performance with ENERGY STAR Program for CY 2014 and CY 2012 through CY 2014.

Table 50. Assisted Home Performance with ENERGY STAR Program Incentive Costs

	CY 2014	CY 2012-2014
Incentive Costs	$1,187,733	$2,693,832

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 51 lists the evaluated costs and benefits.

Table 51. Assisted Home Performance with ENERGY STAR Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012-2014
Costs		
Administration Costs	$122,696	$368,467
Delivery Costs	$279,802	$840,269
Incremental Measure Costs	$1,265,998	$2,705,200
Total Non-Incentive Costs	$1,668,497	$3,913,936
Benefits		
Electric Benefits	$347,113	$964,087
Gas Benefits	$3,457,184	$7,510,638
Emissions Benefits	$782,230	$1,614,631
Total TRC Benefits	$4,586,527	$10,089,356
Net TRC Benefits	**$2,918,030**	**$6,175,420**
TRC B/C Ratio	**2.75**	**2.58**

The Residential Sector cost-effectiveness results reported in Volume I also include the costs and benefits of the CY 2011 Assisted Home Performance with ENERGY STAR Program.

New Homes Program

Focus on Energy delivers the New Homes Program to eligible homeowners throughout Wisconsin through a Program Implementer (Wisconsin Energy Conservation Corporation), participating homebuilders, and Building Performance Consultants. Home builders hire a Building Performance Consultant 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 incentives from the Program to help offset the cost of achieving one of four performance levels set by Focus on Energy.

Table 52 lists a summary of New Homes Program's actual spending, savings, participation, and cost-effectiveness. Spending, savings, and participation totals for CY 2011 through CY 2014 include the CY 2011 New Homes Program, while the cost-effectiveness result includes costs and benefits from CY 2012 through CY 2014 only. Cost-effectiveness results for the former New Homes Program that was active in CY 2011 are reported in Volume I.

Table 52. New Homes Program Summary

Item	Units	CY 2014 Actual Amount	CY 2011–CY 2014 Actual Amount
Incentive Spending	$	$1,215,209	$4,515,872
Verified Gross Life-Cycle Savings	kWh	110,618,533	350,824,739
	kW	1,233	3,242
	therms	26,262,954	83,012,855
Net Annual Savings	kWh	2,563,247	8,812,691
	kW	811	2,336
	therms	564,984	1,924,322
Participation	Number of Participants	2,096	7,416[1]
Cost-Effectiveness	TRC B/C Ratio	4.56	3.67

[1] The CY 2011-2014 total number of participants represents the sum of unique participants in each year.

Figure 19 shows a summary of savings and spending by year from CY 2011 through CY 2014.

Figure 19. New Homes Program Four-Year (CY 2011–CY 2014) Savings and Spending Progress

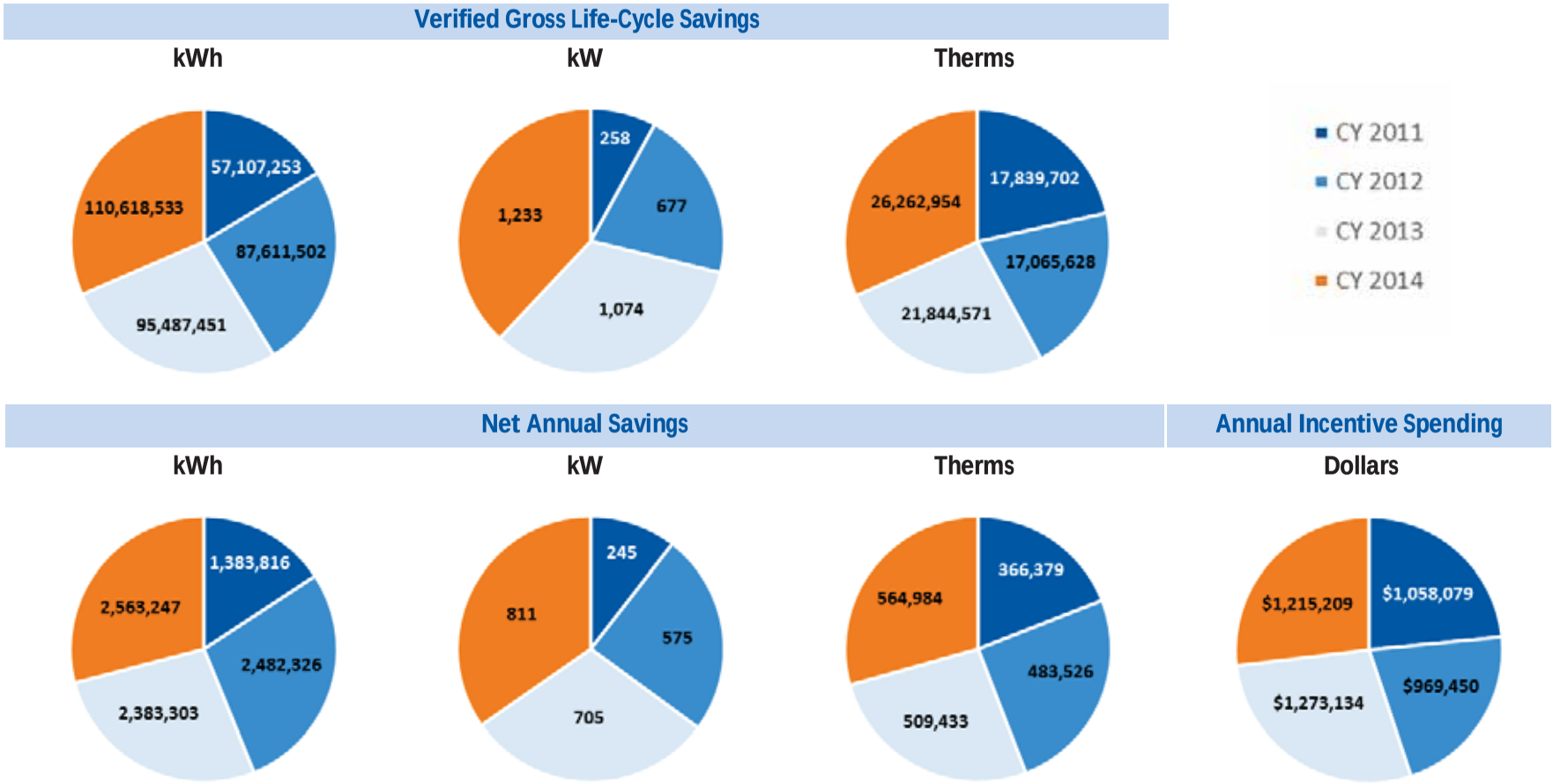
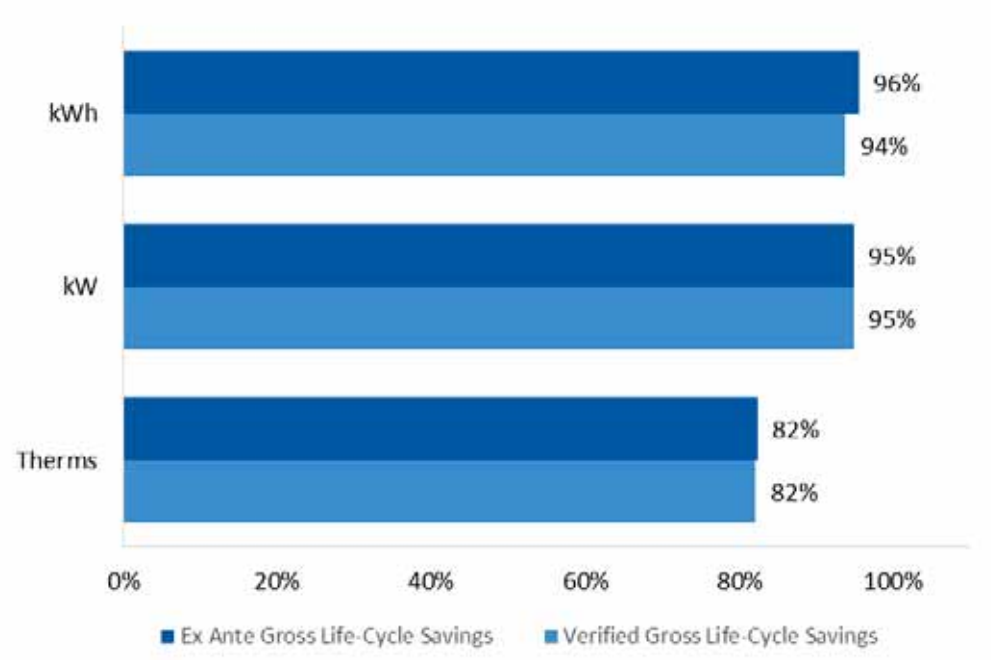


Figure 20 shows the percentage of gross life-cycle savings goals achieved by the New Homes Program in CY 2014. The program fell slightly short of all goals, achieving *ex ante* gross savings equal to 96%, 95%, and 82% of its CY 2014 electric energy, electric demand, and gas savings goals respectively. Verified gross savings were slightly lower than *ex ante* savings due to the adjustment of several certification measure effective useful life (EUL) values.

Figure 20. New Homes Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1]For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 118,000,000 kWh, 1,300 kW, and 32,000,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation in CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the New Homes Program's performance. Table 53 lists the specific data collection activities and sample sizes used in the evaluations.

Table 53. New Homes Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2011–CY 2014 Sample Size (n)
Program Database Review	Census	Census
Builder Survey	0	30
Participant Home Buyer Survey	0	15
Nonparticipant Home Buyer Survey	0	15
Participant Trade Ally Interviews	0	44
Stakeholder Interviews	2	8

More information regarding program evaluation activities can be found in the CY 2012 and 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported participation and applied the results of the CY 2013 evaluation. To calculate CY 2014 net savings, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

Evaluation of Gross Savings

In CY 2014, the Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the New Homes Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

CY 2014 and Quadrennium Realization Rates

The Evaluation Team applied in-service rates of 100% to all New Homes measures and did not adjust the deemed savings. Overall, the New Homes Program achieved an evaluated realization rate of 100% (Table 54).[14] These rates are based on annual savings, and therefore the change in EULs described above does not affect these realization rates.

Table 54. CY 2014 New Homes Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
Certification	100%	100%	100%	100%
Ground Source Heat Pump	100%	100%	100%	100%
Solar PV	100%	100%	N/A	100%
Total	**100%**	**100%**	**100%**	**100%**

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

Figure 21 shows the realization rates by fuel type across four calendar years. The Program realized 100% of *ex ante* savings over all four program years.

Figure 21. CY 2011-2014 New Homes Program Realization Rate by Fuel Type

CY 2014 and Quadrennium Gross and Verified Savings Results

Table 55 lists the combined *ex ante* and verified gross savings by measure in CY 2014. Life-cycle *ex ante* energy savings from the tracking database for the certification measure differ slightly to the annual and life-cycle *ex post* savings due to errors found in several *ex ante* EUL values. Of 2,096 certification measures, 30 had EULs in SPECTRUM that were not equal to 30 years and appeared to be data entry errors (some listed EULs ranged above 100 years). The Evaluation Team set all certification measure EULs to 30 years, as confirmed by the Program Administrator.

Table 55. CY 2014 New Homes Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Certification	105,038,743	1,158	26,336,976	102,948,879	1,158	26,250,120
Ground Source Heat Pump	5,058,180	4	12,834	5,058,180	4	12,834
Solar PV	2,611,474	72	0	2,611,474	72	0
Total Life-Cycle	**112,708,397**	**1,233**	**26,349,810**	**110,618,533**	**1,233**	**26,262,954**

Table 56 lists the combined *ex ante* and verified gross savings for the New Homes Program from CY 2011 through CY 2014.

Table 56. New Homes Program CY 2014 and Four-Year (CY 2011–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	3,843,213	1,233	875,717	3,843,213	1,233	875,717
	Life-Cycle	112,708,397	1,233	26,349,810	110,618,533	1,233	26,262,954
2011-2014	Annual	11,777,422	3,241	2,601,153	11,777,422	3,242	2,601,315
	Life-Cycle	352,914,591	3,241	83,095,968	350,824,739	3,242	83,012,855

Evaluation of Net Savings

For the New Homes Program, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation. In CY 2013, the Evaluation Team conducted interviews with builders to determine freeridership and spillover. The Evaluation Team estimated NTG ratios of 0.65 for certification measures (from self-reported freeridership with builders) and 0.85 for renewable measures (based on planning assumptions).

Table 57 lists the program-level NTG ratios applied for CY 2011 through CY 2014 and the weighted average NTG ratio across the CY 2011 through CY 2014 program years. The CY 2014 NTG ratio represents the weighted average of the CY 2013 measure-level NTG ratios, updated to reflect the CY 2014 mix of measures.

Table 57. New Homes Program NTG Ratios

Adjustment	CY 2011	CY 2012	CY 2013	CY 2014	CY 2011–CY 2014
NTG Ratio	0.99	0.85	0.65	0.65	0.74

CY 2014 and Quadrennium Net Savings Results

Table 58 shows the net energy impacts (kWh, kW, and therms) for the New Homes Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 58. New Homes Program CY 2014 and Four-Year (CY 2011-2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	2,563,247	811	564,984
	Life-Cycle	72,921,233	811	16,942,236
2011-2014	Annual	8,812,691	2,336	1,924,322
	Life-Cycle	265,039,008	2,336	63,348,773

Program Cost-Effectiveness

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

Table 59 lists the incentive costs for the New Homes Program for CY 2014 and CY 2012 through CY 2014.

Table 59. New Homes Program Incentive Costs

	CY 2014	CY 2012–CY 2014
Incentive Costs	$1,215,834	$3,459,018

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 60 lists the evaluated costs and benefits.

Table 60. New Homes Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012-2014
Costs		
Administration Costs	$220,459	$818,889
Delivery Costs	$502,745	$1,867,431
Incremental Measure Costs	$3,832,948	$12,477,394
Total Non-Incentive Costs	$4,556,152	$15,163,714
Benefits		
Electric Benefits	$4,859,525	$12,883,556
Gas Benefits	$12,340,334	$33,205,802
Emissions Benefits	$3,588,948	$9,526,646
Total TRC Benefits	$20,788,807	$55,616,004
Net TRC Benefits	**$16,232,655**	**$40,452,290**
TRC B/C Ratio	**4.56**	**3.67**

The Residential Sector cost-effectiveness results reported in Volume I also include the costs and benefits of the CY 2011 New Homes Program.

Residential Rewards Program

The Residential Rewards Program offers residential customers a range of prescriptive incentives (also known as rewards) for qualified energy-efficient equipment (such as HVAC equipment), home improvements, and renewable-energy technologies. The Program expanded its measure offerings in CY 2013 to include a heating and air conditioning bundle and attic insulation. CLEAResult (formerly RSG) is the Program Implementer.

Table 61 lists a summary of Residential Rewards Program's actual spending, savings, participation, and cost-effectiveness. This chapter reports incentives, savings, participation, and cost-effectiveness for all energy-efficient measures offered under the Residential Rewards Program umbrella, including renewable measures for both residential and nonresidential customers.

Table 61. Residential Rewards Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012–CY 2014 Actual Amount
Incentive Spending	$	$5,844,638	$16,230,248
Verified Gross Life-Cycle Savings	kWh	323,708,725	796,624,855
	kW	6,126	14,525
	therms	39,961,566	100,355,191
Net Annual Savings	kWh	8,012,201	20,664,499
	kW	3,259	8,197
	therms	957,788	2,756,193
Participation	Number of Participants	23,550	60,335[1]
Cost-Effectiveness	TRC B/C Ratio	1.06	1.32

[1] The CY 2012–CY 2014 total number of participants represents the sum of unique participants in each year.

Figure 22 shows a summary of savings and spending by year from CY 2012 through CY 2014.

Figure 22. Residential Rewards Program Three-Year (CY 2012–CY 2014) Savings and Spending Progress

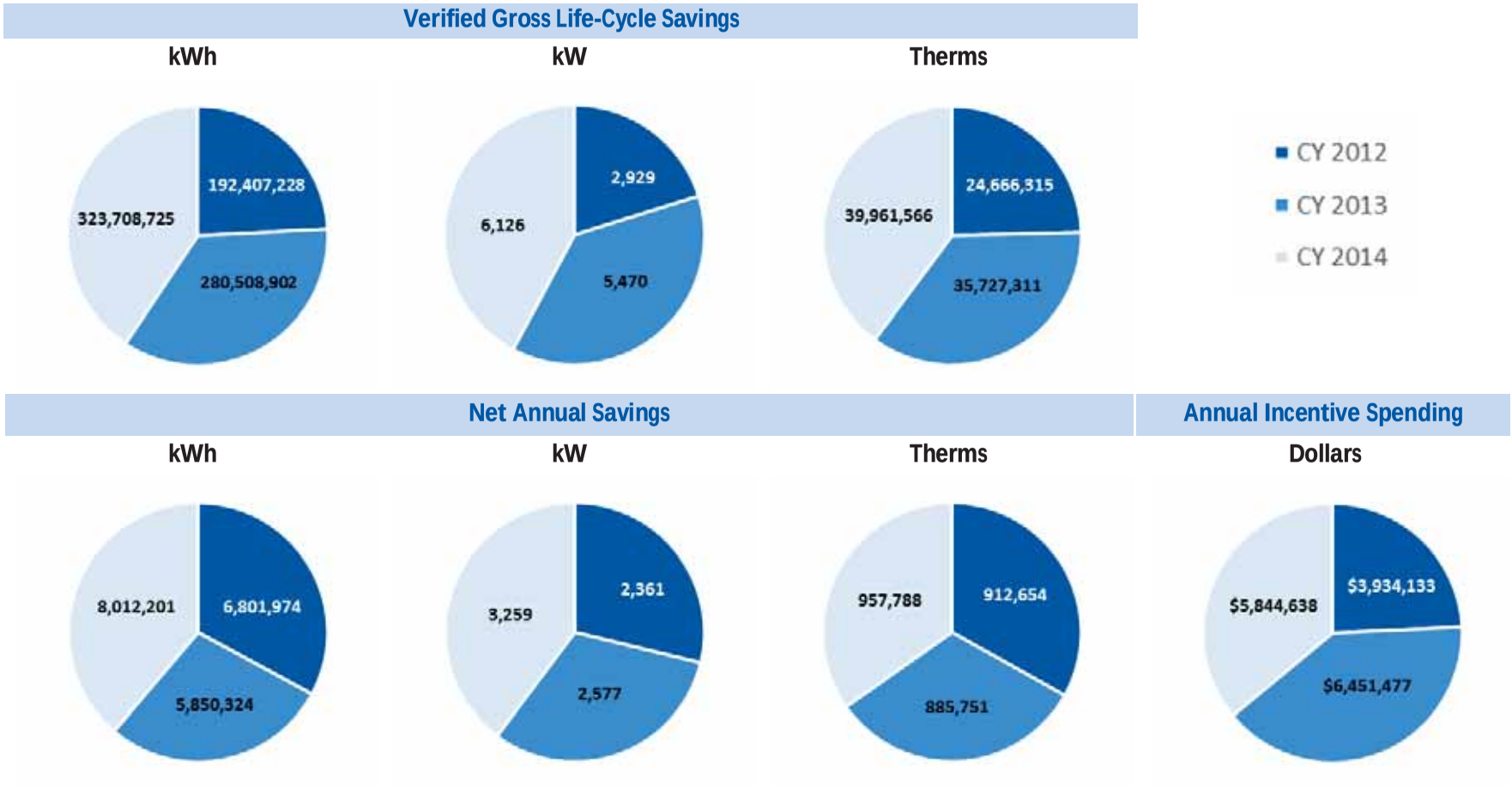
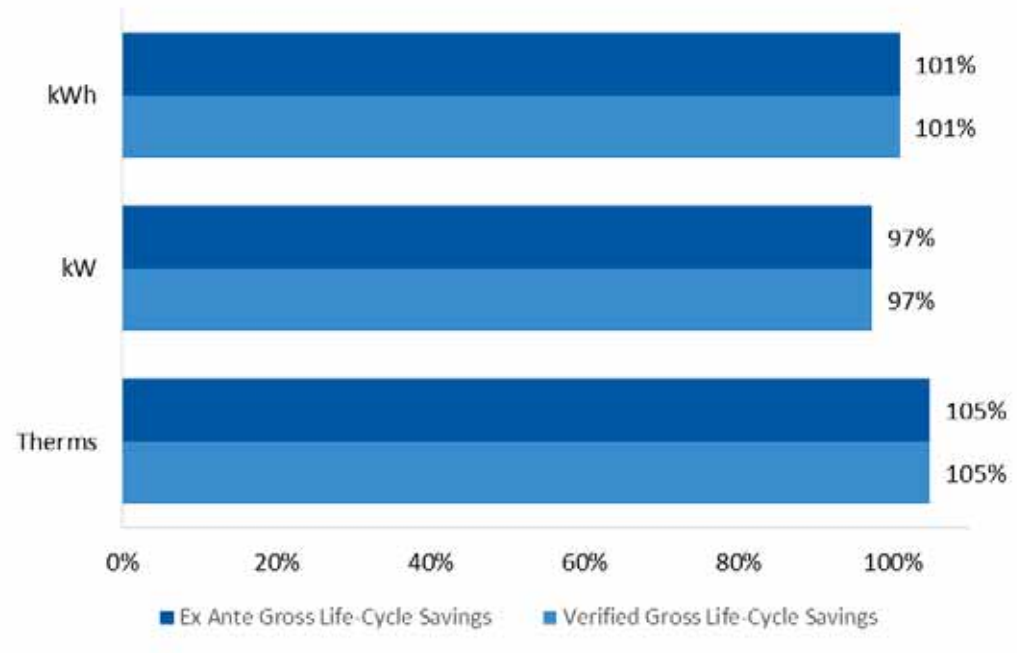


Figure 23 shows the percentage of non-renewable gross life-cycle savings goals achieved by the Residential Rewards Program in CY 2014. The Program achieved 101% and 105% of electric energy and gas goals respectively, but fell just short of the electric demand goal (97%). The Program did not set renewable energy goals in CY 2014.

Figure 23. Residential Rewards Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1]For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 272,000,000 kWh, 5,510 kW, and 38,100,000 therms for all non-renewable program measures. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation in CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Residential Rewards Program's performance. Table 62 lists the specific data collection activities and sample sizes used in the evaluations.

Table 62. Residential Rewards Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Tracking Database Review	Census	Census
Electronically Commutated Motors (ECM) Metering	0	109
Participant Customer Surveys	0	140
Stakeholder Interviews	2	5
Participant Trade Ally Interviews	0	20
Materials Review	0	Census
Benchmarking	0	All Measures

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported participation in the tracking database and applied CY 2013 evaluation results to all measures including renewables. To calculate CY 2014 net savings, the Evaluation Team applied the same methodology for NTG ratio as in CY 2013 (a combination of standard market practice and self-report methods).

Evaluation of Gross Savings

In CY 2014, the Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Residential Rewards Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

CY 2014 and Quadrennium Realization Rates

The Evaluation Team applied in-service rates of 100% to all Residential Rewards measures and only adjusted the annual deemed savings for one water heater measure, which was reported with an incorrect annual electric savings value.[15] Overall, the Residential Rewards Program achieved an evaluated realization rate of 100%.[16]

[15] One electric water heater with the measure name "Water Heater, Electric, EF of 0.93 or greater" had an *ex ante* annual per unit savings value of 978 kWh, a listed EUL of 15 and a life-cycle savings of 1,602 kWh. The Evaluation Team adjusted the annual per unit savings to 107 kWh, which is a consistent savings value to previous years.

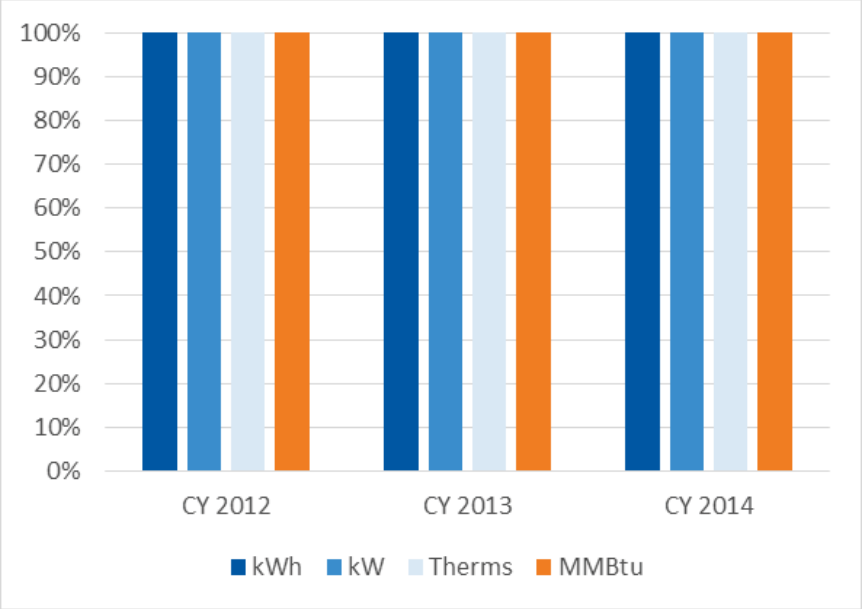
[16] The Evaluation Team calculated realization rates by dividing annual verified gross savings by annual *ex ante* savings.

Table 63. CY 2014 Residential Rewards Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
Adjustment	N/A	N/A	100%	100%
Boiler	N/A	N/A	100%	100%
ECM	100%	100%	N/A	100%
Furnace	100%	100%	100%	100%
Furnace and A/C	100%	100%	100%	100%
Geothermal Heat Pump	100%	100%	100%	100%
Heat Pump	100%	100%	N/A	100%
Insulation	100%	100%	100%	100%
Solar PV	100%	100%	N/A	100%
Water Heater	99%	100%	100%	100%
Total	**100%**	**100%**	**100%**	**100%**

Figure 24 shows the realization rates by fuel type across three calendar years. The program realized 100% of *ex ante* savings over all three program years.

Figure 24. CY 2012-2014 Residential Rewards Program Realization Rate by Fuel Type



CY 2014 and Quadrennium Gross and Verified Savings Results

Table 64 lists the combined *ex ante* and verified gross savings by measure type in CY 2014. The differences between the *ex ante* and verified gross life-cycle savings are due to an error in the *ex ante* assignment of an EUL for one residential solar panel participant (the EUL was mistakenly assigned at 200 years instead of 20 years).

Table 64. CY 2014 Residential Rewards Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Energy-Efficiency	274,544,016	5,366	39,937,311	274,544,016	5,366	39,937,311
Residential Renewable Energy	47,427,562	686	24,255	45,487,463	686	24,255
Nonresidential Renewable Energy	3,677,245	74	0	3,677,245	74	0
Total Life-Cycle	**325,648,823**	**6,126**	**39,961,566**	**323,708,725**	**6,126**	**39,961,566**

Table 65 lists the combined *ex ante* and verified gross savings from CY 2012 through CY 2014.

Table 65. Residential Rewards Program CY 2014 and Three-Year (CY 2012–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	14,538,832	6,126	1,750,828	14,537,961	6,126	1,750,828
	Life-Cycle	325,648,823	6,126	39,961,566	323,708,725	6,126	39,961,566
2012-2014	Annual	35,550,949	14,525	4,427,408	35,549,830	14,525	4,427,250
	Life-Cycle	798,569,907	14,525	100,358,351	796,624,855	14,525	100,355,191

Evaluation of Net Savings

For the Residential Rewards Program, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation, except for renewable measures, which received a NTG value of 1.

Table 66 shows the program-level NTG ratio applied for CY 2014 and the weighted average NTG ratio for CY 2012 through CY 2014. The CY 2014 NTG ratio represents the weighted average of the CY 2013 measure-level NTG ratios, updated to reflect the CY 2014 measure mix.

Table 66. Residential Rewards Program NTG Ratios

Adjustment	CY 2012	CY 2013	CY 2014	CY 2012–CY 2014
NTG Ratio	0.83	0.54	0.55	0.61

The overall NTG ratio increased slightly between CY 2013 and CY 2014, mostly due to updating the renewables NTG ratio to 1 in CY 2014.

Freeridership Methodology

Freeriders are participants who would have purchased the same efficient measure at the same time without any influence from the Program. In CY 2013, the Evaluation Team used three different methodologies to assess freeridership (described in greater detail in Appendix L):

- Measures included in the Market Baseline Study or where adequate market baseline data were available from other sources. The Evaluation Team applied a SMP methodology to determine freeridership. This methodology estimates net savings based on data on market conditions, rather than participant survey data.
- Measures not included in the Market Baseline Study but captured in the participant survey. The Evaluation Team applied a self-report methodology and derived the participants' freeridership score by converting their survey responses into freeridership scores and then applying a consistent, rules-based calculation to obtain the overall freeridership score.
- Measures that were neither included in the Market Baseline Study nor had significant sample sizes from the participant survey. The Evaluation Team applied a ratio developed from the weighted average of the SMP measures' net of freeridership savings to the *ex ante* savings. The savings achieved by these measure groups is minimal as each comprised 2% or less of the Program savings.

Using this same methodology in CY 2014, the Program had an average net-of-freeridership of 50% across all measures, after the Evaluation Team weighted survey responses and SMP analysis for each measure by savings.

Spillover Findings

Spillover results when customers invest in additional efficiency measures or make additional energy-efficient behavior choices beyond those rebated through the Program. Participants reported that the Program was highly influential in their purchase and installation of energy-efficient refrigerators and clothes washers as well as insulation and windows. In CY 2013, the Evaluation Team estimated spillover at 2.53% of the Program's CY evaluated gross savings. The same spillover percentage was applied in CY 2014.

CY 2014 and Quadrennium Net Savings Results

Table 67 lists the combined verified net annual savings by measure type for CY 2014.

Table 67. CY 2014 Residential Rewards Program Net Annual Savings Summary by Measure Type

Measure Type	Net Annual		
	kWh	kW	Therms
Energy-Efficiency	5,471,628	2,499	956,441
Residential Renewable Energy	2,356,711	686	1,348
Nonresidential Renewable Energy	183,862	74	0
Total Annual	**8,012,201**	**3,259**	**957,788**

Table 68 shows the net energy impacts (kWh, kW, and therms) for the Residential Rewards Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 68. Residential Rewards Program CY 2014 and Three-Year (CY 2012-2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	8,012,201	3,259	957,788
	Life-Cycle	173,535,972	3,259	21,738,591
2012-2014	Annual	20,664,499	8,197	2,756,193
	Life-Cycle	457,291,836	8,197	62,036,051

Program Cost-Effectiveness

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

Table 69 lists the CY 2012-2014 incentive costs for the Residential Rewards Program.

Table 69. Residential Rewards Program Incentive Costs

	CY 2014	CY 2012-2014
Incentive Costs	$5,845,614	$16,234,349

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 70 lists the evaluated costs and benefits.

Table 70. Residential Rewards Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012-2014
Costs		
Administration Costs	$1,159,803	$3,030,271
Delivery Costs	$2,644,867	$6,910,368
Incremental Measure Costs	$27,280,057	$63,343,210
Total Non-Incentive Costs	$31,084,726	$73,283,849
Benefits		
Electric Benefits	$13,251,804	$36,107,618
Gas Benefits	$13,934,204	$43,684,978
Emissions Benefits	$5,882,481	$16,984,028
Total TRC Benefits	$33,068,489	$96,776,623
Net TRC Benefits	**$1,983,763**	**$23,492,773**
TRC B/C Ratio	**1.06**	**1.32**

Enhanced Rewards Program

The Focus on Energy Enhanced Rewards Program encourages income-eligible residents to increase the energy efficiency, affordability, and comfort of their homes by offering incentives for replacing older or failed home heating equipment with high-efficiency units, including a heating and air-conditioning bundle option. CLEAResult (formerly RSG) is the Program Implementer.

The Program targets customers who earn from 60% to 80% of the SMI. These customers may be financially unable to participate in the Residential Rewards Program but do not qualify for, or choose not to participate in, the Wisconsin Weatherization Assistance Program or the Home Energy Plus program offered by the Wisconsin Department of Administration.

The Program was first implemented in CY 2012 under the name Home Heating Assistance Program. In CY 2013, the Program Implementer aligned the Program more closely with the Residential Rewards Program and changed its name to Enhanced Rewards. The Program Implementer combined marketing efforts and now presents both programs jointly to customers and Trade Allies.

Table 71 lists a summary of Enhanced Rewards Program's actual spending, savings, participation, and cost-effectiveness.

Table 71. Enhanced Rewards Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012–CY 2014 Actual Amount
Incentive Spending	$	$1,388,200	$2,746,525
Verified Gross Life-Cycle Savings	kWh	17,396,740	33,033,939
	kW	334	644
	therms	6,056,445	10,646,275
Net Annual Savings	kWh	756,380	1,436,258
	kW	334	644
	therms	264,495	464,727
Participation	Number of Participants	1,655	3,167[1]
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	2.22	1.45

[1] The CY 2012-2014 total number of participants represents the sum of unique participants in each year.

Figure 25 shows a summary of savings and spending by year from CY 2012 through CY 2014.

Figure 25. Enhanced Rewards Program Three-Year (CY 2012–CY 2014) Savings and Spending Progress

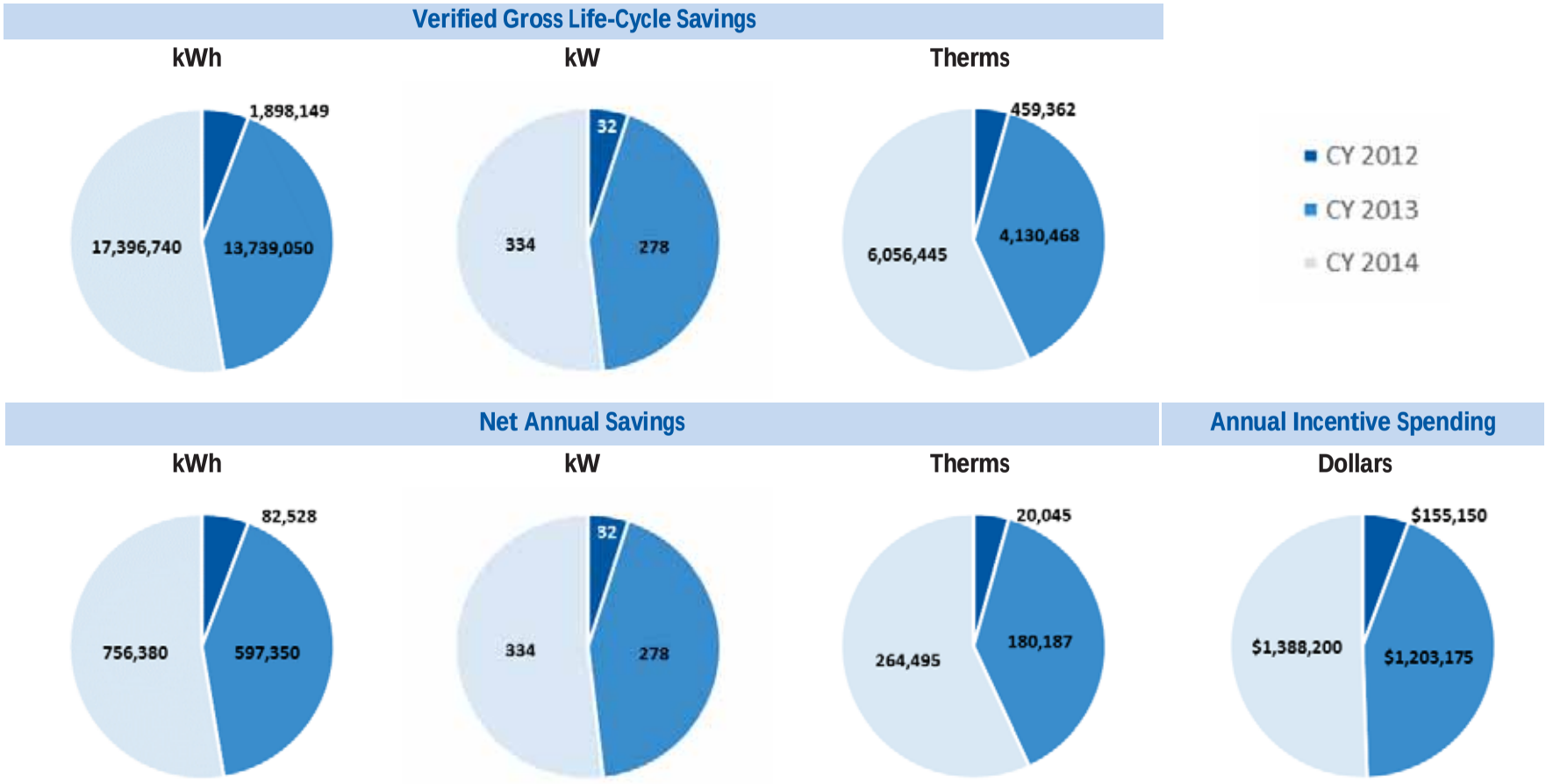
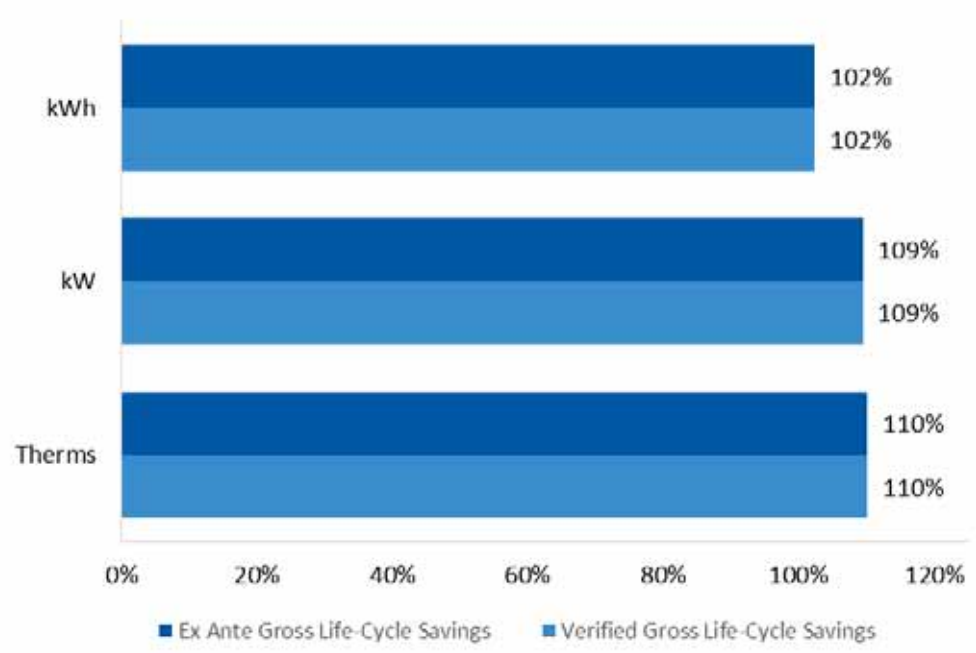


Figure 26 shows the percentage of gross life-cycle savings goals achieved by the Enhanced Rewards Program in CY 2014. The Program exceeded all goals, achieving 102%, 109%, and 110% of electric energy and demand and gas goals respectively.

Figure 26. Enhanced Rewards Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1]For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 17,000,000 kWh, 305 kW, and 5,500,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation in CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Enhanced Rewards Program's performance. Table 72 lists the specific data collection activities and sample sizes used in the evaluations.

Table 72. Enhanced Rewards Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Tracking Database Review	Census	Census
Participant Surveys	0	70
Nonparticipant Surveys	0	2
Participant Trade Ally Interviews	0	8
Stakeholder Interviews	2	4

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied CY 2013 evaluation results to all measures. To calculate CY 2014 net savings, the Evaluation Team applied a NTG ratio of 1.

Evaluation of Gross Savings

In CY 2014, the Evaluation Team reviewed the tracking database and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Enhanced Rewards Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

CY 2014 and Quadrennium Realization Rates

The Evaluation Team applied in-service rates of 100% to all Enhanced Rewards measures and did not adjust the deemed savings. Overall, the Enhanced Rewards Program achieved an evaluated realization rate of 100%.[17]

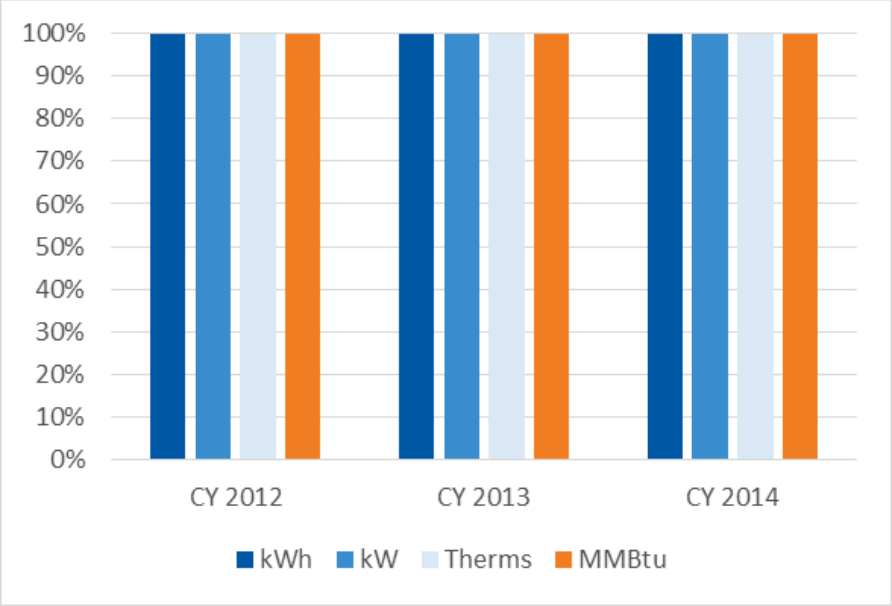
Table 73. CY 2014 Enhanced Rewards Program Realization Rates by Measure Type

Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
Furnace	100%	100%	100%	100%
Furnace and A/C	100%	100%	100%	100%
Boiler	N/A	N/A	100%	100%
Total	**100%**	**100%**	**100%**	**100%**

Figure 27 shows the realization rates by fuel type across three calendar years. The Program realized 100% of *ex ante* savings over all three program years.

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

Figure 27. CY 2012-2014 Enhanced Rewards Program Realization Rate by Fuel Type



CY 2014 and Quadrennium Gross and Verified Savings Results

Table 73 lists the combined *ex ante* and verified gross savings by measure type in CY 2014. Annual and life-cycle *ex ante* energy and demand savings from the tracking database are equal to the annual and life-cycle *ex post* savings.

Table 74. CY 2014 Enhanced Rewards Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Furnace	15,329,500	267	5,622,465	15,329,500	267	5,622,465
Furnace and A/C	2,067,240	67	254,380	2,067,240	67	254,380
Boiler	0	0	179,600	0	0	179,600
Total Life-Cycle	**17,396,740**	**334**	**6,056,445**	**17,396,740**	**334**	**6,056,445**

Table 74 lists the combined *ex ante* and verified gross savings from CY 2012 through CY 2014.

Table 75. Enhanced Rewards Program CY 2014 and Three-Year (CY 2012-2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	756,380	334	264,495	756,380	334	264,495
	Life-Cycle	17,396,740	334	6,056,445	17,396,740	334	6,056,445
2012-2014	Annual	1,436,260	644	464,728	1,436,258	644	464,727
	Life-Cycle	33,033,980	644	10,646,291	33,033,939	644	10,646,275

Evaluation of Net Savings

The Public Service Commission of Wisconsin and the Evaluation Work Group have concluded that NTG ratios and spillover are not likely to have significant influence on income-eligible programs, and have therefore directed the Evaluation Team to apply a NTG ratio of 1 for all income-qualified programs.

CY 2014 and Quadrennium Net Savings Results

Table 76 shows the net energy impacts (kWh, kW, and therms) for the Enhanced Rewards Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 76. Enhanced Rewards Program CY 2014 and Three-Year (CY 2012-2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	756,380	334	264,495
	Life-Cycle	17,396,740	334	6,056,445
2011-2014	Annual	1,436,258	644	464,727
	Life-Cycle	33,033,939	644	10,646,275

Program Cost-Effectiveness

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

Table 77 lists the incentive costs for the Enhanced Rewards Program in CY 2014 and CY 2012 through CY 2014.

Table 77. Enhanced Rewards Program Incentive Costs

	CY 2014	CY 2012–CY 2014
Incentive Costs	$1,387,350	$5,024,974

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 78 lists the evaluated costs and benefits.

Table 78. Enhanced Rewards Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012–CY 2014
Costs		
Administration Costs	$260,742	$913,578
Delivery Costs	$594,608	$2,083,366
Incremental Measure Costs	$2,427,555	$6,970,757
Total Non-Incentive Costs	$3,282,905	$9,967,702
Benefits		
Electric Benefits	$1,399,752	$2,991,375
Gas Benefits	$4,703,077	$9,122,315
Emissions Benefits	$1,190,638	$2,302,514
Total TRC Benefits	$7,293,466	$14,416,204
Net TRC Benefits	**$4,010,561**	**$4,448,502**
TRC B/C Ratio	**2.22**	**1.45**

Express Energy Efficiency Program

The Express Energy Program offers energy efficiency education, direct install measures, and instant energy savings to residential customers who may not be ready to engage in more substantial upgrades. The Program targets specific locations on a rotating basis, seeking to serve a broad geographic cross-section of the state over the course of the quadrennium. Conservation Services Group (CSG) is the Program Implementer and markets the Program through the local utility in each targeted city. The Program Implementer's technicians visit customers and install the following measures at no cost:

- Light bulbs (up to 10 CFLs and two LEDs per residence)
- Faucet aerators and energy-efficient showerheads (no limit)
- Water heater pipe insulation (up to six feet)
- Water heater thermostat setback assistance

Technicians also walk through the home to identify opportunities for deeper savings and inform residents about relevant incentives available from other Focus on Energy programs.

Table 79 lists a summary of Express Energy Efficiency Program's actual spending, savings, participation, and cost-effectiveness.

Table 79. Express Energy Efficiency Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012–CY 2014 Actual Amount
Incentive Spending	$	$1,680,241	$3,864,845
Verified Gross Life-Cycle Savings	kWh	69,779,555	192,329,128
	kW	922	2,426
	therms	4,125,975	19,905,522
Net Annual Savings	kWh	8,122,835	24,207,106
	kW	922	2,368
	therms	361,167	1,698,885
Participation	Number of Participants	17,121	51,848[1]
Cost-Effectiveness	TRC B/C Ratio	4.39	4.73

[1] The CY 2012-2014 total number of participants represents the sum of unique participants in each year.

Figure 28 shows a summary of savings and spending progress made from CY 2012 through CY 2014.

Figure 28. Express Energy Efficiency Program Three-Year (CY 2012–CY 2014) Savings and Spending Progress

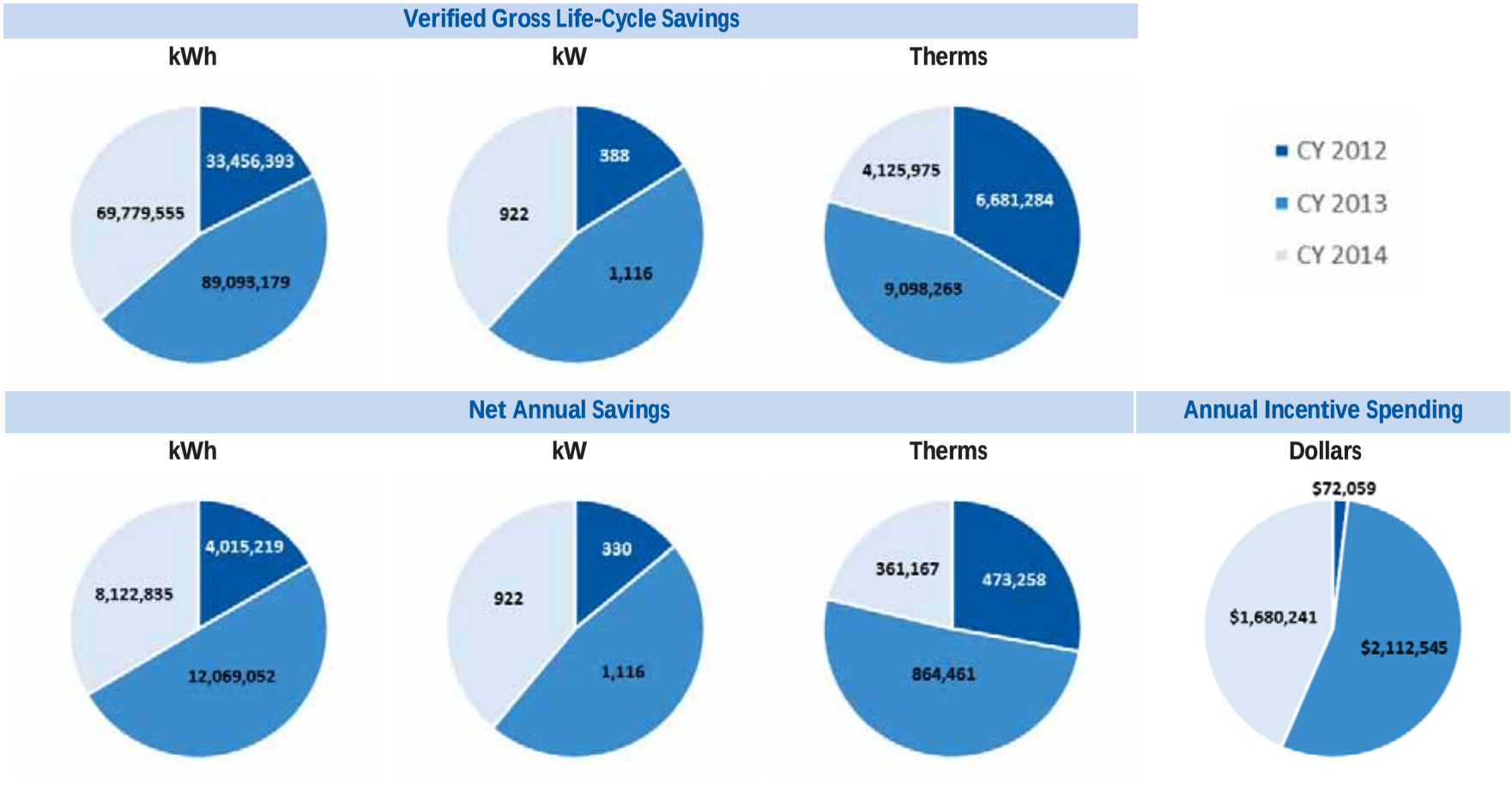
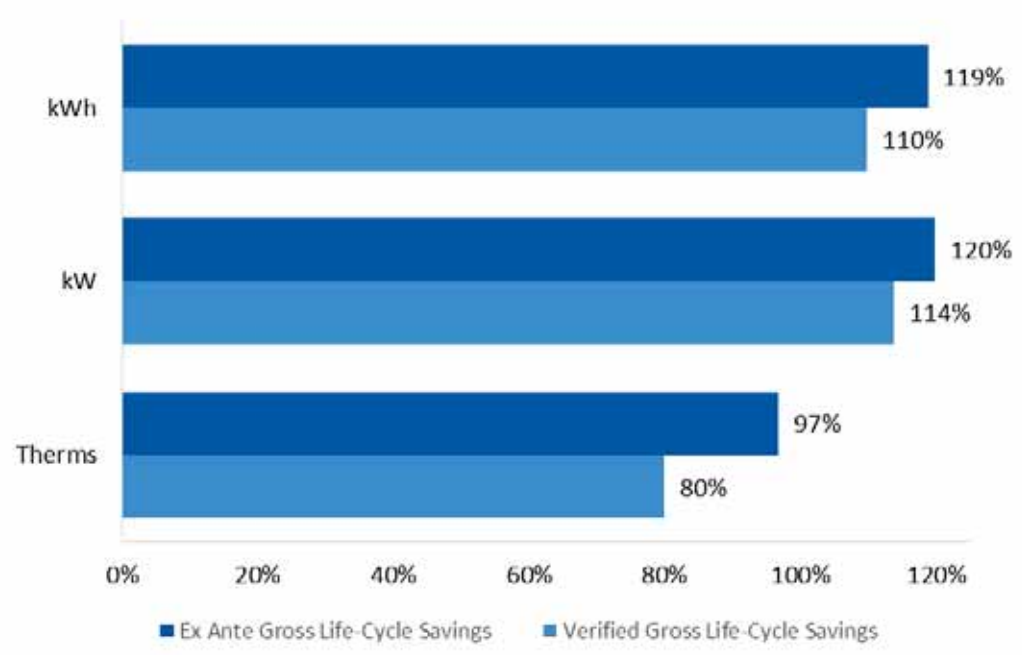


Figure 29 shows the Express Energy Efficiency Program achievements as a percentage of CY 2014 gross life-cycle savings goals. The program exceeded CY 2014 electric demand and energy goals (achieved 119% and 120% respectively), but fell just short achieving the gas goal (97%).

Figure 29. Express Energy Efficiency Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1]For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 63,500,000 kWh, 810 kW, and 5,160,550 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

The Evaluation Team verified the achievement of 110%, 114%, and 80% of the electric energy, electric demand, and gas goals respectively. Verified gross savings were lower than *ex ante* savings due to installation adjustments that reflect the Evaluation Team's findings that some customers remove direct install measures after program participation.

Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation in CY 2014. Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives in assessing the Express Energy Efficiency Program's performance. Table 80 lists the specific data collection activities and sample sizes used in the evaluations.

Table 80. Express Energy Efficiency Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012–CY 2014 Sample Size (n)
Tracking Database Review	Census	Census
Verification Site Visits	0	72
Program Stakeholder Interviews	2	6
Field Technician Interviews	0	7
Community Partner Interview	0	10
Customer Telephone Surveys	60	159
Nonparticipant (Drop-out) Surveys	0	14

More information regarding program evaluation activities can be found in the CY 2012 and CY 2013 evaluation reports.

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied CY 2013 evaluation results to all measures, with the exception of the showerhead in-service rate calculated from new research conducted in CY 2014. To calculate CY 2014 net savings, the Evaluation Team applied a NTG ratio of 1.

Evaluation of Gross Savings

In CY 2014, the Evaluation Team reviewed the tracking database and site visits and applied the most recent research to the gross savings. (See Standard Evaluation Methods for detailed descriptions of these methods.) The Evaluation Team did not find any duplicate entries for the Express Energy Efficiency Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

In-service Rates

The ISR represents the percentage of measures still installed, in use, and operating properly following the installation by the Implementer. In CY 2013, the Evaluation Team conducted site visits to physically verify the installed measures and estimate the ISR, and all ISRs were carried forward for the CY 2014 evaluation, except for the showerhead ISR. Table 81 shows the ISRs by measure carried forward from the CY 2013 site visit study.

Table 81. Express Energy Efficiency Program CY 2013 ISRs by Measure

Measure Type	In-Service Rate
Lighting–CFLs	97.3%
Faucet Aerator–Kitchen	75.6%
Faucet Aerator–Bathroom	86.1%
Water Heater Pipe Insulation	95.7%
Water Heater Temperature Turndown	52.9%

In 2014, the Evaluation Team conducted a participant survey with 100 participants from three Focus on Energy programs—Assisted Home Performance with ENERGY STAR, Express Energy Efficiency, and Home Performance with ENERGY STAR. The Evaluation Team weighted the samples per program by the contribution of savings that each program represents, with the Express Energy Efficiency Program contributing the majority of the savings.

The primary goal of the survey was to determine the rate at which CY 2013 and CY 2014 program showerheads were installed, and remained installed, up to the date of the survey. The Evaluation Team also wanted to apply the data collected from site visits for the Express Energy Efficiency Program in 2013. Using both sets of data, the Evaluation Team calculated a residential direct-install ISR for energy-efficient showerheads for CY 2014. Table 82 list the combined results of the survey and site visits.

Table 82. CY 2014 Showerhead In-service Rate Study Results

Showerheads Received	Showerheads Remaining	In-Service Rate
208	187	90%

CY 2014 and Quadrennium Realization Rates

The Evaluation Team multiplied the ISR by the total *ex ante*[18] gross energy savings at a measure-level to obtain the Program's total *ex post* gross energy savings and the realization rate.

Overall, the Express Energy Efficiency Program achieved an evaluated realization rate of 86% (Table).[19]

Table 83. CY 2014 Express Energy Efficiency Program Realization Rates by Measure Type

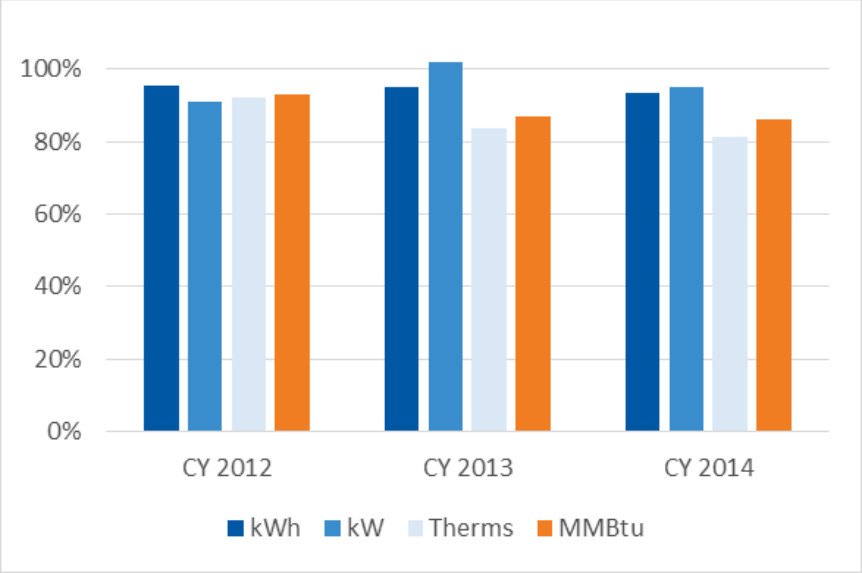
Measure Type	Realization Rate			
	kWh	kW	Therms	MMBtu
Adjustment	100%	100%	100%	100%
CFL	97%	97%	N/A	97%
Faucet Aerator	78%	82%	78%	78%
LED	97%	97%	N/A	97%
Pipe Insulation	96%	N/A	96%	96%
Showerhead	90%	90%	90%	90%
Water Heater Turn Down	53%	N/A	53%	53%
Total	**93%**	**95%**	**81%**	**86%**

[18] The Evaluation Team found several cases of electric savings applied to gas water measures and gas savings applied to electric water measures in SPECTRUM. The Evaluation Team set all instances of cross-fuel-type savings applications to 0, resulting in a change in the realization rate less than 1%.

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

Figure 30 shows the realization rates by fuel type across three calendar years. The Program realized 88% of *ex ante* savings over all three program years.

Figure 30. CY 2012-2014 Express Energy Efficiency Program Realization Rate by Fuel Type



CY 2014 and Quadrennium Gross and Verified Savings Results

Table 84 lists the combined *ex ante* and verified gross savings by measure type for the Express Energy Efficiency Program in CY 2014.

Table 84. CY 2014 Express Energy Efficiency Program Gross Life-Cycle Savings Summary by Measure Type

Measure Type	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Adjustment	122,347	0	-5,332	122,347	0	(5,332)
CFL	34,986,876	651	0	34,035,874	633	0
Faucet Aerator	10,858,316	100	1,701,169	8,460,043	82	1,334,432
LED	12,331,429	109	0	11,996,240	106	0
Pipe Insulation	1,009,259	0	87,033	965,378	0	83,166
Showerhead	15,329,264	112	2,752,502	13,770,384	100	2,469,085
Water Heater Turn Down	811,604	0	462,240	429,289	0	244,624
Total Life-Cycle	**75,449,096**	**971**	**4,997,613**	**69,779,555**	**922**	**4,125,975**

Table 85 lists the combined *ex ante* and verified gross savings for the Express Energy Efficiency Program from CY 2012 through CY 2014.

Table 85. Express Energy Efficiency Program CY 2014 and Three-Year (CY 2012–CY 2014) Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	8,688,056	971	443,658	8,122,835	922	361,167
	Life-Cycle	75,449,096	971	4,997,613	69,779,555	922	4,125,975
2012-2014	Annual	26,340,025	2,494	2,079,780	24,915,674	2,426	1,782,401
	Life-Cycle	205,008,165	2,494	22,949,455	192,329,128	2,426	19,905,522

Evaluation of Net Savings

In adherence to guidance from the Public Service Commission of Wisconsin, the Evaluation Team applied a NTG ratio of 1 for direct install measures for CY 2014. Table 86 shows the program-level NTG ratio applied from CY 2012 through CY 2014 and the weighted NTG ratio for all years. The Evaluation Team applied a NTG ratio of 0.85 in CY 2012, before it was stipulated that direct install measures should be assigned a stipulated NTG ratio of one.

Table 86. Express Energy Efficiency Program NTG Ratios

Adjustment	CY 2012	CY 2013	CY 2014	CY 2012-2014
NTG Ratio	0.85	1.00	1.00	0.96

CY 2014 and Quadrennium Net Savings Results

Table 87 lists the net energy impacts (kWh, kW, and therms) for the Express Energy Efficiency Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 87. Express Energy Efficiency Program CY 2014 and Three-Year (CY 2012–CY 2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	kW	Therms
2014	Annual	8,122,835	922	361,167
	Life-Cycle	69,779,555	922	4,125,975
2012-2014	Annual	24,207,106	2,368	1,698,885
	Life-Cycle	187,310,669	2,368	18,903,329

Program Cost-Effectiveness

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

Table 88 lists the incentive costs for the Express Energy Efficiency Program for CY 2014 and CY 2012 through CY 2014.

Table 88. Express Energy Efficiency Program Incentive Costs

	CY 2014	CY 2012-2014
Incentive Costs	$1,723,468	$4,766,455

The Evaluation Team found the CY 2014 Program was cost-effective (a TRC benefit/cost ratio above 1). Table 89 lists the evaluated costs and benefits.

Table 89. Express Energy Efficiency Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2012–CY 2014
Costs		
Administration Costs	$352,529	$1,035,265
Delivery Costs	$803,923	$2,360,866
Incremental Measure Costs	$962,686	$3,202,081
Total Non-Incentive Costs	$2,119,137	$6,598,213
Benefits		
Electric Benefits	$3,640,922	$9,370,631
Gas Benefits	$3,546,604	$15,212,663
Emissions Benefits	$2,105,911	$6,654,216
Total TRC Benefits	$9,293,436	$31,237,510
Net TRC Benefits	**$7,174,299**	**$24,639,297**
TRC B/C Ratio	**4.39**	**4.73**

Nonresidential Segment Programs

The nonresidential segment encompasses all customers in the commercial, industrial, local government, schools, and agricultural sectors. For the CY 2014 evaluation, the Evaluation Team reviewed eight nonresidential programs in the nonresidential portfolio:

- Business Incentive
- Chain Stores and Franchises
- Large Energy Users
- Small Business
- Retrocommissioning[20]
- Design Assistance
- Renewable Energy Competitive Incentive
- Renewable Rewards(Business)

The Evaluation Team designed the CY 2014 Focus on Energy nonresidential evaluation to meet two primary objectives:

- Assess the CY 2014 nonresidential segment energy and demand savings
- Report the cumulative results of the CY 2011 to CY 2014 quadrennium[21]

To meet these objectives, the Evaluation Team calculated savings from program participation reported in CY 2014 for each nonresidential program listed above. The Evaluation Team evaluated each program independently, following the same general evaluation plan. The Program Administrator reports various types of efficiency measures in SPECTRUM using three categories:

- Prescriptive
- Hybrid
- Custom

For each program, the Evaluation Team first reviewed the CY 2014 SPECTRUM database for completeness and quality. After confirming the accuracy of the tracking data in SPECTRUM, the Evaluation Team used the TRM and other program documentation to report savings for prescriptive measures.

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[20] The Retrocommissioning Program was not active after June 2014. Many of its offerings were integrated into Large Energy Users and Business Incentive Program.

[21] None of the Target Market programs described in this report operated in CY 2011, but this evaluation report refers to the complete program cycle as the quadrennium program cycle.

For hybrid measures, the Evaluation Team used either SPECTRUM tracking data or measure-specific evaluation findings from applicable project audits in CY 2013 and CY 2014 to estimate savings. For custom measures, the Evaluation Team used findings from project audits and on-site visits performed in CY 2013 and CY 2014. The Evaluation Team selected a statistically significant sample of projects within each program to determine measure-specific realization rates and then applied these realization rates to each custom and hybrid measure not reviewed.

Business Incentive Program

The Business Incentive Program (the Program) offers incentives for installation of energy efficiency measures to customers in the agriculture, education, government, commercial, and industrial sectors. Customers whose monthly average energy demand ranges between 100 kW and 1,000 kW and who are not eligible for the Chain Stores and Franchises or Large Energy Users Programs may participate in the Business Incentive Program.[22] Franklin Energy is the Program Implementer and oversees the management and delivery of the Program. The Program Implementer primarily relies on Trade Allies to promote and deliver this program to customers, with support from the Implementer staff, Energy Advisors, and Administrator staff. Measures include efficient lighting, heating and cooling systems, motors and drives, appliances, renewable energy systems, and custom projects.

The savings, participation, spending, and cost-effectiveness values do not include Renewable Energy Competitive Incentive Program (RECIP) measures. Savings, participation, spending, and cost-effectiveness values for Business Incentive Program customers' RECIP measures are described in the RECIP program chapter. Table 90 lists the Program's actual spending, savings, participation, and cost-effectiveness.

Table 90. Business Incentive Program Summary

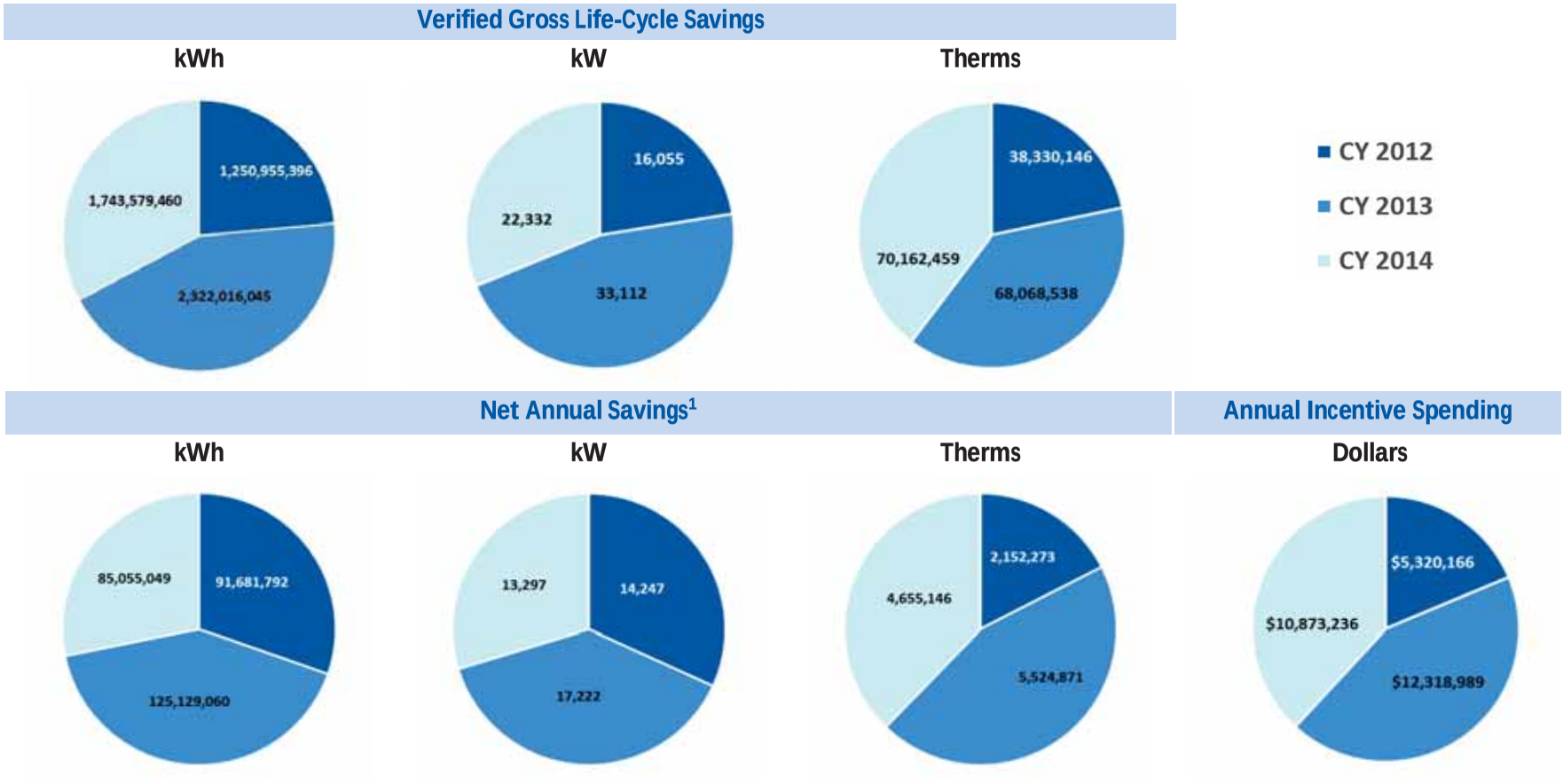
Item	Units	CY 2014 Actual Amount	CY 2012-2014 Actual Amount
Incentive Spending	$	10,873,236	28,512,391
Verified Gross Life-Cycle Savings	kWh	1,743,579,460	5,316,550,901
	kW	22,332	71,499
	therms	70,162,459	176,561,143
Net Annual Savings	kWh	85,055,049	301,865,901
	kW	13,297	44,766
	therms	4,655,146	12,332,290
Participation	Unique Customers[1]	2,895	9,256
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost ratio	3.06	2.99

[1] In CY 2012-2014, the total number of participants represents the sum of unique participants by year and may include customers who participated in multiple years.

[22] Small businesses may participate in the Business Incentive Program to receive incentives for energy efficiency measures that Focus on Energy does not offer in the Small Business Program.

Figure 31 shows a summary of savings and spending by year from CY 2012 through CY 2014. Note that the Program launched in April 2012 and was only active for nine months during CY 2012.

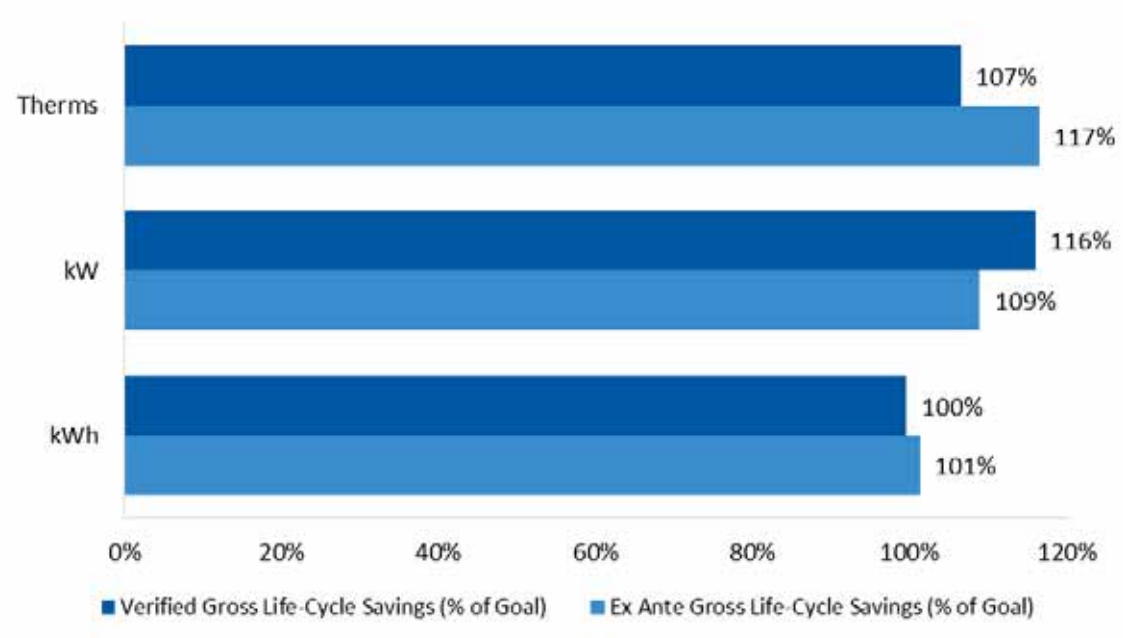
Figure 31. Business Incentive Program Three-Year (CY 2012-2014) Savings and Spending Progress



[1] CY 2013 Net Annual savings values differ from those reported in the CY 2013 report due to an adjustment made to commercial lighting baseline assumptions used in the net savings calculation. Appendix L provides more detail on this adjustment.

Figure 32 shows the percentage of gross life-cycle savings goals achieved by the Business Incentive Program in CY 2014. The Program achieved *ex ante* gross savings equal to 117%, 109%, and 101% of its therm, demand, and electric energy goals respectively. The Evaluation Team verified that the Program achieved 107% of its therm savings goal, 116% of its electric demand savings goal, and 100% of its electric energy savings goal. The variance in the verified gross and *ex ante* gross savings percentage achievements is due to the application of the realization rates determined through evaluation activities described in subsequent sections. Table 93 shows a summary of the variance in realization rates by measure and savings type.

Figure 32. Business Incentive Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 1,750,000,000 kWh, 19,250 kW, and 72,000,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

Since the launch of the Program in April 2012, the Evaluation Team designed its EM&V approach to integrate multiple perspectives to assess Program performance. Table 91 lists the specific data collection activities and sample sizes used to conduct the evaluation. More information on the evaluation activities from previous years can be found in the CY 2012 and CY 2013 Volume II reports.

Table 91. Business Incentive Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)[1]	CY 2012-2014 Sample Size (n)
On-Site Measurement and Verification	26	237
Project Audit Only	70	264
Program Administrator and Implementer Interviews	2	25
Trade Ally Focus Groups	-	33
Trade Ally Interviews	-	42
Nonparticipant Trade Ally Interviews	-	33
Participant Customer Surveys	-	284
Partial Participant Customer Interviews	-	10

[1]See Table 92 for evaluation activities performed in CY 2014. These activities included some site visits that do not affect the realization rates in this evaluation; however, the Evaluation Team will use the results to update the 2014 Deemed Savings Report.

CY 2014 Impact Evaluation Methodologies

In CY 2014, the Evaluation Team performed a tracking database review, project audits, and site visits to evaluate the Program (see Standard Evaluation Methods for detailed descriptions of these methods).

The Evaluation Team did not find any duplicate entries for the Business Incentive Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

As part of the project audits, the Evaluation Team conducted participant surveys either by e-mail or phone to collect information not available in SPECTRUM.

Projects Sampled for Evaluation

The Evaluation Team identified measures for project audits and on-site inspection using the findings from the CY 2012 and CY 2013 evaluation cycles (see Table 92). To estimate savings for custom and hybrid measures, the Team identified high-priority measures that had relatively high or uncertain reported savings. For CY 2014, high-priority measures included boilers, variable frequency drives (VFDs), guestroom energy management systems (GREMs), and custom process projects. Table 93 lists the sample size for desk reviews and site visits by measure group.

Table 92. CY 2014 Sample Sizes for Evaluation Activities by Measure Group

Measure Group	Project Audit Only	Project Audit and On-Site Inspection
Boilers and Burners	70	-
Custom	2	5
HVAC VFDs	-	30
GREMs	1	2
Total	73	37

Appendix K describes the analysis, methodologies, and findings for the custom and HVAC measures listed in Table 93. The boilers and burners and GREM measure evaluation activities focused on prescriptive savings, so the Evaluation Team will include findings from these in the 2014 Deemed Savings Report, which will be published separately during the summer of 2015.

In addition to the high-priority measures listed above, the Program includes incentives for efficiency measures in the following measure groups:

- Agriculture
- Building Shell
- Compressed Air, Vacuum Pumps (evaluated in 2013)
- Domestic Hot Water
- Food Service
- Industrial Ovens and Furnaces
- Information Technology
- Laundry
- Lighting (evaluated in 2013)
- Motors and Drives
- Pools
- Refrigeration
- Vending and Plug Loads
- Waste Water Treatment
- HVAC Controls and Other HVAC (evaluated in 2013)
- Renewable Energy

The Evaluation Team applied results from specific evaluation activities performed in previous years to the relevant measure groups in CY 2014. For example, in CY 2013, the Team conducted a study on a statistically significant sample of lighting projects and determined a realization ratio of 116% for electric energy savings for hybrid lighting projects. The Evaluation Team applied this realization ratio to hybrid lighting projects reported in CY 2014. Some of the measures listed above (e.g., pools) had consistently low participation relative to other measures throughout the quadrennial period; thus, the Evaluation Team did not perform any project audits.[23] If previous evaluation activities did not provide measure-specific realization ratios, the Evaluation Team applied an overall realization ratio from all custom and

[23] The Evaluation Team reviewed savings for all prescriptive measures, which included an engineering review at a minimum. More details on accepted savings calculations methods are documented in the TRM.

hybrid projects reviewed in the Program to the custom and hybrid measure types in the remaining measure groups. Table 92 above lists the measures evaluated.

Evaluation of Gross Savings

The Evaluation Team used data from the SPECTRUM database, project audits, and on-site inspections to estimate savings.

Deemed (Prescriptive) Measures

The Evaluation Team performed a tracking database review to estimate savings for all prescriptive measures. Although CY 2014 evaluation activities included evaluation of prescriptive measures (e.g., boiler and burner billing analysis, GREM analysis), the Evaluation Team continued to use deemed savings for the CY 2014 impact evaluation. Based on the evaluation results for prescriptive measures, the Evaluation Team will make recommendations for updating per-unit savings assumptions in the 2014 Deemed Savings Report, which will be applied beginning in 2016.

Custom and Hybrid Measures

For measures not explicitly addressed in a work paper or the TRM, the Evaluation Team developed savings algorithms and assumptions based on engineering judgment and best practices from other statewide TRMs. Typically, the Program Implementer classified such measures as custom measures in SPECTRUM. To evaluate these measures, the Evaluation Team performed either project audits or site visits. Table 93 lists the measure types evaluated in CY 2014. The Evaluation Team only updated savings realization ratios for custom process measures in CY 2014.

HVAC VFD Evaluation

To build upon evaluation activities of the HVAC measure group, the Evaluation Team conducted a metering study of VFD fan motors in CY 2014. Appendix K provides detailed information about the study, including background and rationale, sampling methodology, metering and verification methodology, data analysis methodology, evaluated savings and other findings, and conclusions and recommendations. In summary, the Evaluation Team metered energy consumption and power on 56 VFDs installed in CY 2014. Based on this study, the Team calculated a 67% realization rate, but did not calculate the demand (kW) savings because the analysis did not include metering data from the summer peak months.[24] There are two reasons for the lower-than-expected savings from this measure:

- The baseline assumed that motors at full load draw approximately 80% of the rated power. The Evaluation Team found that the average load factor of fan motors it studied was about 65% of the nameplate rated power.

[24] The Evaluation Team installed meters in September 2014 and collected data in February 2015. Meters will remain in place through August 2015.

- Savings vary with fan speed—savings increase as fan speed decreases. Some of the VFDs ran at high fan speeds thus had relatively low savings.

The Evaluation Team is currently conducting additional analysis to compare VFD fan motor load profiles to constant-speed HVAC fan motors. When the results of this study are final, the Evaluation Team will recommend a modification to certain parameters in the VFD savings calculation workbook tool,[25] which will update both the electric energy and demand savings calculations. The Team will include the recommendations in the CY 2015 evaluation report.

Custom Process Measure Evaluation

To evaluate the custom process measure, the Evaluation Team focused on projects completed in CY 2014, placing an emphasis on any projects claiming significant therm savings. Based on the findings from these evaluated projects, the Evaluation Team updated the reported therm realization rate for custom measures in CY 2014. Appendix K provides detailed information about the study including background and rationale, sampling methodology, metering and verification methodology, data analysis methodology, evaluated savings and other findings, and conclusions and recommendations.

In CY 2014 the Evaluation Team focused on custom process projects, primarily reporting therm savings because electric energy savings were the focus of CY 2013 evaluation activities. Fifteen participants implementing custom process measures reported primarily therm savings. The Evaluation Team conducted site visits and desk reviews on seven of these projects. The evaluated projects represent 62% of the therm savings reported for custom measures and 31% of the total therm savings reported for the Program.

One project, defined as a "process heat recovery" project, represented 58% of the total therm savings reported for all of the evaluated projects. Evaluated savings were less than half of the expected therm savings, due to the heat recovery system operating at 47% of the design condition assumptions. Interviews with the facility's personnel indicated future changes would lead to an increase in savings but the Team was unable to verify the timing or the effect of the upcoming changes on the facility. Because of this unique circumstance, the Evaluation Team adjusted the CY 2014 verified savings for this particular project to reflect the evaluation findings, but it did not include this project in the overall realization rate applied to other custom and hybrid projects.

The Evaluation Team reviewed all of the projects in the same way and found none that had the same type of uncertainty in year-to-year savings, lending support for the decision to exclude it from the overall realization rate and avoid an unwarranted downward savings adjustment for other projects based on this circumstance. In future evaluations, the Evaluation Team plans to revisit this project and

[25] Microsoft Excel workbook VFD savings calculation tool used by participants to estimate savings. Key parameters updated will include load factor of baseline motor and coincident load factors of VFDs.

others like it to gain a better understanding of the persistence of first-year savings and to determine whether CY 2012 through CY 2014 realization ratios apply to future Program savings. Appendix K includes description of additional findings from other custom measure evaluation activities.

CY 2014 and Quadrennium Realization Rates

After determining verified savings for each project, the Evaluation Team calculated realization rates at the project level and rolled up weighted average results to the measure level. For each measure group, the Evaluation Team calculated the realization rate by dividing the total verified gross savings by the total reported gross savings. The Team multiplied measure-level Program gross savings by the corresponding measure-level realization rate to arrive at total verified gross savings (see Table 90).

Table 93 lists the CY 2014 Program realization rates by measure group. This table also helps illustrate the rationale for how the Evaluation Team selected specific measures for project reviews and on-site inspections. The column titled "Percentage of Total Program MMBtu" shows the measure savings percentage relative to the total program savings. The column titled "Proportion of Prescriptive MMBtu Savings" shows the percentage of prescriptive savings within each measure group.

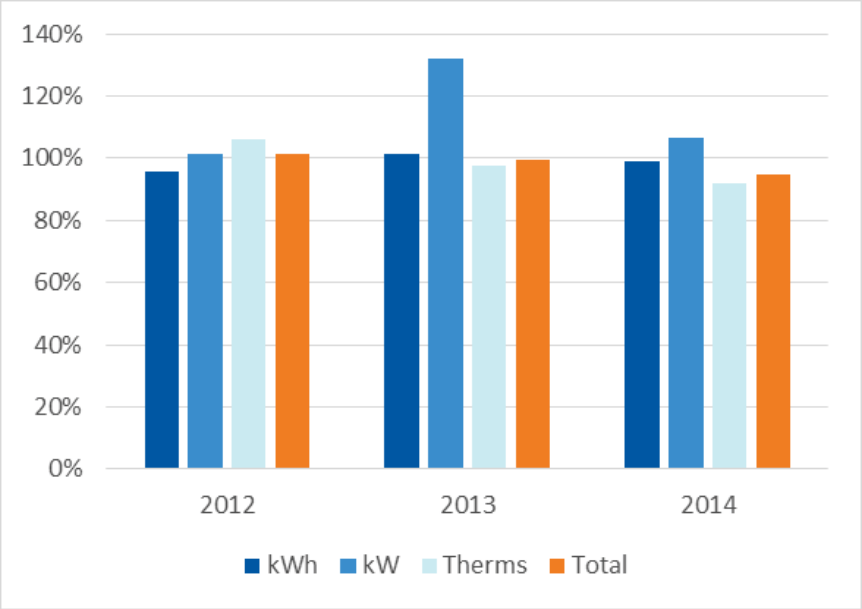
Table 93. CY 2014 Business Incentive Program Realization Rates by Measure Group

Measure Group	Realization Rate			% of Total Program MMBtu	Proportion of Savings from Prescriptive Measures
	kWh	kW	Therms		
Agriculture	98.4%	111.8%	81.4%	1.7%	10.5%
Boilers and Burners	98.1%	100.0%	99.6%	12.8%	93.4%
Building Shell	98.1%	111.8%	89.6%	1.3%	38.2%
Compressed Air, Vacuum Pumps	105.4%	145.0%	100.0%	4.9%	47.7%
Domestic Hot Water	98.4%	99.1%	81.4%	0.2%	0.5%
Food Service	100.0%	100.0%	99.8%	0.6%	99.2%
Industrial Ovens and Furnaces	98.1%	111.8%	81.4%	2.3%	0.0%
Information Technology	99.5%	111.8%	N/A	0.4%	74.7%
Laundry	98.1%	111.8%	81.4%	1.5%	0.0%
Lighting	102.7%	102.5%	N/A	18.2%	82.9%
Motors & Drives	98.1%	111.8%	N/A	0.0%	0.0%
Pools	98.1%	111.8%	81.4%	0.3%	0.0%
Process	98.1%	111.8%	81.4%	14.8%	0.0%
Refrigeration	99.5%	103.8%	82.0%	1.4%	67.7%
Vending and Plug Loads	100.0%	100.0%	N/A	0.0%	100.0%
Waste Water Treatment	98.1%	111.8%	N/A	0.3%	0.0%
HVAC Controls	100.2%	38.9%	79.8%	2.3%	0.0%
HVAC VFDs	66.7%	66.7%	81.4%	2.5%	0.0%
HVAC All Other	98.7%	109.9%	95.6%	27.9%	72.4%
HVAC: GREM - Prescriptive	100.0%	100.0%	N/A	0.1%	100.0%

Measure Group	Realization Rate			% of Total Program MMBtu	Proportion of Savings from Prescriptive Measures
	kWh	kW	Therms		
HVAC: GREM - Hybrid	98.1%	100.0%	N/A	0.0%	0.0%
Renewable Energy	98.1%	111.8%	N/A	6.4%	0.0%
Total	**98.9%**	**106.5%**	**92.2%**	**100.0%**	**52.2%**

Figure 33 shows the realization rate by fuel type for CY 2012 through CY 2014. The realization rate in CY 2012 includes carryover savings from the prior program year. Savings listed as carryover pertain to projects approved under the legacy programs but were completed after the new Program launched in April 2012.

Figure 33. Business Incentive Program 2012-2014 Realization Rate by Fuel Type



CY 2014 and Quadrennium Gross and Verified Savings Results

To calculate the total verified gross savings, the Evaluation Team applied measure-level realization rates to the savings of each measure group. The Program includes the Renewable Energy Competitive Incentive Program, which is tracked as an independent line item.[26] Table 94 lists the total verified gross savings for the Program since it launched in April 2012 by measure type.

[26] A separate chapter details the Renewable Energy Competitive Incentive Program.

Table 94. Three-Year (CY 2012-2014) Business Incentive Program Annual Gross Verified Savings by Measure Type

Measure Group	kWh	kW	Therms	MMBtu	% of Program
Agriculture	14,012,102	5,023	233,325	71,142	2.3%
Boilers & Burners	6,182,336	16	4,404,100	461,504	15.2%
Building Shell	6,220,579	2,039	1,396,123	160,837	5.3%
Compressed Air, Vacuum Pumps	30,136,595	4,693	617,676	164,594	5.4%
Domestic Hot Water	734,142	47	60,063	8,511	0.3%
Food Service	2,481,061	331	172,824	25,748	0.9%
HVAC	54,012,355	8,934	6,732,362	857,526	28.3%
Industrial Ovens and Furnaces	1,868,067	202	248,582	31,232	1.0%
Information Technology	4,816,565	448	0	16,434	0.5%
Laundry	79,255	-5	238,660	24,136	0.8%
Lighting	202,140,939	40,248	0	689,705	22.8%
Motors & Drives	1,809,183	158	0	6,173	0.2%
New Construction	652,078	150	92,160	11,441	0.4%
Other	13,476,549	-216	233,844	69,366	2.3%
Pools	1,591,430	93	25,338	7,964	0.3%
Process	30,651,534	2,333	1,274,768	232,060	7.7%
Refrigeration	14,880,730	1,778	37,418	54,515	1.8%
Vending and Plug Loads	340,872	0	0	1,163	0.0%
Adjustment Measure	876,830	169	2,270	3,219	0.1%
Waste Water Treatment	7,545,072	1,020	0	25,744	0.9%
Renewable Energy	30,215,293	4,035	23,232	105,418	3.5%
Total	**424,723,567**	**71,499**	**15,792,745**	**3,028,431**	**100.0%**

Table 95 lists the combined reported gross and verified gross savings for the Business Incentive Program from CY 2012 through CY 2014.

Table 95. CY 2012-2014 Business Incentive Program Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	144,754,497	20,972	7,179,610	143,217,468	22,332	6,616,652
	Life-Cycle	1,773,543,276	20,972	83,918,769	1,743,579,460	22,332	76,744,292
2012-2014	Annual	428,935,731	61,946	16,342,895	424,723,567	71,499	15,792,745
	Life-Cycle	5,371,822,870	61,946	189,311,453	5,316,550,901	71,499	183,142,976

Evaluation of Net Savings

For the Business Incentive Program, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

CY 2014 and Quadrennium Net Savings Results

Table 96 lists the Program-level freeridership and spillover ratios applied for CY 2014. The freeridership ratio represents the weighted average of the CY 2013 measure-level freeridership ratios, updated to reflect the CY 2014 measure mix.

Table 96. Business Incentive Program Freeridership and Spillover

Adjustment	CY 2014	CY 2012-2014
Freeridership Ratio (Weighted Average)	0.42	0.34
Spillover Ratio	0.18	0.08

In CY 2013, The Evaluation Team used self-report and standard market practice approaches to determine the Program's freeridership level. The Team used a combination of standard market practice for certain measures in the boilers and burners and lighting categories and self-report for all other measures. Combining the self-report and standard market practice freeridership data, the Evaluation Team estimated that the Business Incentive Program had overall average freeridership of 45% in CY 2013, which dropped to 42% in CY 2014 due to the changes in the measure mix. The largest contributing factor to the decrease in freeridership was the increase in LEDs in the Program's commercial lighting portfolio.

Table 97 lists the net energy impacts (kWh, kW, and therms) for the Business Incentive Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 97. Three-Year (CY 2012-2014) Business Incentive Net Savings by Fuel Type

Savings		Verified Net		
		kWh	KW	Therms
2014	Annual	103,932,594	16,228	5,152,387
	Life-Cycle	1,273,838,519	16,228	59,363,315
2011-2014	Annual	320,743,446	47,697	12,829,530
	Life-Cycle	4,034,214,763	47,697	148,681,765

Program Cost-Effectiveness

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

Table 98 lists the annual and three-year incentive costs for the Business Incentive Program.

Table 98. Business Incentive Program Incentive Costs

Costs	CY 2014	CY 2012-2014
Incentive Costs	$10,874,746	$30,435,935

The Evaluation Team found the CY 2014 Program to be cost-effective (a TRC benefit/cost ratio above 1). Table 99 lists the evaluated costs and benefits.

Table 99. Business Incentive Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2011-2014
Costs		
Administration Costs	$1,480,170	$4,110,739
Delivery Costs	$6,044,152	$16,785,860
Incremental Measure Costs	$49,390,438	$134,307,210
Total Non-Incentive Costs	$56,914,759	$155,203,809
Benefits		
Electric Benefits	$74,462,581	$225,143,900
Gas Benefits	$61,744,041	$132,110,889
Emissions Benefits	$38,177,046	$106,063,976
Total TRC Benefits	$174,383,668	$463,318,765
Net TRC Benefits	**$117,468,909**	**$308,114,957**
TRC B/C Ratio	**3.06**	**2.99**

Evaluation Outcomes and Recommendations

The CY 2014 gross impact evaluation found that the Business Incentive Program achieved 99% of reported energy savings, 106% of reported demand savings, and 92% of reported therm savings.

Outcome 1. A small number of projects represent a large portion of savings.

A small number of custom process projects represent over half of the custom and hybrid therm savings. Evaluation of these custom projects requires enhanced rigor, detailed data collection, and analysis.

Recommendation 1. Custom projects with high savings will receive a proportional level of scrutiny, so participants should prepare for an evaluation.

The Evaluation Team expects to consistently review the custom projects with the highest reported savings. The confidence level for custom projects can be highly variable due to inconsistencies in data sources or collection methods for key parameters that heavily influence the calculated savings. When common, approved parametric values are inappropriate, the Evaluation Team will require data or documentation to support a change. Anticipating evaluation of key projects and parameters, the Program Implementer should work with participants to prepare them for an engineering evaluation. As an example, the Evaluation Team can determine fluid flow rates through a heat exchanger using system trend data from an energy management system, hand-written logs by facility personnel, temporary flow meters, spot measurements, or estimates made by plant personnel. If participants understand they need to provide the Evaluation Team with evidence of savings recorded *after* project completion, the accuracy and efficiency of the evaluation will continue to improve. The Evaluation Team recommends monthly meetings (as needed) with the program implementer to discuss high impact custom projects to understand the planned savings calculation methods to identify areas of uncertainty or concern.

Chain Stores and Franchises Program

The Chain Stores and Franchises Program (the Program) offers financial incentives to retail, food sales, and food service businesses that have at least five locations in Wisconsin. Key actors are the Program Administrator, the Program Implementer (Franklin Energy), Trade Allies, and National Rebate Administrators. The Program offers both custom and prescriptive incentive paths and allows participants to consolidate projects at multiple locations on one application. Other services include a direct install option, through which Implementer staff install a limited set of measures at no cost to the customer.

Table 100 lists the Program's actual spending, savings, participation, and cost-effectiveness.

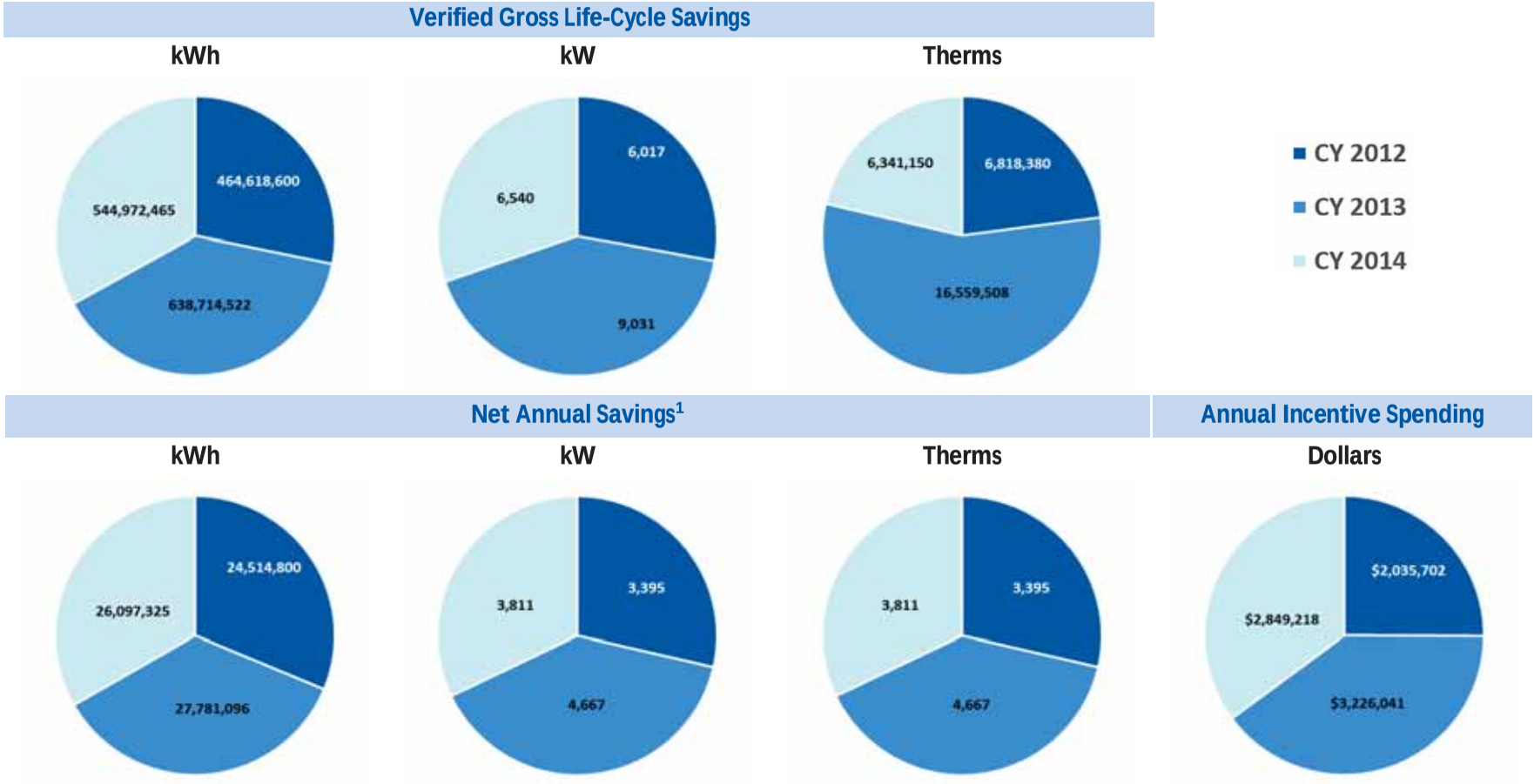
Table 100. Chain Stores and Franchises Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012-2014 Actual Amount
Incentive Spending	$	2,849,218	8,110,961
Verified Gross Life-Cycle Savings	kWh	544,972,465	1,648,305,586
	kW	6,540	21,588
	therms	6,341,150	29,719,038
Net Annual Savings	kWh	26,097,325	90,729,772
	kW	3,811	13,295
	therms	288,773	1,298,357
Participation	Unique Customers[1]	329	1,048
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost ratio	1.98	2.67

[1] The CY 2012-2014 total number of participants represents the sum of unique participants by year and may include customers who participated in multiple years.

Figure 34 shows a summary of savings and spending by year from CY 2012 through CY 2014. Note that the Program launched in April 2012 and was only active for nine months during CY 2012.

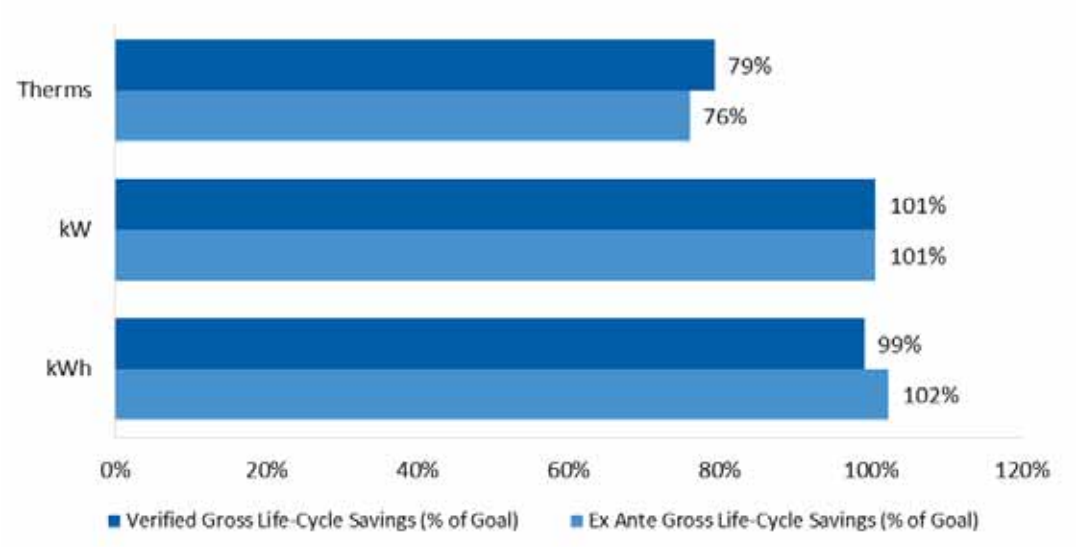
Figure 34. Chain Stores and Franchises Program Three-Year (CY 2012-2014) Savings and Spending Progress



[1] CY 2013 Net Annual savings values differ from those reported in the CY 2013 report due to an adjustment made to commercial lighting baseline assumptions used in the net savings calculation. Appendix L provides more detail on this adjustment.

Figure 35 shows the percentage of gross life-cycle savings goals achieved by the Chain Stores and Franchises Program in CY 2014. The Program achieved *ex ante* gross savings equal to 76%, 101%, and 102% of its therm, demand, and electric energy goals respectively. The Program achieved 79% of the therm savings goal, 101% of the electric demand savings goal, and 99% of the electric energy savings goal. The variance in the verified gross and *ex ante* gross savings percentage achievements is due to application of the realization rates determined through evaluation activities described in subsequent sections. For example, findings of refrigeration measures in CY 2013 lowered kWh verified savings and increased verified therm savings slightly (see Table 103).

Figure 35. Chain Stores and Franchises Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 550,000,000 kWh, 6,500 kW, and 8,000,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

Since the launch of the Program in April 2012, the Evaluation Team designed its EM&V approach to integrate multiple perspectives to assess Program performance. Table 101 lists the specific data collection activities and sample sizes used for the evaluation. More detailed information on the evaluation activities from previous years can be found in the CY 2012 and CY 2013 Volume II reports.

Table 101. Chain Stores and Franchises Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012-2014 Sample Size (n)
On-Site Measurement and Verification	-	73
Project Audit Only	-	60
Program Administrator and Implementer Interviews	2	18
Participant Surveys	-	110
Participant Trade Ally Interviews	-	25
Nonparticipant Trade Ally Interviews	-	27
National Rebate Administrators	3	6

CY 2014 Impact Evaluation Methodologies

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied CY 2013 installation rates to all measures. (See Standard Evaluation Methods for a detailed description of the tracking database review.) The Team did not find any duplicate entries and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

To calculate CY 2014 net savings, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation, combined with new adjustments for projects that used National Rebate Administrators, based on the findings of the CY 2014 freeridership analysis specific to those projects.

Evaluation of Gross Savings

Four measure types—lighting, refrigeration, domestic hot water, HVAC—made up 94% of the total savings achieved by the Program during the quadrennium. In CY 2013, the Evaluation Team conducted specific evaluation activities for lighting, refrigeration, and domestic hot water measures. The Team also researched HVAC measure parameters through other evaluation activities and used findings to determine a realization rate for the HVAC measure category. In CY 2014, the Evaluation Team reviewed the tracking database and applied the most recent evaluation findings (including CY 2013 and CY 2014 studies) to evaluate gross savings.

CY 2014 and Quadrennium Realization Rates

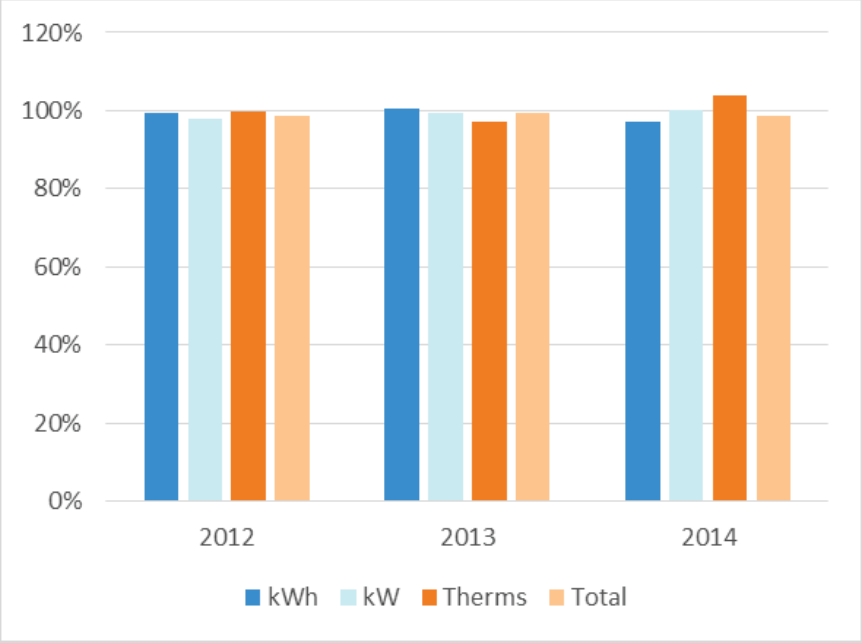
The Evaluation Team applied installation rates of 100% to all Chain Stores and Franchises measures and did not adjust the deemed savings. With the exception of refrigeration measures, the Team based reported savings on the CY 2013 evaluation activities, which it included in the updated Deemed Savings Report. The Evaluation Team reviewed custom refrigeration measures in CY 2013 and applied that realization rate to the same measure group reported in CY 2014. Overall, Program achieved an evaluated realization rate of nearly 100% for energy, demand, and therm savings (Table 102).

Table 102. CY 2014 Chain Stores and Franchises Realization Rates by Measure Type

Measure Group	Realization Rate			
	kWh	kW	Therms	MMBtu
Agriculture	100%	100%	100%	100%
Boilers and Burners	100%	100%	100%	100%
Building Shell	100%	100%	100%	100%
Compressed Air, Vacuum Pumps	100%	100%	100%	100%
Domestic Hot Water	100%	100%	100%	100%
Food Service	100%	100%	100%	100%
HVAC – All Other	100%	100%	100%	100%
HVAC – Controls	100%	100%	100%	100%
HVAC – VFDs	100%	100%	100%	100%
Information Technology	100%	100%	100%	100%
Lighting	100%	100%	100%	100%
Other	100%	100%	100%	-
Pools	100%	100%	100%	100%
Process	100%	100%	100%	100%
Refrigeration	88%	100%	126%	94%
Total	**97%**	**100%**	**104%**	**99%**

Figure 36 shows the realization rates by fuel type across three calendar years.

Figure 36. CY 2012-2014 Chain Stores and Franchises Realization Rate by Fuel Type



Gross and Verified Savings Results

To calculate the total verified gross savings, the Evaluation Team applied measure-level realization rates to the reported savings of each measure group. Table 103 lists the total verified gross savings by measure type, since the launch of the Program in April 2012.

Table 103. Chain Stores and Franchises CY 2012 – CY 2014 Annual Gross Verified Savings Summary by Measure Type

Measure Group	kWh	kW	Therms	MMBtu	% of Program
Agriculture	565,319.00	6.38	-	1,928.87	0.3%
Boilers and Burners	256,679	-	103,502	11,226	1.6%
Building Shell	332,857	56	41,778	5,314	0.7%
Compressed Air, Vacuum Pumps	537,056	81	25,199	4,352	0.6%
Domestic Hot Water	6,656,451	1,471	480,098	70,722	9.9%
Food Service	282,064	36	89,832	9,946	1.4%
HVAC	15,601,872	4,285	1,258,328	179,066	25.0%
Information Technology	1,382,828	116	-	4,718	0.7%
Lighting	72,464,370	10,312	-	247,248	34.6%
Other	161,005	5	-	549	0.1%
Process	121,497	-	35,402	3,955	0.6%
Pools	9,462	-	-	32	0.0%
Refrigeration	46,110,698	5,220	189,916	176,321	24.6%
Total	**144,482,157**	**21,588**	**2,224,054**	**715,379**	**100.0%**

Table 104 lists the combined *ex ante* and verified gross savings for the Program from CY 2012 through CY 2014.

Table 104. Chain Stores and Franchises CY 2014 and Three-Year Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	46,127,984	6,540	459,340	44,744,926	6,540	476,975
	Life-Cycle	562,272,242	6,540	6,080,100	544,972,465	6,540	6,341,150
2012-2014	Annual	145,895,410	21,773	2,240,104	144,482,157	21,588	2,224,054
	Life-Cycle	1,753,330,279	21,773	30,063,899	1,648,305,586	21,588	29,719,038

Evaluation of Net Savings

For the Chain Stores and Franchises Program, the Evaluation Team calculated net savings through interviews with National Rebate Administrators, combined with freeridership and spillover values determined through the CY 2013 evaluation.

CY 2014 and Three-Year Net Savings Results

In 2014, there were 27 companies that pursued projects through the Program by using a National Rebate Administrator. These organizations help national chains maximize their return on investment

when making store upgrades or installing new equipment by "matching" them with various utility incentive programs around the country. National Rebate Administrators will often help national companies process incentive applications, advise them on program-qualifying equipment, and navigate eligibility guidelines. Because they play a significant role in customer decision-making and work with companies representing a notable share of program savings (19% of total MMBtu in CY 2014), the Evaluation Team interviewed the three National Rebate Administrators operating in Wisconsin to help inform freeridership in CY 2014.

According to the interviewed group, freeridership was low (Table 105). All three National Rebate Administrators that work with the Program reported that Focus on Energy was very influential in how their clients decide on facility upgrades. Occasionally, respondents reported that their clients will purchase and install equipment prior to learning about the rebates, but this was rare.

Table 105. National Rebate Administrator Respondent Freeridership Scores

Respondent	Freeridership Score
NRA #1	12%
NRA #2	5%
NRA #3	0%
Overall Savings-weighted NRA Freeridership Score	6%

After calculating a savings-weighted average freeridership score of 6% based on the interview responses, the Evaluation Team applied this percentage to the proportion of savings associated with National Rebate Administrator projects. For the remainder of the program savings, the Team applied the self-report freeridership score that was determined through the CY 2013 participant survey, after removing any respondents that were accounted for through the National Rebate Administrator interviews (the adjusted self-report survey freeridership value was 49%). For two measure categories, lighting and boilers and burners, the Evaluation Team incorporated the standard market practice values determined in CY 2013. Overall, this approach resulted in a program-level freeridership score of 40% CY 2014; the program-level freeridership was 50% in CY 2013.

Because the survey was conducted in 2014, the Evaluation Team did not apply a retroactive adjustment to CY 2012 or CY 2013 net savings. However, since the program processed incentive applications through National Rebate Administrators throughout the quadrennium, freeridership in those years may have been lower than originally measured.

Table 106 shows the overall Program-level freeridership and spillover ratios applied for CY 2014.

Table 106. Chain Stores and Franchises Program Freeridership and Spillover

Adjustment	CY 2014	CY 2012-2014
Freeridership Ratio (Weighted Average)	0.40	0.39
Spillover Ratio	0.01	0.01

Table 107 shows the net energy impacts (kWh, kW, and therms) for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 107. Three-Year Chain Stores and Franchises Net Savings by Fuel Type

Savings		Verified Net		
		kWh	KW	Therms
2014	Annual	27,088,731	3,953	287,153
	Life-Cycle	329,799,293	3,953	3,828,460
2012-2014	Annual	91,721,178	13,437	1,296,736
	Life-Cycle	1,102,198,094	13,437	17,009,404

Program Cost-Effectiveness

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

Table 108 lists the annual and three-year incentive costs for the Chain Stores and Franchises Program.

Table 108. Chain Stores and Franchises Program Incentive Costs

Costs	CY 2014	CY 2012-2014
Incentive Costs	$2,849,236	$8,151,871

The Evaluation Team found the CY 2014 Program to be cost-effective (a TRC benefit/cost ratio greater than 1). Table 109 lists the evaluated costs and benefits.

Table 109. Chain Stores and Franchises Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2011-2014
Costs		
Administration Costs	$309,294	$1,010,849
Delivery Costs	$1,262,974	$4,127,719
Incremental Measure Costs	$13,873,291	$41,293,327
Total Non-Incentive Costs	$15,445,559	$46,431,896
Benefits		
Electric Benefits	$19,353,466	$77,932,465
Gas Benefits	$3,418,493	$13,406,708
Emissions Benefits	$7,831,579	$32,442,919
Total TRC Benefits	$30,603,538	$123,782,092
Net TRC Benefits	**$15,157,979**	**$77,350,197**
TRC B/C Ratio	**1.98**	**2.67**

Large Energy Users Program

The Large Energy Users Program (the Program) was launched in 2012 and delivers technical services, as well as prescriptive and custom incentives, to Wisconsin's largest commercial, industrial, and institutional customers to encourage them to reduce energy usage and increase energy efficiency in their facilities. Leidos, the Program Implementer, delivers these services primarily through direct contact using Energy Advisors (who receive support from Trade Allies and utility Key Account Managers). The Energy Advisors and Key Account Managers also work with the customers' energy management teams to provide technical expertise, identify energy efficiency opportunities, and support the development of strategic energy management plans.

The savings, participation, spending, and cost-effectiveness values exclude measures offered through the Renewable Energy Competitive Incentive Program (savings, participation, spending, and cost-effectiveness values for these measures appear in the Renewable Energy Competitive Incentive Program chapter of this report). Table 110 lists the Program's actual spending, savings, participation, and cost-effectiveness.

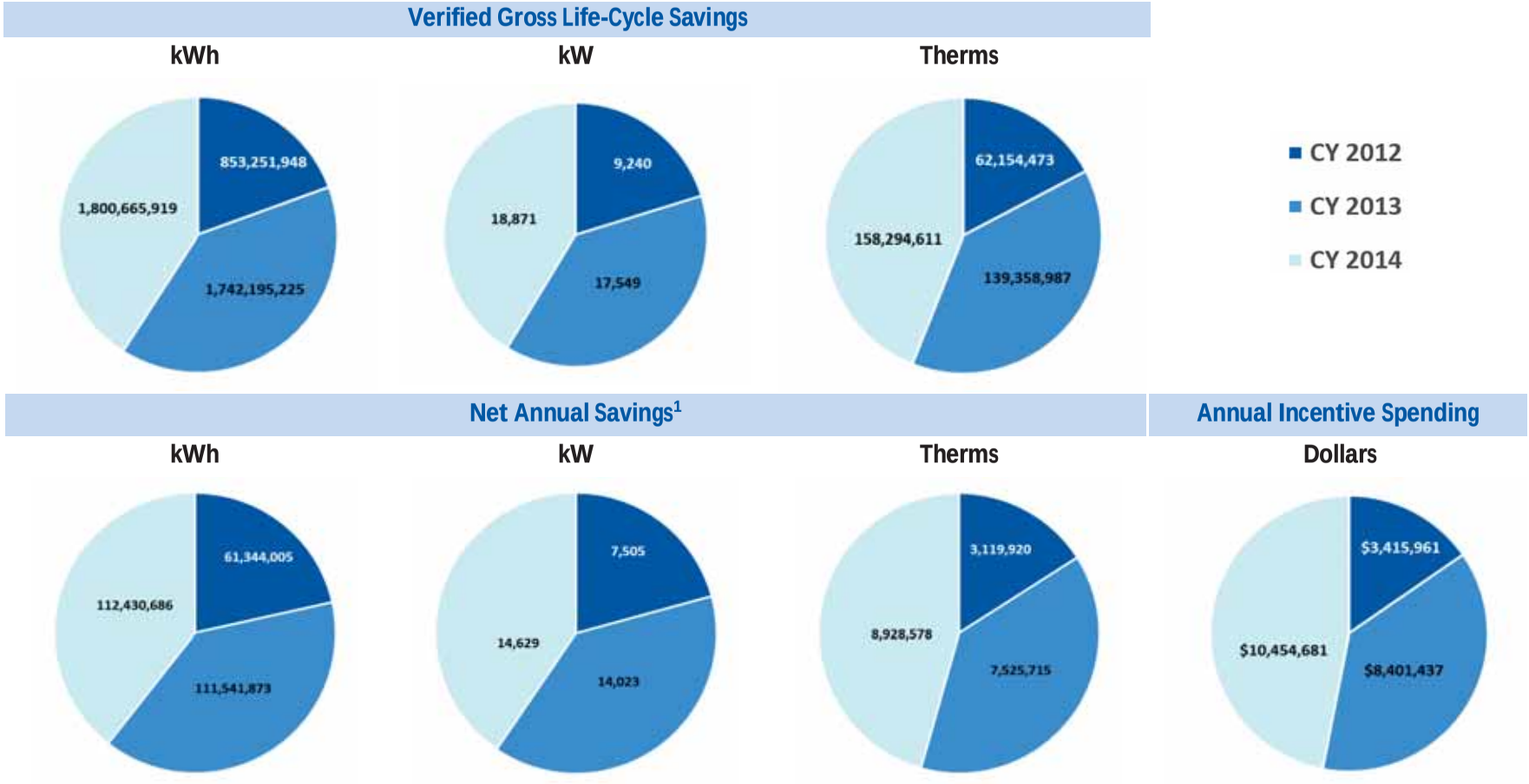
Table 110. Large Energy Users Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012-2014 Actual Amount
Incentive Spending	$	10,454,681	22,272,079
Verified Gross Life-Cycle Savings	kWh	1,800,665,919	4,396,113,092
	kW	18,871	45,660
	therms	158,294,611	359,808,070
Net Annual Savings	kWh	112,430,686	285,316,564
	kW	14,629	36,157
	therms	8,928,578	19,574,213
Participation	Unique Customers[1]	374	933
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost ratio	4.30	5.38

[1] The CY 2012-2014 total number of participants represents the sum of unique participants by year and may include customers who participated in multiple years.

Figure 37 shows a summary of savings and spending by year from CY 2012 through 2014. Note that the Program launched in April 2012 and was only active for nine months during CY 2012.

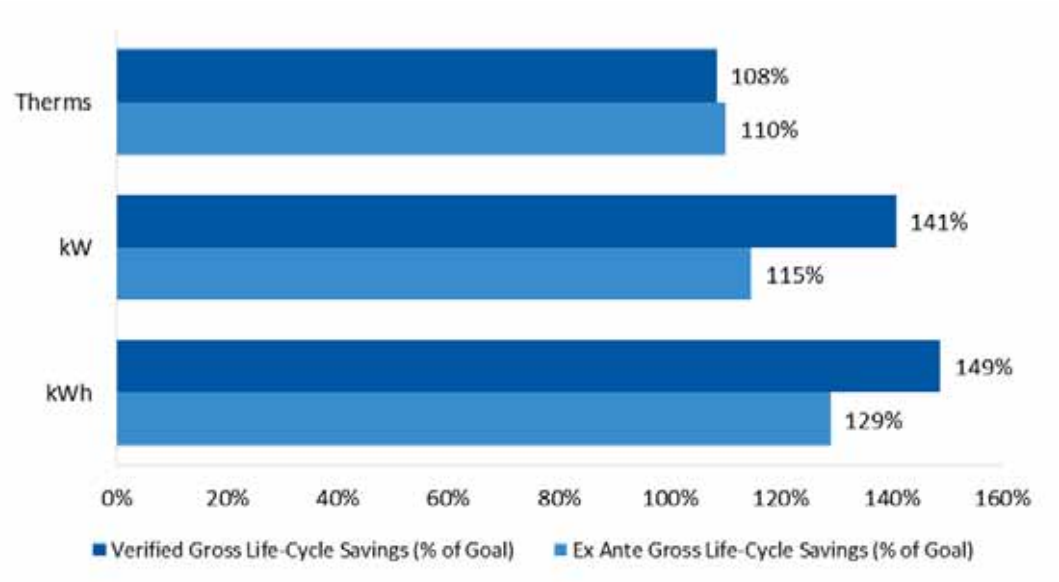
Figure 37. Large Energy Users Program Three-Year (CY 2012-2014) Savings and Spending Progress[1]



[1] CY 2013 Net Annual savings values differ from those reported in the CY 2013 report due to an adjustment made to commercial lighting baseline assumptions used in the net savings calculation. Appendix L provides more detail on this adjustment.

Figure 38 shows the percentage of gross life-cycle savings goals achieved by the Large Energy Users Program in CY 2014. The Program achieved *ex ante* gross savings equal to 110%, 115%, and 129% of its therm, demand, and electric energy goals respectively. The Program achieved 108% of the therm savings goal, 141% of the electric demand savings goal, and 149% of the electric energy savings goal. The variance in therm, electric demand, and electric energy realization rates is due to the evaluation findings of various measure groups in CY 2013 and CY 2014 including custom process, HVAC, lighting, and compressed air measures.

Figure 38. Large Energy Users Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 1,210,000,000 kWh, 13,400 kW, and 146,000,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

Over the course of the quadrennial period, the Evaluation Team designed its EM&V approach to integrate multiple perspectives to assess Program performance. Table 111 lists the specific data collection activities and sample sizes used to evaluate the Program. More detailed information on the evaluation activities from previous years can be found in the CY 2012 and CY 2013 Volume II reports.

Table 111. Large Energy Users Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)[1]	CY 2012-2014 Sample Size (n)
On-Site Measurement and Verification	14	102
Project Audit Only	18	105
Participant Surveys	-	82
Customer Energy Team Interviews	-	10
Participant Trade Ally Interviews		19
Program Administrator, Implementer Energy Advisor, and Utility Key Account Manager Interviews	2	34

[1]See Table 112 for CY 2014 Large Energy Users evaluation activities. These activities included some site visits that did not affect the realization rates in this evaluation; the Evaluation Team will use these results to update the 2014 Deemed Savings Review.

CY 2014 Impact Evaluation Methodologies

In CY 2014, the Evaluation Team performed a tracking database review, project audits, and site visits to evaluate the Program (see Standard Evaluation Methods for detailed descriptions of these methods). The Evaluation Team estimated savings for the Program's prescriptive, custom, and hybrid measures (described in detail under Evaluation of Gross Savings below).

The Evaluation Team did not find any duplicate entries for the Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

As part of the project audits, the Evaluation Team conducted participant surveys consisting of e-mails and follow-up calls to collect information not available in SPECTRUM. The Team also performed a billing analysis and engineering review of hybrid boiler project documents and utility bills and will present findings in the Deemed Savings Review.

Projects Sampled for Evaluation

The Evaluation Team identified measures for project audits and on-site inspection using the findings from the CY 2012 and CY 2013 evaluation cycles. To estimate savings for custom and hybrid measures in CY 2014, the Team focused on boilers and burners and custom process projects. The Team identified these as high-priority measures for evaluation either because of their relatively high reported savings or because of the uncertainty in reported savings estimates.

Table 112 lists the sample size for desk reviews and site visits by measure group. Although the Evaluation Team evaluated a relatively small number of measures, the projects evaluated made up 16% of electric energy (kWh) savings and 50% of the total custom and hybrid therm savings. The CY 2013 evaluation activities focused on electric energy (kWh) savings, so the Team applied these findings to similar measures in CY 2014.

Table 112. Large Energy Users Program CY 2014 Sample Size for Each Evaluation Activity

Custom Process Measure Category	Project Audit Only	Project Audit and On-Site Inspection
Heat Exchanger Replacement/Improvement	1	4
Industrial Steam Traps and Pipe Insulation	7	
Paper and Pulp Process Improvement	1	5
Process Heat Recovery	1	4
Reverse Osmosis Filtration		1
Boilers and Burners[1]	8	
Total	**18**	**14**

[1] Boilers and burners is not a custom process measure. The results from the CY 2014 evaluation activities do not affect the evaluated savings in this report; the Evaluation Team will use these results to update the 2014 Deemed Savings Review.

Appendix K contains abbreviated EM&V methods describing evaluation protocols and findings for the custom measures listed in Table . In addition to the high-priority measures listed above, the Program includes incentives for efficiency measures in the following measure groups:

- Agriculture
- Building Shell
- Compressed Air, Vacuum Pumps (evaluated in CY 2013)
- Domestic Hot Water
- Food Service
- HVAC (evaluated in CY 2013)
- Industrial Ovens and Furnaces
- Information Technology
- Lighting (evaluated in CY 2013)
- Refrigeration
- Retrocommissioning

To determine savings, the Evaluation Team applied results from specific evaluation activities performed in previous years to the relevant measure groups in CY 2014.

Evaluation of Gross Savings

The Evaluation Team used data from the SPECTRUM database, project audits, and on-site inspections to estimate savings.

Deemed (Prescriptive) Measures

The Evaluation Team performed a review of the SPECTRUM tracking database to assess quality and completeness of the data. The Team used the TRM and Program materials to estimate savings for all prescriptive measures.

Custom and Hybrid Measures

For measures not explicitly addressed in a work paper or the TRM, the Evaluation Team developed savings algorithms and assumptions based on engineering judgment and best practices from other statewide TRMs. Typically, the Program Implementer classified such measures as custom measures in SPECTRUM. To evaluate these measures, the Evaluation Team performed either project audits or site visits. Table 112 shows the measure types evaluated in CY 2014.

Custom Process Evaluation

To evaluate the custom measures, the Evaluation Team focused on projects completed in CY 2014, placing a primary emphasis on any projects claiming significant natural gas savings. The Team used results from CY 2014 evaluation activities to determine a therm realization rate for all custom measures reported in CY 2014. Appendix K provides detailed information about the custom process evaluation including background and rationale, sampling methodology, metering and verification methodology, data analysis methodology, evaluated savings and other findings, and conclusions and recommendations. A total of 36 participants implementing custom process measures reported primarily therm savings; for 24 of these projects, the Evaluation Team conducted site visits and desk reviews. The projects evaluated in CY 2014 represent 55% of the reported therm savings for custom projects and 50% of the total therm savings reported for the Program.

CY 2014 and Quadrennium Realization Rates

After determining verified savings for each project, the Evaluation Team calculated realization rates at the project level and rolled up weighted average results to the measure level. For each identified measure group, the Evaluation Team calculated the realization rate by dividing the total verified gross savings by the total reported gross savings. The Team multiplied measure-level Program gross savings by the corresponding measure-level realization rate to arrive at total verified gross savings (Table).

Table outlines the realization rates achieved by the Program in CY 2014 by measure group. This table also helps illustrate the rationale for how The Team selected specific measures for project reviews and on-site inspections. The column titled “Percentage of Total Program MMBtu” shows the measure savings percentage relative to the total program savings. The column titled “Proportion of Savings from Prescriptive Measures” shows the percentage of prescriptive savings within each measure.

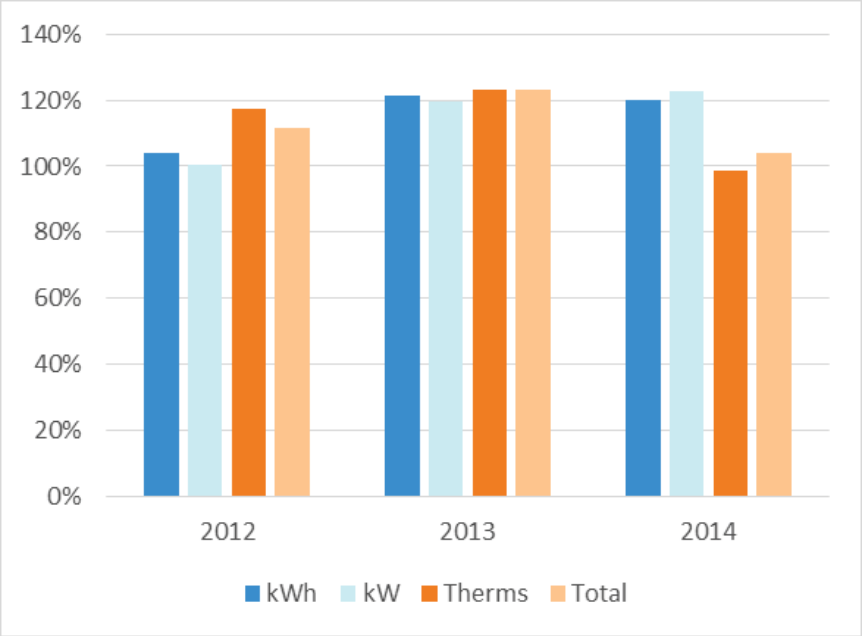
Table 113. 2014 Large Energy Users Program Realization Rates by Measure Group

Measure Group	Realization Rate			% of Total Program MMBtu	Proportion of Savings from Prescriptive Measures
	kWh	kW	Therms		
Agriculture	124.2%	129.0%	100.0%	0.2%	0.0%
Boilers and Burners	138.4%	107.6%	80.4%	10.2%	49.0%
Building Shell	124.2%	129.0%	98.7%	3.5%	12.9%
Compressed Air, Vacuum Pumps	203.0%	196.6%	100.0%	5.6%	44.7%
Domestic Hot Water	124.2%	129.0%	98.5%	-0.2%	0.0%
Food Service	100.0%	100.0%	100.0%	0.3%	100.0%

Measure Group	Realization Rate			% of Total Program MMBtu	Proportion of Savings from Prescriptive Measures
	kWh	kW	Therms		
HVAC – All Other	74.2%	83.1%	125.0%	13.5%	15.6%
HVAC – Controls	124.2%	129.0%	98.5%	3.4%	0.0%
HVACVFDs	124.2%	129.0%	100.0%	0.9%	0.0%
Industrial Ovens and Furnaces	124.2%	129.0%	98.5%	1.0%	0.0%
Information Technology	124.2%	129.0%	100.0%	0.1%	0.0%
Lighting	110.3%	111.7%	100.0%	6.8%	57.4%
Process	98.1%	111.2%	95.8%	51.6%	0.0%
Refrigeration	124.2%	129.0%	100.0%	2.4%	0.0%
Retrocommissioning	124.2%	100.0%	98.5%	1.0%	0.0%
Total	**119.9%**	**122.8%**	**98.7%**	**100.0%**	**16.6%**

Figure 39 shows the realization rate by fuel type for CY 2012 through CY 2014. The realization rate in CY 2012 includes carryover savings from the prior program year. Savings listed as carryover pertain to projects approved under the legacy programs, but they were completed until after the new Large Energy Users Program launched in April 2012.

Figure 39. Large Energy Users Program 2012-2014 Realization Rate by Fuel Type



CY 2014 and Quadrennium Gross and Verified Savings Results

To calculate the total verified gross savings, the Evaluation Team applied measure-level realization rates to the savings of each measure group. The Program includes two components called the Emerging Technology Program and the Renewable Energy Competitive Incentive Program, which are tracked as

independent line items.[27] Table 114 lists the total verified gross savings by measure type since the launch of the Large Energy Users Program in April 2012.

Table 114. CY 2012-2014 Large Energy User Program Annual Gross Verified Savings by Measure Type

Measure Group	kWh	kW	Therms	MMBtu	% of Program
Agriculture	2,035,735	280	0	6,946	0.2%
Boilers & Burners	4,207,127	260	3,690,553	383,410	10.1%
Building Shell	-301,200	581	703,299	69,302	1.8%
Compressed Air, Vacuum Pumps	80,727,510	10,809	990,156	374,458	9.9%
Domestic Hot Water	1,185,601	140	-15,551	2,490	0.1%
Food Service	677,060	109	68,848	9,195	0.2%
HVAC	40,829,283	4,573	9,280,663	1,067,376	28.1%
Industrial Ovens and Furnaces	-138,962	-24	162,263	15,752	0.4%
Information Technology	5,547,177	224	0	18,927	0.5%
Lighting	92,132,845	12,502	0	314,357	8.3%
Motors & Drives	58,069	2	0	198	0.0%
Process	94,148,039	12,364	11,050,727	1,426,306	37.6%
Refrigeration	18,582,084	2,530	0	63,402	1.7%
Renewable Energy	7,082,482	702	0	24,165	0.6%
Retrocommissioning	1,291,268	0	117,647	16,171	0.4%
Vending & Plug Loads	90,006	0	0	307	0.0%
Waste Water Treatment	3,413,675	390	30,923	14,740	0.4%
Other	9,307,111	223	37,124	35,468	0.9%
Adjustment Measure	-13,223	-5	0	-45	0.0%
Total	**360,861,685**	**45,051**	**26,048,605**	**3,792,455**	**100.0%**

Table 115 lists the combined reported gross and verified gross savings for the Large Energy Users Program from CY 2012 through CY 2014.

Table 115. CY 2012 - 2014 Large Energy User Program Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	121,537,211	15,364	12,069,530	145,735,249	18,871	11,909,020
	Life-Cycle	1,561,156,899	15,364	160,598,415	1,800,665,919	18,871	158,294,611
2012-2014	Annual	309,132,488	39,264	23,801,550	360,861,685	45,660	26,116,651
	Life-Cycle	3,902,240,734	39,264	320,062,285	4,396,113,092	45,660	359,808,070

[27] A separate chapter details the Renewable Energy Competitive Incentive Program.

Evaluation of Net Savings

For the Large Energy Users Program, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

CY 2014 and Quadrennium Net Savings Results

Table 116 shows the Program-level freeridership and spillover ratios applied for CY 2014. The freeridership ratio represents the weighted average of the CY 2013 measure-level freeridership ratios, updated to reflect the CY 2014 measure mix.

Table 116. Large Energy Users Program Freeridership and Spillover

Adjustment	CY 2014	CY 2011 CY 2014
Freeridership Ratio (Weighted Average)	0.27	0.21
Spillover Ratio	0.02	0.01

In CY 2013, The Evaluation Team used self-report and standard market practice approaches to determine the Program's freeridership level. The Team used a combination of standard market practice for certain measures in the boilers and burners and lighting categories and the self-report approach for all other measures. Combining the self-report and standard market practice freeridership data, the Evaluation Team estimated that the Program had overall average freeridership of 27% in CY 2013. This did not change in CY 2014.

Table 117 shows the net energy impacts (kWh, kW, and therms) for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 117. CY 2014 and Three-Year Large Energy Users Net Savings by Fuel Type

Savings		Verified Net		
		kWh	KW	Therms
2014	Annual	112,931,861	14,726	8,869,045
	Life-Cycle	1,394,440,630	14,726	117,880,556
2011-2014	Annual	285,817,739	36,254	19,514,680
	Life-Cycle	3,464,745,709	36,254	263,987,379

Program Cost-Effectiveness

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

Table 118 lists the annual and three-year incentive costs for the Large Energy Users Program.

Table 118. Large Energy Users Program Incentive Costs

Costs	CY 2014	CY 2012-2014
Incentive Costs	$10,432,140	$24,203,978

The Evaluation Team found the CY 2014 Program to be cost-effective (a TRC benefit/cost ratio greater than 1). Table 119 lists the evaluated costs and benefits.

Table 119. Large Energy Users Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2011-2014
Costs		
Administration Costs	$1,144,854	$2,539,842
Delivery Costs	$4,668,614	$10,364,934
Incremental Measure Costs	$50,749,554	$89,871,315
Total Non-Incentive Costs	$56,563,022	$102,776,091
Benefits		
Electric Benefits	$86,055,217	$200,514,242
Gas Benefits	$105,802,274	$234,432,841
Emissions Benefits	$51,602,791	$118,444,850
Total TRC Benefits	$243,460,282	$553,391,933
Net TRC Benefits	**$186,897,260**	**$450,615,842**
TRC B/C Ratio	**4.30**	**5.38**

Evaluation Outcomes and Recommendations

In CY 2014, the Evaluation Team found that the Program achieved energy, demand, and therm savings within 5% of reported savings.

Outcome 1. The Evaluation Team found inconsistencies in savings calculation methodologies.

The savings calculations in the sample of custom process projects reviewed were all custom-built spreadsheet analyses developed by the customer, consultant, energy advisor, or vendor. These savings were not deemed, but some of the calculations could have followed the guidelines or methodology in the current TRM.[28] For example, the Wisconsin TRM includes sections on steam traps in an industrial or HVAC application as well as pipe insulation, but the TRM savings algorithms were not used on a consistent basis for the industrial steam trap and pipe insulation projects evaluated in this study.

Recommendation 1. Refer to the guidelines and methodology used in the TRM.

The Evaluation Team recommends that the Program Implementers refer to the guidelines and methodology (algorithms) used in the TRM. If any portion of the savings from a custom process project

[28] The Wisconsin TRM was not published until August 2014; therefore, participants did not have guidance from this document until then.

is attributable to a measure in the TRM, the Program Implementer must document why the TRM algorithm is not applicable or inaccurate. This documentation will provide consistency in calculation methodology for similar projects, simplify data collection (the M&V plan data collection will include the input parameters for the approved calculation methodology), reduce the evaluation-cycle time, and result in more consistent savings estimates. The Evaluation Team recognizes improvements are in place to make savings calculations consistent; Program Implementers have a uniform custom savings calculation workbook (as of May 1, 2015).

Small Business Program

The Small Business Program (the Program) launched midway through CY 2012 to encourage customers with monthly average demand of less than 100 kW to install easy and affordable energy efficiency upgrades. The Program offers free on-site energy assessments and installation of a package of energy efficiency measures. Trade Allies conduct 30- to 45-minute energy assessments at customer facilities. Following the energy assessment, customers may request Trade Allies to install a free package of energy efficiency equipment and purchase additional energy-saving measures as part of a package or individually.

The Program operated almost identically in CY 2014 as it did in CY 2013, with some changes to the measures offered. Table 120 provides a summary of the Program's actual spending, savings, participation, and cost-effectiveness.

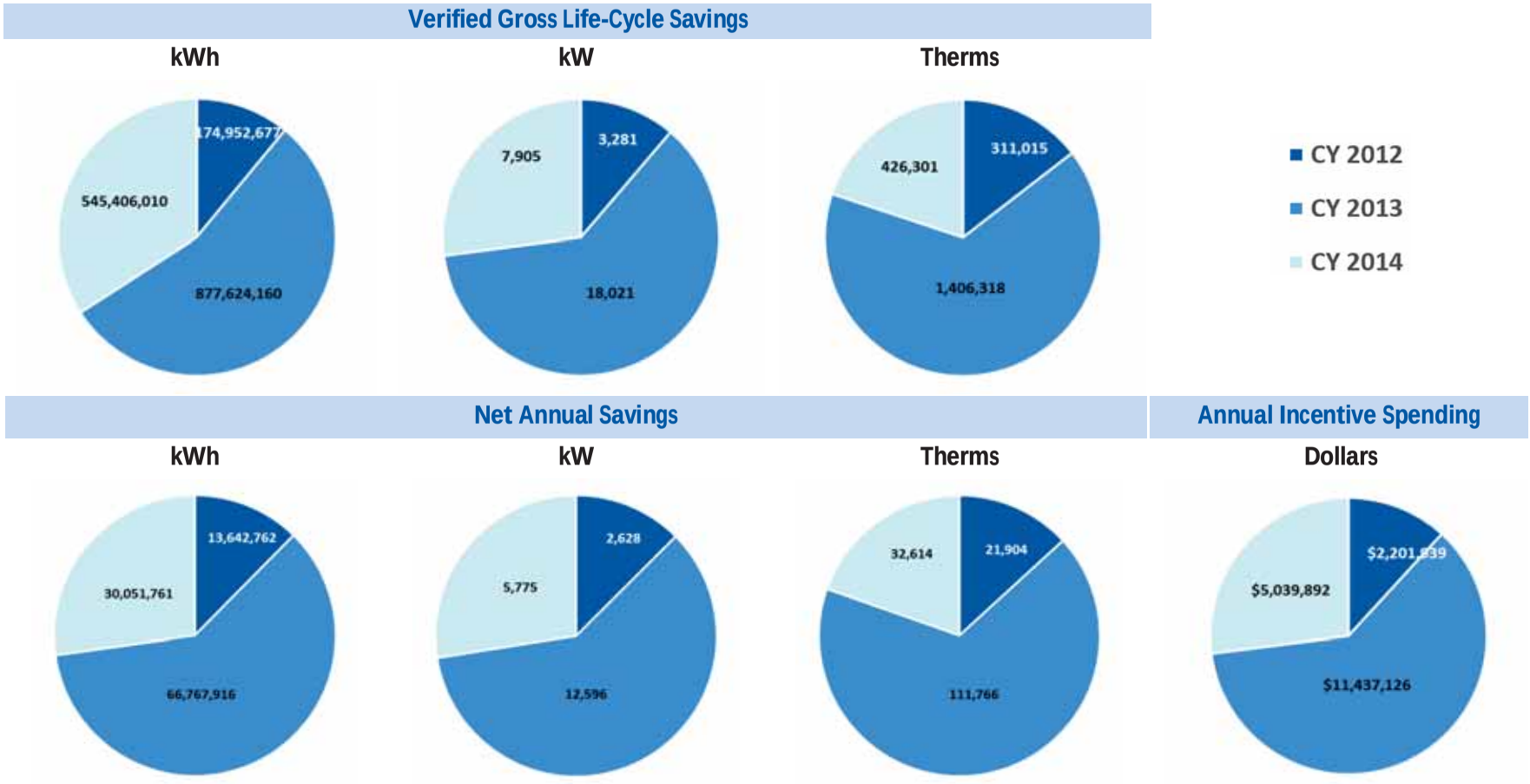
Table 120. Small Business Program Summary

Item	Units	CY 2014 Actual Amount	CY 2012-2014 Actual Amount
Incentive Spending	$	5,039,892	18,678,957
Verified Gross Life-Cycle Savings	kWh	545,406,010	1,597,982,847
	kW	7,905	29,207
	therms	426,301	2,143,634
Net Annual Savings	kWh	30,051,761	110,462,440
	kW	5,775	20,999
	therms	32,614	166,285
Participation	Unique Customers[1]	2,571	8,806
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost ratio	4.77	2.13

[1] The CY 2012-2014 total number of participants represents the sum of unique participants by year and may include customers who participated in multiple years.

Figure 40 shows a summary of savings and spending by year from CY 2012 through 2014. Note that the Program launched in April 2012 and was only active for nine months during CY 2012.

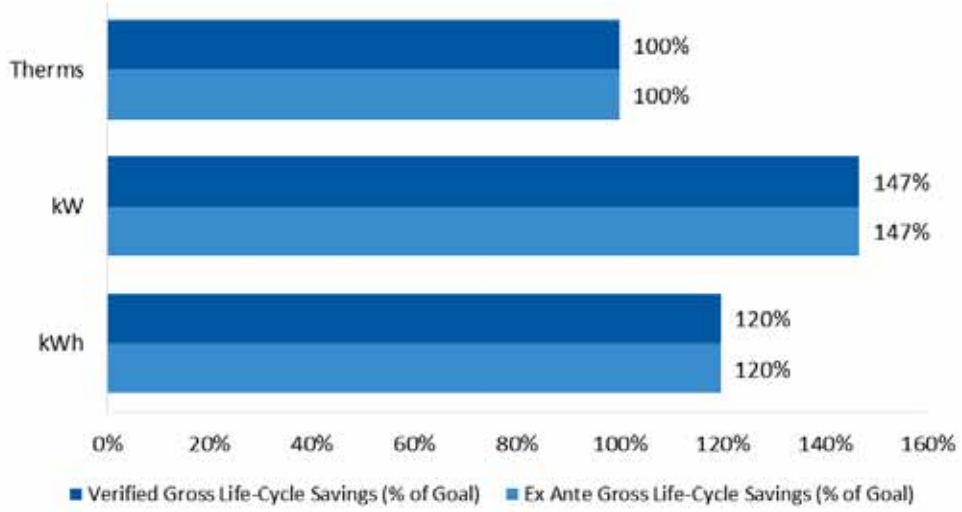
Figure 40. Small Business Program Three-Year (CY 2012-2014) Savings and Spending Progress



[1] CY 2013 Net Annual savings values differ from those reported in the CY 2013 report due to an adjustment made to commercial lighting baseline assumptions used in the net savings calculation. Appendix L provides more detail on this adjustment.

Figure 41 shows the percentage of gross life-cycle savings goals achieved by the Small Business Program in CY 2014. The Program's *ex ante* and verified gross savings exceeded the goals for therms, demand, and electric energy.

Figure 41. Small Business Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 455,613,512 kWh, 5,386 kW, and 426,295 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

Since the Program launched in CY 2012, the Evaluation Team designed its EM&V approach to integrate multiple perspectives to assess Program performance. Table 121 lists the specific data collection activities and sample sizes used to evaluate the Program. More detailed information on the evaluation activities from previous years can be found in the CY 2012 and CY 2013 Volume II reports.

Table 121. Small Business Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2012-2014 Sample Size (n)
Audit of Project Measures Installed	-	668
Materials Review	-	1
Participant Trade Ally Interviews	-	30
Program Administrator and Stakeholder Interviews	2	19
Participant Customer Survey	-	69
Partial Participant Customer Survey	-	70

CY 2014 Impact Evaluation Methodologies

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied CY 2013 installation rates to all measures. The Evaluation Team did not find any duplicate entries and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

To calculate CY 2014 net savings, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

Evaluation of Gross Savings

In CY 2014, the Evaluation Team reviewed the tracking database and applied the most recent research to evaluate gross savings.

CY 2014 and Quadrennium Realization Rates

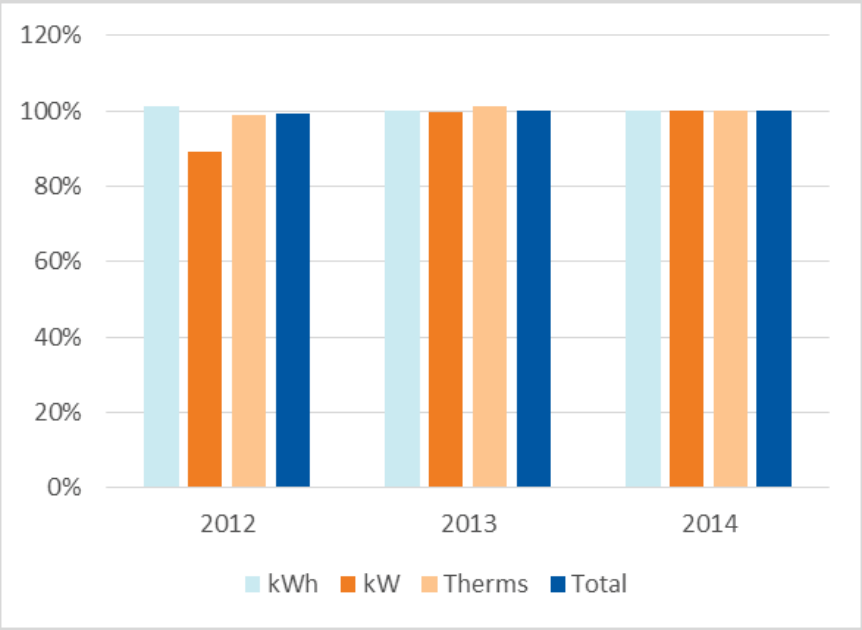
The Evaluation Team applied installation rates of 100% to all Small Business Program measures and did not adjust the deemed savings. The Team based the reported savings on the CY 2013 evaluation activities, which included project audits of 668 reported measures. Overall, the Small Business Program achieved an evaluated realization rate of 100% for energy, demand, and therm savings (Table 122).

Table 122. CY 2014 Small Business Program Realization Rates by Measure Type

Measure Group	Realization Rate			
	kWh	kW	Therms	MMBtu
Aeration	100%	100%	100%	100%
Controls	100%	100%	N/A	100%
Delamping	100%	100%	N/A	100%
Fluorescent, Compact (CFL)	100%	100%	N/A	100%
Fluorescent, Linear	100%	100%	N/A	100%
Insulation	100%	N/A	100%	100%
Light Emitting Diode (LED)	100%	100%	N/A	100%
Showerhead	100%	N/A	100%	100%
Strip Curtain	100%	100%	N/A	100%
Vending Machine	100%	N/A	N/A	100%
Total	**100%**	**100%**	**100%**	**100%**

Figure 42 shows the realization rates by fuel type across three calendar years.

Figure 42. CY 2012-2014 Small Business Program Realization Rate by Fuel Type



Three-Year Gross and Verified Savings Results

To calculate the total verified gross savings, the Evaluation Team applied measure-level realization rates to the reported savings of each measure group. Table 123 lists the total verified gross savings by measure type for three years.

Table 123. CY 2012-2014 Small Business Program Annual Gross Verified Savings Summary by Measure Type

Measure Group	kWh	kW	Therms	MMBtu	% of Program
Faucet Aerator	1,056,630	91	63,021	9,907	1.9%
Lighting	137,896,820	29,131	0	470,504	88.4%
Lighting - Controls	6,724,131	88	0	22,943	4.3%
Pipe Insulation	786,287	0	29,973	5,680	1.1%
Refrigeration	389,970	45	0	1,331	0.2%
Showerhead	1,440,852	0	108,069	15,723	3.0%
Vending	1,833,379	0	0	6,255	1.2%
Other	32,846	(148)	0	112	0.0%
Total	**150,160,915**	**29,207**	**201,063**	**532,455**	**100%**

Table 124 lists the combined *ex ante* and verified gross savings for the Program from CY 2012 through CY 2014.

Table 124. Small Business Program CY 2014 and Three-Year Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	40,626,815	7,905	38,350	40,626,815	7,905	38,350
	Life-Cycle	545,406,010	7,905	426,301	545,406,010	7,905	426,301
2012-2014	Annual	149,915,994	29,712	200,138	150,160,915	29,207	201,063
	Life-Cycle	1,596,294,257	29,712	2,114,279	1,597,982,847	29,207	2,143,634

Evaluation of Net Savings

For the Small Business Program, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

CY 2014 and Three-Year Net Savings Results

Table 125 shows the Program-level freeridership and spillover ratios applied to the CY 2014 Program. The freeridership ratio represents the weighted average of the CY 2013 measure-level freeridership ratios, updated to reflect the CY 2014 measure mix.

Table 125. Small Business Program Freeridership and Spillover

Adjustment	CY 2014	CY 2012-2014
Freeridership Ratio (Weighted Average)	0.26	0.24
Spillover Ratio	0.00	0.00

In CY 2013, The Evaluation Team used self-report and standard market practice approaches to determine the Program's freeridership level. The Team used a combination of standard market practice for certain measures categories and the self-report approach for all other measures. Combining the self-report and standard market practice freeridership data, the Evaluation Team estimated that the Small Business Program had overall average freeridership of 28% in CY 2013. Due to the change in measure mix, the program-level freeridership dropped slightly to 26% in CY 2014.

Table 126 shows the net energy impacts (kWh, kW, and therms) for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 126. CY 2014 and Three-Year Small Business Program Net Savings by Fuel Type

Savings		Verified Net		
		kWh	KW	Therms
2014	Annual	30,104,585	5,786	32,614
	Life-Cycle	402,756,340	5,786	362,545
2011-2014	Annual	110,515,264	21,010	166,285
	Life-Cycle	1,137,764,579	21,010	1,776,709

Program Cost-Effectiveness

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

Table 127 lists the annual and three-year incentive costs for the Small Business Program.

Table 127. Small Business Program Incentive Costs

Costs	CY 2014	CY 2012-2014
Incentive Costs	$5,036,879	$18,309,591

The Evaluation Team found the CY 2014 Program to be cost-effective (a TRC benefit/cost ratio greater than 1). Table 128 lists the evaluated costs and benefits.

Table 128. Small Business Program Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2011-2014
Costs		
Administration Costs	$486,201	$1,820,008
Delivery Costs	$1,985,361	$7,431,853
Incremental Measure Costs	$4,400,725	$29,519,097
Total Non-Incentive Costs	$6,872,288	$38,770,959
Benefits		
Electric Benefits	$24,092,810	$59,570,894
Gas Benefits	$304,240	$1,560,383
Emissions Benefits	$8,373,220	$21,451,337
Total TRC Benefits	$32,770,269	$82,582,614
Net TRC Benefits	**$25,897,982**	**$43,811,655**
TRC B/C Ratio	**4.77**	**2.13**

Retrocommissioning Program

Focus on Energy launched the Retrocommissioning Program (the Program) in late CY 2012 and began claiming savings in CY 2013. The Program offered financial assistance to nonresidential customers to improve energy efficiency at their facilities by optimizing existing building systems, energy-using equipment, and operations.

In CY 2014, Focus on Energy combined the Program with the core nonresidential programs and began offering retrocommissioning and building tune-ups as measures under the Business Incentive and Large Energy Users Programs. Therefore, the Program only claimed savings for one year in the quadrennium evaluation cycle.

Table 129 lists the Program's actual spending, savings, participation, and cost-effectiveness in CY 2013.

Table 129. Retrocommissioning Program Summary

Item	Units	CY 2014 Actual Amount	CY 2013 Actual Amount
Incentive Spending	$	0	258,994
Verified Gross Life-Cycle Savings	kWh	0	14,336,177
	kW	0	225
	Therms	0	1,428,476
Net Annual Savings	kWh	0	2,849,745
	kW	0	225
	Therms	0	280,706
Participation	Number of Participants	0	19
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	N/A	1.58

Evaluation, Measurement, and Verification Approach

In CY 2013, the Evaluation Team conducted a process and impact evaluation. Table 130 lists the specific data collection activities and sample sizes used to evaluate the Program.

Table 130. Retrocommissioning Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size	CY 2013-2014 Sample Size (n)
On-Site Measurement and Verification	0	10
Participant Surveys	0	13
Trade Ally Interviews	0	20
Administrator and Implementer Interviews	0	4

Impact Evaluation Methodology

Because the Program was not in operation in CY 2014, the Evaluation Team did not conduct any impact evaluation activities. To calculate CY 2013 gross savings, the Evaluation Team conducted a database review, project audits, and 10 on-site visits. (See the Standard Evaluation Methods section for detailed descriptions of these evaluation methods.) To calculate net savings, the Evaluation Team used self-report data from 13 participant surveys. [29]

Evaluation of Gross Savings

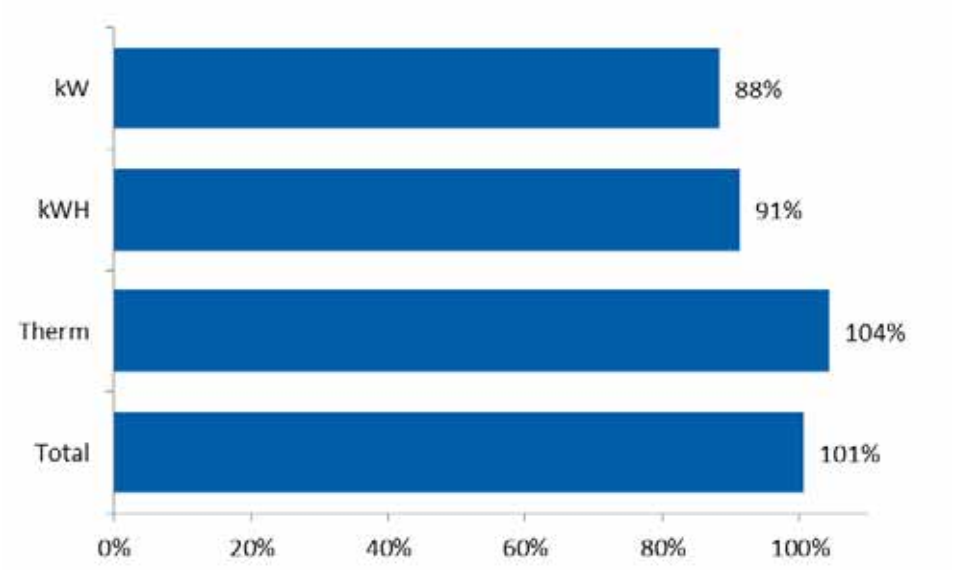
In CY 2013, the Program achieved an overall realization rate of 101%. Table 131 contains the realization rate by measure group.

Table 131. Retrocommissioning Program Realization Rates by Measure Group

Measure Group	Realization Rate			
	kWh	kW	Therms	MMBtu
Core Retrocommissioning—HVAC, Not Otherwise Specified	93%	88%	95%	95%
Retrocommissioning, Express Building Tune-Up	72%	N/A	219%	180%
Total	**91%**	**88%**	**104%**	**101%**

Figure 43 shows the realization rate by fuel type.

Figure 43. Retrocommissioning Program Realization Rate by Fuel Type



[29] The CY 2013 Volume II report contains more detail on CY 2013 evaluation methodology and results.

Gross and Verified Gross Savings Results

Table 132 lists the Program's total and verified gross savings by measure type for CY 2013.

Table 132. CY 2013 Retrocommissioning Program Gross Saving

Retrocommissioning Savings Type	Gross			Verified Gross		
	kWh	kW	Therms	kWh	kW	Therms
Annual Core Retrocommissioning	2,924,659	255	254,109	2,714,687	225	242,184
Life-Cycle Core Retrocommissioning	14,623,297	255	1,270,544	13,573,437	225	1,210,918
Annual Express Building Tune-Up	212,217	N/A[1]	19,856	152,548	0	43,512
Life-Cycle Express Building Tune-Up	1,061,087	N/A[1]	99,279	762,740	0	217,558
Total Annual	**3,136,877**	**255**	**273,965**	**2,867,235**	**225**	**285,695**
Total Life-Cycle	**15,684,385**	**255**	**1,369,823**	**14,336,177**	**225**	**1,428,476**

[1] Because of the nature of the measures implemented under the Express Building Tune-Up path, the Evaluation Team did not include demand savings.

Evaluation of Net Savings

The Evaluation Team used self-report surveys to determine net savings. The Team estimated the overall NTG for the Program at 98.4% (Table 133).

Table 133. CY 2013 Retrocommissioning Program Freeridership, Spillover, and Net-to-Gross Estimates[1]

Measure Type	Freeridership	Spillover	Net-to-Gross
Overall	1.6%	0%	98.4%

[1] The Evaluation Team weighted the overall value by the distribution of evaluated gross energy savings for the Program population.

Net Savings Results

Table 134 shows the net energy impacts (kWh, kW, and therms) for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 134. Retrocommissioning Program Net Savings

	Verified Net		
	kWh	kW	Therms
Annual	2,849,745	225	280,706
Life-cycle	14,248,723	225	1,403,531

Program Cost-Effectiveness

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

Table 135 lists the CY 2013 incentive costs for the Retrocommissioning Program in CY 2013.

Table 135. Retrocommissioning Program Incentive Costs

	CY 2013
Incentive Costs	$258,994

The Evaluation Team found the CY 2013 Program to be cost-effective (a TRC benefit/cost ratio above 1). Table 136 lists the evaluated costs and benefits.

Table 136. Retrocommissioning Program CY 2013 Costs and Benefits

Cost and Benefit Category	CY 2013
Administration Costs	$209,169
Delivery Costs	$854,126
Incremental Measure Costs	$576,024
Total Non-Incentive Costs	$1,639,319
Benefits	
Electric Benefits	$758,087
Gas Benefits	$1,268,550
Emissions Benefits	$561,316
Total TRC Benefits	$2,587,952
Net TRC Benefits	**$948,633**
TRC B/C Ratio	**1.58**

Design Assistance Program

The Design Assistance Program (the Program), launched in January 2013, offers technical advice, energy modeling services, and financial incentives to owners and builders of new buildings more than 5,000 square feet.[30] Program participants receive incentives based on their buildings' energy savings (as projected by energy modeling performed through the Program). The Program Implementer, the Weidt Group, conducts outreach that targets design professionals, such as architects, engineers, and design/build contractors, to recruit projects for the Program.

Table 137 lists a summary of the Program' actual spending, savings, participation, and cost-effectiveness.

Table 137. Design Assistance Program Summary

Item	Units	CY 2014 Actual Amount	CY 2013-2014 Actual Amount
Incentive Spending	$	1,933,133	2,035,300
Verified Gross Life-Cycle Savings	kWh	364,426,302	385,736,302
	kW	2,245	2,365
	Therms	10,961,680	11,189,780
Net Annual Savings	kWh	10,428,992	10,953,208
	kW	1,285	1,349
	Therms	313,697	322,779
Participation	Number of Participants	65	67
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	2.75	2.51

Figure 44 shows a summary of savings and spending by year from CY 2013 and CY 2014. Because of the long-term nature of new construction projects, the participants completed just two projects through the Program in 2013.

[30] Eligible new construction projects include multifamily buildings.

Figure 44. Design Assistance Program Two-Year (CY 2013-2014) Savings and Spending Progress

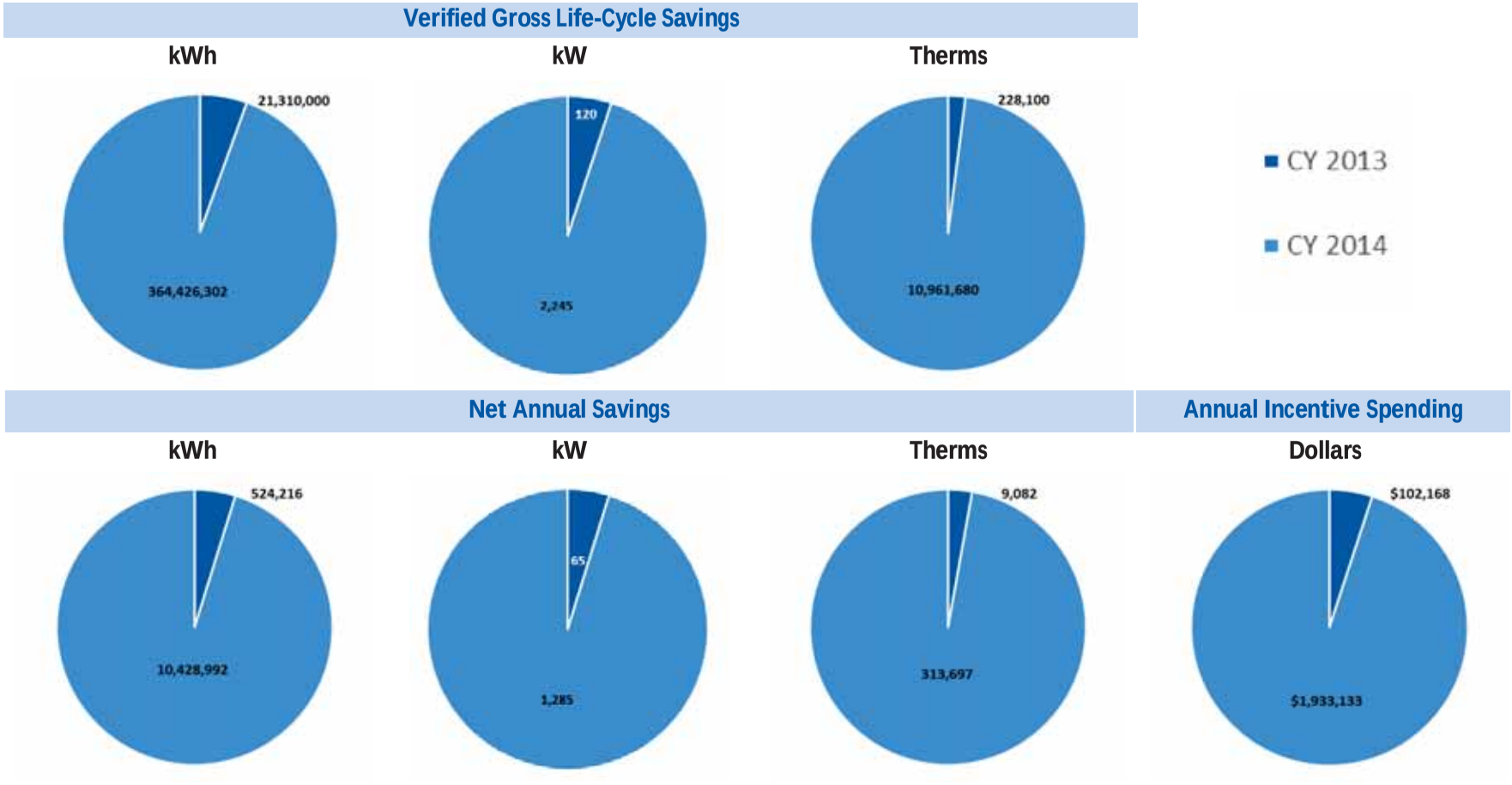
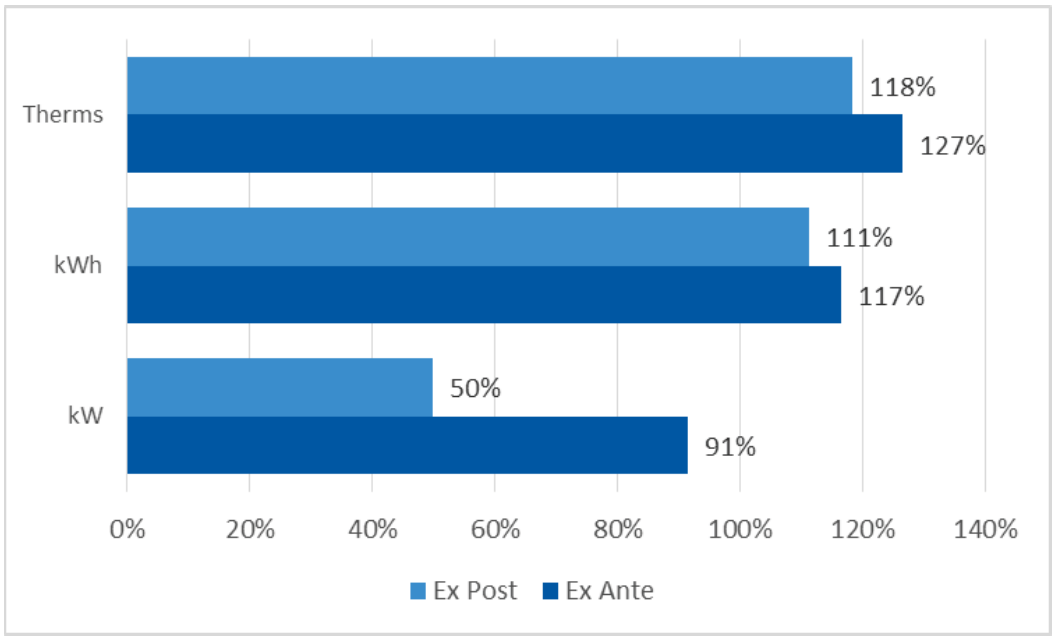


Figure 45 shows the percentage of gross life-cycle savings goals achieved by the Program in CY 2014. The program exceeded the electric energy and therm savings goals, but it fell short of the demand savings goal.

The Evaluation Team discovered that the demand savings for one of the CY 2014 projects had been incorrectly reported. The Evaluation Team determined that according to the results of the energy modeling, the project in question was actually showing negative demand savings. The Evaluation Team brought this issue to the attention of the Program Implementer, who confirmed an error in their original demand savings calculation for this project and agreed with the Evaluation Team that the demand savings for this project should be negative. This project originally reported the highest demand savings of all the participants in the program, and therefore accounted for a significant portion of the total program-level savings. Because the Ex Post savings for this project were much lower than its Ex Ante savings, the program-level Ex Post savings were lower as well.

Figure 45. Design Assistance Program Achievement of CY 2014 Gross Life-Cycle Savings Goal[1]



[1] For *ex ante* gross life-cycle savings, 100% reflects the Program Implementation contract goals for CY 2014: 327,600,000 kWh, 4,500 kW, and 9,270,000 therms. The verified gross life-cycle savings contribute to the Program Administrator's portfolio-level goals.

Evaluation, Measurement, and Verification Approach

The Evaluation Team designed its EM&V approach to integrate multiple perspectives to assess Program performance. Table 138 lists the specific data collection activities and sample sizes used to evaluate the Program.

Table 138. Design Assistance Program Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2013-2014 Sample Size (n)
On-Site Measurement and Verification	15	15
Engineering Desk Review	15	17
Program Administrator and Implementer Interviews	2	8
Design Team Interviews	0	15
Participant Customer Surveys	7	19

CY 2014 Impact Evaluation Methodologies

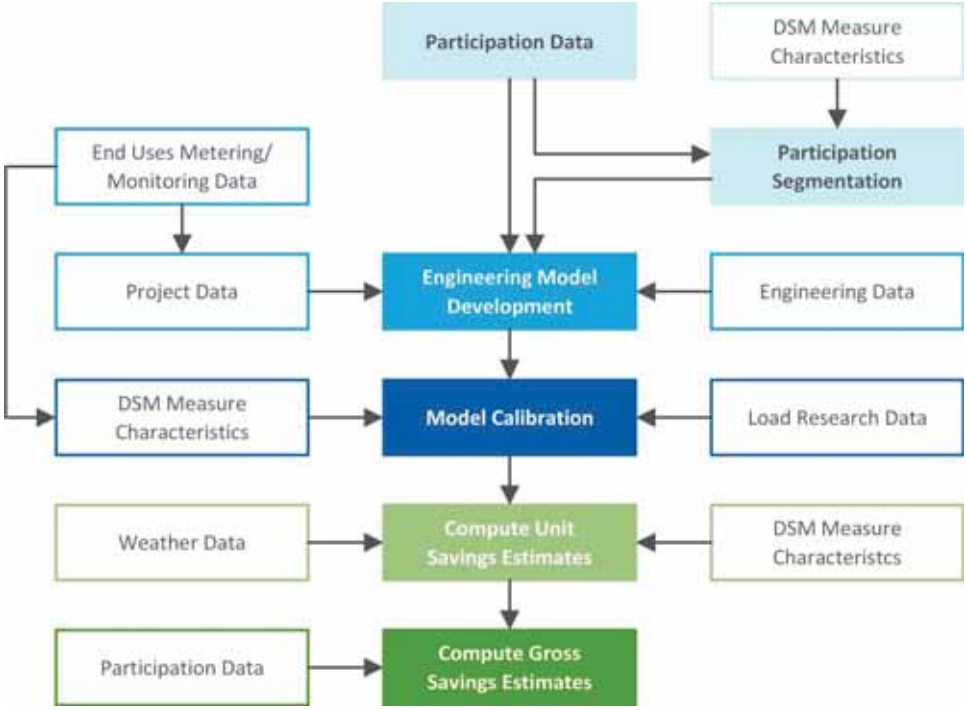
The Program used building energy simulation models to calculate savings for projects conducted through the Program. The Evaluation Team used a measurement-based calibrated engineering method (MCEM) to evaluate the savings for these projects. This approach was based on *in situ* measurements and observations, calibrated to best available energy use indices, and conducted with industry-accepted energy simulation programs (either DOE-2 or TRACE depending on each project's chosen modeling platform).

The analysis focused on the following:

- Quantifying as-built construction characteristics, energy systems operational characteristics, and energy-efficient measure characteristics (such as quantities, capacities, and efficiencies) through on-site inspection and engineering documentation review.
- Reviewing the energy models provided with the program documentation and created by the project teams. The Evaluation Team reviewed energy-efficient measure assumptions and performance variables for each building to ensure that the model inputs accurately reflected the as-built conditions. The Team also reviewed the baseline model for each building to ensure that it reflected code-prescribed values and complied with standard modeling procedure, revising models as necessary.
- Calibrating models to the best available consumption indices, including monthly utility billing data.
- Comparing the results of calibrated, as-built model energy use with the baseline model to determine the annual realized energy savings for individual buildings.
- Summarizing energy savings for each sampled building. Along with participation data, these values were extrapolated to the population to estimate gross savings for the program.

Figure 46 depicts the MCEM approach.

Figure 46. Measurement-Based Calibrated Engineering Method Flowchart



Projects Sampled for Evaluation

The Evaluation Team used stratified random sampling to select a set of projects to evaluate. Based on the number of completed projects in CY 2014, the Team chose a sample size of 15 projects to achieve the acceptable levels of 90% confidence with ±20% precision. To determine the strata, the Evaluation Team sorted the completed projects based on total reported combined electricity and gas energy savings.

One project accounted for 27% of the total MMBtu savings and was included in the sample. The Team removed the eight projects that accounted for the bottom 2% of the total program savings. Then the Team divided the remaining projects into two groups that each accounted for equal MMBtu savings. The first group comprised fewer projects with higher savings per project and was deemed the large stratum. The second group comprised more projects with lower savings per project and was deemed the small stratum.

The Team randomly chose seven projects from the large stratum and seven projects from the small stratum to include in the sample. The sample included two multifamily residential projects, with the remaining projects coming from the commercial or schools/government sectors. The total Program population contained four multifamily residential projects and 33 commercial or schools/government projects.

Evaluation of Gross Savings

The Evaluation Team used data from the SPECTRUM database, on-site inspections, and energy simulation model calibrations to estimate savings. (See Standard Evaluation Methods for detailed descriptions of the database review and on-site inspections.)

Model Calibration

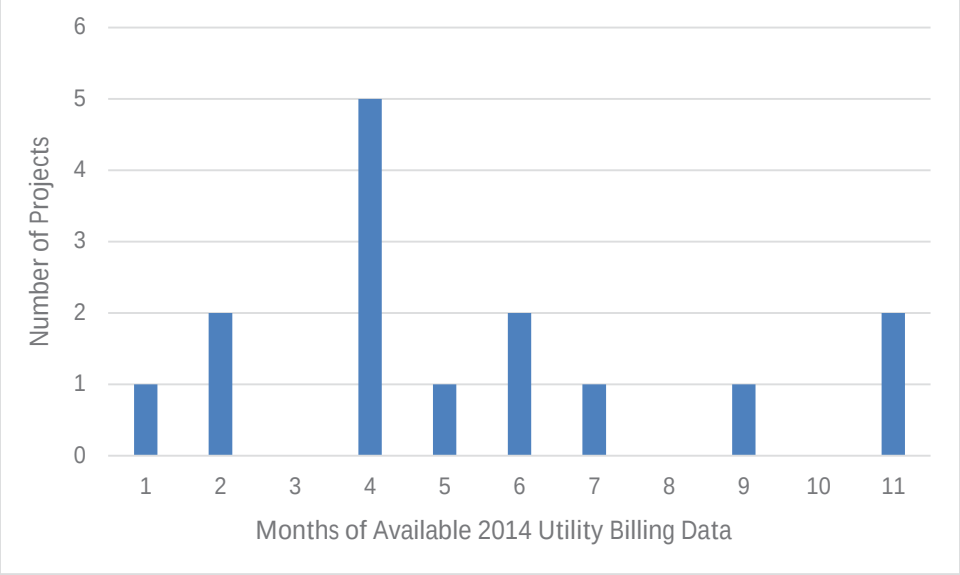
Because this was a new construction program, the models for the as-built buildings served as the Evaluation Team's starting point for calibration purposes. The Team obtained the as-built models for projects in the sample that were used to predict energy savings. These models contained the following characteristics:

- Building sizes and configurations
- Shell characteristics (such as window-shading coefficients and wall insulation values)
- HVAC equipment specifications
- Lighting densities and control methods
- Occupancies
- Schedules

First, the Evaluation Team checked the model files against the project file documentation available through SPECTRUM. If there was a discrepancy, the Team contacted the Weidt Group to obtain the correct files. The Evaluation Team then confirmed the model and project file information through detailed data collection from site visits, which included determining occupancy levels and operating schedules achieved during the previous year.

Next, the Evaluation Team adjusted the original as-built model to accurately reflect all of the information gathered during the documentation review and site visit. The Team then fine-tuned the model to calibrate it to monthly utility data for the period of one year (or as many months as were available, as shown in), incorporating actual meteorological year weather data. The target variance for calibrated values with respect to the utility data was ±10% on a monthly basis and ±5% for the annual total. Then the Team made corresponding changes to the baseline model to match parameters that should remain consistent with the as-built model, such as occupancy schedules or space temperature set points. Finally, the Evaluation Team ran both the baseline and as-built models with typical meteorological year weather data. The differences in electricity and gas consumption between the calibrated baseline and as-built models were the evaluated savings for the project.

Figure 47. Availability of CY 2014 Utility Billing Data for Sampled Projects



CY 2014 and Quadrennium Realization Rates

After determining verified savings for each project in the sample, the Evaluation Team calculated realization rates for each sample stratum (census, large, and small) by dividing the sum of the verified gross savings for the projects in the stratum by the sum of the reported gross savings for the projects in the stratum. Table 139 lists these realization rates.

Table 139. CY 2014 Design Assistance Program Realization Rates by Sample Stratum

Sample Stratum	Realization Rate			
	kWh	kW	Therms	MMBtu
Very Large Project[1]	100%	100%	100%	100%
Large Projects	77.4%	36.4%	96.4%	88.8%
Small Projects	109%	87.6%	79.0%	96.3%

[1] Because the census project was completed late in CY 2014, an insufficient amount of utility billing data were available to perform a full calibration; therefore, the Evaluation Team awarded the project a realization rate of 100%.

As shown in Table 140, The Team then applied these realization rates to each of the Program's completed projects, according to its stratum, to determine the verified gross savings for every completed project. The Evaluation Team divided the sum of the verified gross savings for all projects in the Program by the sum of the reported gross savings for all projects in the Program to arrive at the Program-level realization rates.

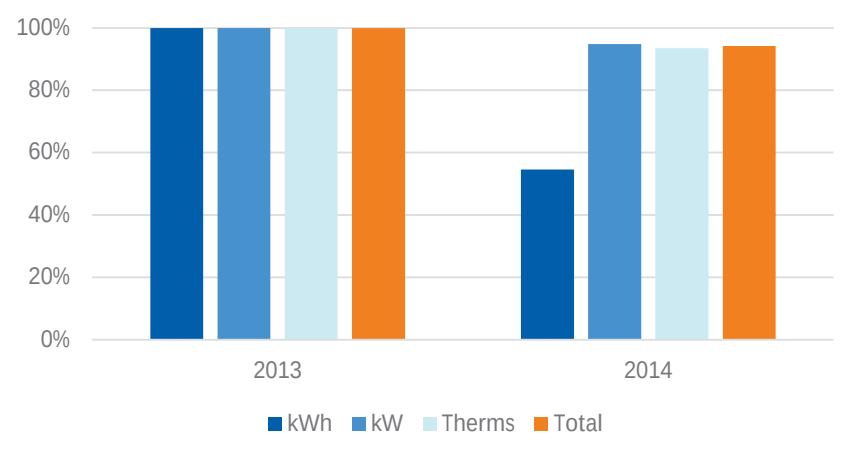
Table 140. Design Assistance Program Realization Rates by Measure Group

Measure Group	Realization Rate			
	kWh	kW	Therms	MMBtu
Project Savings Verification – Nonresidential	94.8%	54.6%	93.5%	94.2%
Project Savings Verification, Renewable Group 1 – Nonresidential[1]	100%	-	-	100%
Project Savings Verification – Residential	94.8%	54.6%	93.5%	93.8%
Project Savings Verification, Renewable Group 1 – Residential	N/A	N/A	N/A	N/A

[1] The Evaluation Team applied a 100% realization rate for the renewable measure group because no renewable energy projects were included in the evaluation sample.

Figure 48 shows the realization rate by fuel type for CY 2013 and CY 2014.

Figure 48. Design Assistance Program Realization Rate by Fuel Type



CY 2014 and Gross and Verified Savings Results

Table 141 lists the life-cycle *ex ante* and verified gross savings by sector for the Program. Savings for the residential sector included multifamily buildings.

Table 141. CY 2014 Design Assistance Program Gross Life-Cycle Savings Summary by Sector

Sector	*Ex Ante* Gross Life-Cycle			Verified Gross Life-Cycle		
	kWh	kW	Therms	kWh	kW	Therms
Residential	17,675,980	106	1,554,060	16,760,532	58	1,452,382
Nonresidential	364,139,824	4,007	10,175,020	347,665,770	2,187	9,509,297
Total Life-Cycle	**381,815,804**	**4,113**	**11,729,080**	**364,426,302**	**2,245**	**10,961,680**

Table 142 lists the combined annual and life-cycle *ex ante* and verified gross savings for the Program from CY 2013 through CY 2014.

Table 142. CY 2013-2014 Design Assistance Program Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	KW	Therms	kWh	KW	Therms
2014	Annual	19,090,790	4,113	586,454	18,221,315	2,245	548,084
	Life-Cycle	381,815,804	4,113	11,729,080	364,426,302	2,245	10,961,680
2013-2014	Annual	20,156,290	4,233	597,859	19,286,815	2,365	559,489
	Life-Cycle	403,125,804	4,233	11,957,180	385,736,302	2,365	11,189,780

Evaluation of Net Savings

The Evaluation Team used the self-report approach to determine the Program's freeridership level, by applying a freeridership ratio based on telephone surveys with 14 completed projects. The Team interviewed participants from seven of the 14 projects in CY 2013, while they were still in-progress, and determined a preliminary freeridership ratio. For the CY 2014 evaluation, the Team re-evaluated those preliminary results, assigned verified savings, and combined with an additional seven respondents for a savings-weighted freeridership ratio for the Program.

As in CY 2013, the Evaluation Team considered both the modeling assistance and incentives the Program offers when assessing the Program's net savings. Freeridership ratios for assessed projects ranged from 6.7% to 100%. Using a savings-weighted average, the Evaluation Team estimated that the Program had an overall average freeridership ratio of 43% in CY 2014, which is consistent with CY 2013 (44%). However, the CY 2013 analysis only used data from two completed projects.

Two project participants were deemed 100% freeriders. These projects represented 7% of the savings (kBtu) in the interview sample and 14% of the responses, indicating that these projects did not skew the overall freeridership score. These two respondents reported that they would have installed the same equipment with the same level of efficiency without the Program's assistance.

Table 143 shows the Program-level freeridership and spillover ratios applied for CY 2014. The freeridership ratio represents the weighted average of the CY 2014 project-level freeridership ratios.

Table 143. Design Assistance Program Freeridership and Spillover

Adjustment	CY 2014	CY 2013-2014
Freeridership Ratio (Weighted Average)	43%	43%
Spillover Ratio[1]	0%	0%
NTG Ratio	57%	57%

[1] The Evaluation Team did not assess spillover because interviews were completed with building owners. The Evaluation Team will evaluate Program spillover in CY 2015 by interviewing design teams.

CY 2014 and Quadrennium Net Savings Results

Table 144 shows the net energy impacts (kWh, kW, and therms) for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 144. Design Assistance CY 2014 and Two-Year (CY 2013-2014) Net Savings by Fuel Type

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	10,428,992	1,194	313,697
	Life-Cycle	208,579,843	1,194	6,273,931
2011-2014	Annual	10,953,208	1,259	322,779
	Life-Cycle	219,064,153	1,259	6,455,573

Program Cost-Effectiveness

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

Table 145 lists the incentive costs from CY 2013 through CY 2014 for the Program.

Table 145. Design Assistance Incentive Costs

Costs	CY 2014	CY 2013-2014
Incentive Costs	$1,987,963	$2,235,051

The Evaluation Team found the CY 2014 Program to be cost-effective (a TRC benefit/cost ratio greater than 1). Table 146 lists the evaluated costs and benefits.

Table 146. Design Assistance Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2013-2014
Costs		
Administration Costs	$516,746	$748,961
Delivery Costs	$2,110,087	$3,058,321
Incremental Measure Costs	$5,035,120	$5,182,315
Total Non-Incentive Costs	$7,661,953	$8,989,597
Benefits		
Electric Benefits	$10,958,249	$11,908,035
Gas Benefits	$5,004,162	$5,160,044
Emissions Benefits	$5,116,485	$5,508,470
Total TRC Benefits	$21,078,897	$22,576,549
Net TRC Benefits	**$13,416,944**	**$13,586,951**
TRC B/C Ratio	**2.75**	**2.51**

Renewable Energy Competitive Incentive Program

The Renewable Energy Competitive Incentive Program (the Program; RECIP) offers financial incentives for eligible cost-effective, renewable-energy projects to Wisconsin business customers through a competitive proposal process. The Program Implementers (Franklin Energy for customers eligible for the Business Incentive Program; Leidos for customers eligible for the Large Energy Users Program) deliver the Program according to the custom program path requirements of the Business Incentive and Large Energy Users Programs.

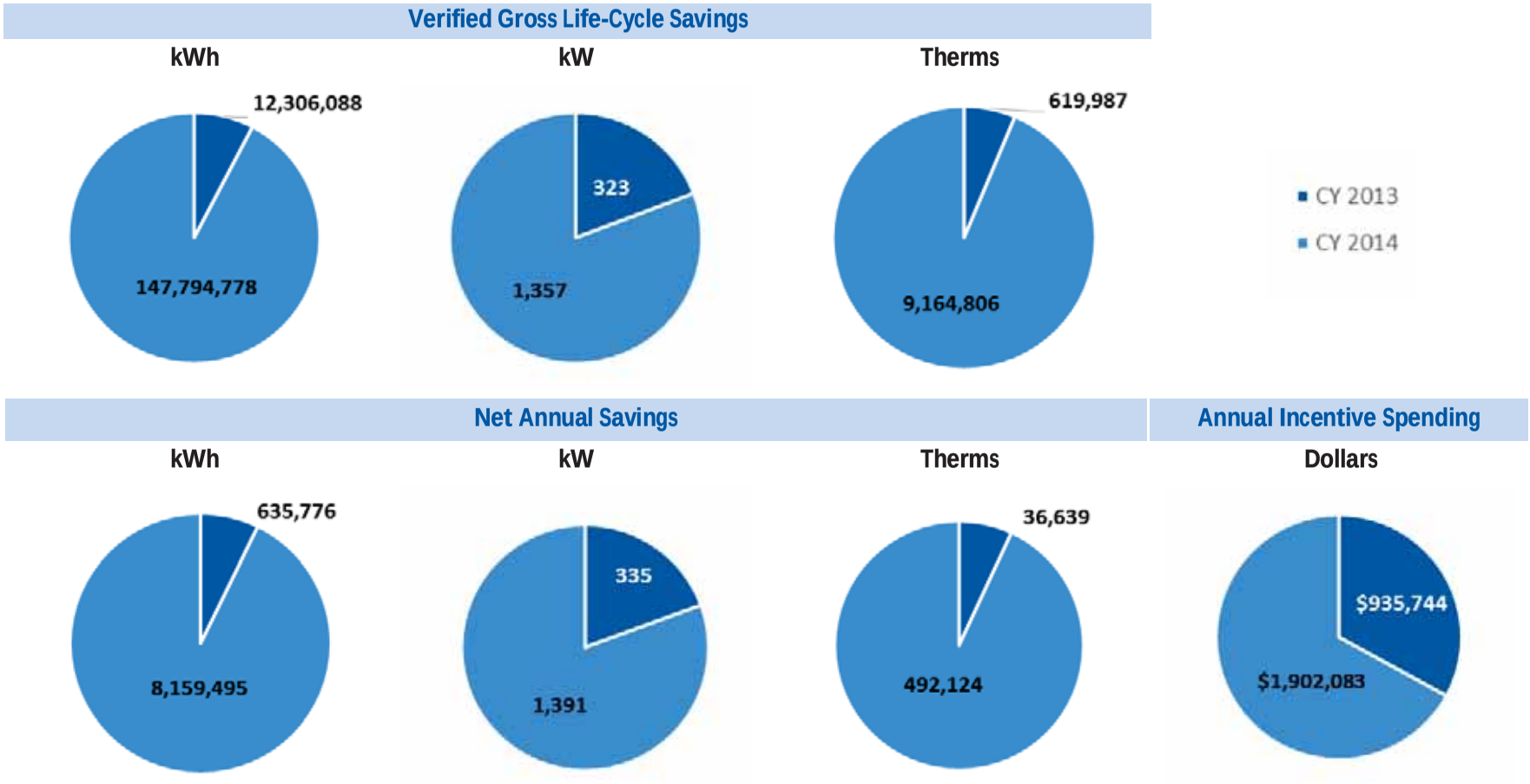
Table 147 shows a summary of the Renewable Energy Competitive Incentive Program's actual spending, savings, participation, and cost-effectiveness.

Table 147. RECIP Performance Summary

Item	Units	CY 2014 Actual Amount	CY 2013-2014 Actual Amount
Incentive Spending	$	1,902,083	2,837,827
Verified Gross Life-Cycle Savings	kWh	147,794,778	160,100,866
	kW	1,357	1,680
	Therms	9,164,806	9,784,793
Net Annual Savings	kWh	8,159,495	8,795,272
	kW	1,391	1,726
	Therms	492,124	528,763
Participation	Number of Participants	38	59
Cost-Effectiveness	Total Resource Cost Test: Benefit/Cost Ratio	1.84	1.55

Figure 49 shows a summary of savings and spending by year from CY 2013 through CY 2014.

Figure 49. RECIP Two-Year (CY 2013-2014) Savings and Spending Progress



Evaluation, Measurement, and Verification Approach

The Evaluation Team conducted an impact evaluation of the Program in CY 2014. Over the course of CY 2013 and CY 2014, it designed its EM&V approach to integrate multiple perspectives in assessing the RECIP performance. Table 148 lists the specific data collection activities and sample sizes used in the evaluations. More detailed information on the evaluation activities from previous years can be found in the CY 2012 and CY 2012 Volume II reports.

Table 148. RECIP Data Collection Activities and Sample Sizes

Activity	CY 2014 Sample Size (n)	CY 2013-2014 Sample Size (n)
Project Audit and On-Site Inspection[1]	0	11
Project Audit Only[2]	0	4
Participant Customer Surveys	0	7
Participant Trade Ally Interviews	0	6
Administrator and Implementer Interviews	0	5

[1] On-site inspections conducted in CY 2013 included 10 solar photovoltaic projects and one wind project.
[2] Project audits conducted in CY 2013 included three geothermal projects and one solar thermal project.

The CY 2013 evaluation report contains information regarding historical program evaluation activities.

CY 2014 Impact Evaluation Methodologies

To calculate CY 2014 gross savings, the Evaluation Team reviewed the reported installations in the tracking database and applied CY 2013 installation rates to all measures. To calculate CY 2014 net savings, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation.

Evaluation of Gross Savings

The Evaluation Team reviewed the tracking database and applied the most recent evaluation research conducted in CY 2013 to the gross savings. (See the Standard Evaluation Methods section for a detailed description of the tracking database review.)

The Evaluation Team did not find any duplicate entries during the database review for the Program and was able to match all savings, incentives, and quantities to reports pulled directly from SPECTRUM.

CY 2014 and Quadrennium Realization Rates

To calculate the total verified gross savings, the Evaluation Team applied measure-level realization rates to the savings of each measure group. Table 149 lists the total verified gross savings for the Program by measure type. Overall, the Program achieved an evaluated realization rate of 101% (Table 149).

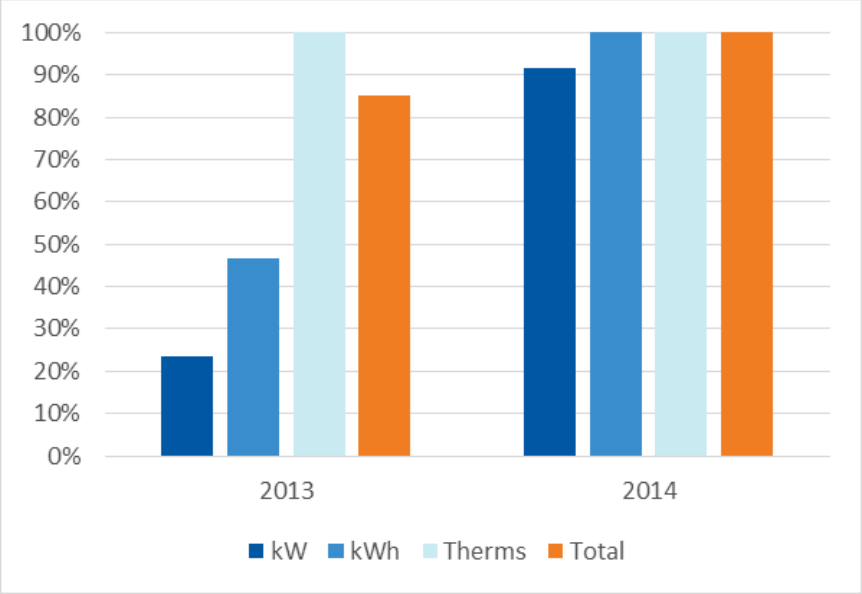
Table 149. CY 2014 RECIP Realization Rates by Measure Type

Measure Group	Realization Rate			
	kWh	kW	Therms	MMBtu
BIP Biogas	100%	100%	100%	100%
BIP Biomass	N/A	N/A	100%	100%
BIP Geothermal	N/A	N/A	174%	174%
BIP Solar Thermal	N/A	N/A	107%	107%
BIP Solar Photovoltaic	111%	82%	N/A	111%
LEU Biogas	100%	100%	100%	100%
LEU Solar Photovoltaic	111%	11%	N/A	111%
LEU Wind	100%	100%	N/A	100%
Total	**102%**	**92%**	**101%**	**101%**

Figure 50 shows the realization rates by fuel type across two calendar years. Changes in the realization rate between years were due to several factors. In CY 2013, solar thermal and geothermal measures offered under the Business Incentive Program resulted in negative electric energy savings, contributing to an overall low Program-level kWh realization rate. In CY 2014, the Program did not claim electric energy savings for these measures.

In CY 2013, the Evaluation Team verified that solar photovoltaic (Large Energy Users) and geothermal projects (Business Incentive) had significantly lower demand savings than estimated by the Program. In CY 2014, the Business Incentive Program did not claim demand savings for geothermal projects, and though there were some solar photovoltaic projects processed by Large Energy Users, these made up a smaller percentage of the total kW claimed. These two factors improved the CY 2014 kW realization rate.

Figure 50. CY 2011-2014 RECIP Realization Rate by Fuel Type



Two-Year Gross and Verified Savings Results

To calculate the total verified gross savings of the Program since its launch in CY 2013, the Evaluation Team applied measure-level realization rates to the reported savings of each measure group. Table 150 lists the total verified gross savings by measure type.

Table 150. CY 2013-2014 RECIP Annual Gross Verified Savings by Measure Type

Measure Group	kWh	kW	Therms	MMBTU	Percentage of Program
BIP Biogas	3,706,310	495	38,400	16,486	21%
BIP Biomass	0	0	36,057	3,606	5%
BIP Geothermal	-119,334	119	39,415	3,534	4%
BIP Solar Photovoltaic	1,859,984	550	0	6,346	8%
BIP Solar Thermal	-3,400	0	6,125	601	1%
BIP Wind	108,580	0	0	370	0%
LEU Biogas	2,625,912	424	389,900	47,950	60%
LEU Solar Photovoltaic	303,405	77	0	1,035	1%
LEU Wind	33,600	15	0	115	0%
Total	**8,515,058**	**1,680**	**509,897**	**80,043**	**100%**

Table 151 lists the combined *ex ante* and verified gross savings for RECIP from CY 2013 through CY 2014.

Table 151. RECIP CY 2014 and Two-Year Gross Savings Summary

Savings Type		*Ex Ante* Gross			Verified Gross		
		kWh	kW	Therms	kWh	kW	Therms
2014	Annual	7,749,555	1,479	471,528	7,901,966	1,357	474,565
	Life-Cycle	144,703,063	1,479	9,104,060	147,794,778	1,357	9,164,806
2013-2014	Annual	9,061,404	2,846	492,789	8,515,058	1,680	509,897
	Life-Cycle	170,707,039	2,846	9,479,345	160,100,866	1,680	9,784,793

Evaluation of Net Savings

For the RECIP, the Evaluation Team applied freeridership and spillover adjustments determined through the CY 2013 evaluation. In CY 2013, the Evaluation Team used the self-report and standard market practice approaches to determine the Program's freeridership level. Overall, the CY 2013 Program had 0% freeridership across all respondents.

Table 152 shows the Program-level freeridership and spillover ratios applied for CY 2014. The CY 2014 freeridership score represents the weighted average of the CY 2013 measure-level ratios, updated to reflect the CY 2014 measure mix.

Table 152. RECIP Freeridership and Spillover

Adjustment	CY 2014	CY 2013-2014
Freeridership Ratio	0.00	0.00
Spillover Ratio	0.04	0.04

CY 2014 and Quadrennium Net Savings Results

Table 153 shows the net energy impacts (kWh, kW, and therms) for the Program. The Evaluation Team attributed these savings net of what would have occurred without the Program.

Table 153. RECIP CY 2014 and Two-Year (CY 2013-2014) Net Savings Summary

Savings Type		Verified Net		
		kWh	KW	Therms
2014	Annual	8,159,495	1,391	492,124
	Life-Cycle	152,392,105	1,391	9,503,904
2013-2014	Annual	8,795,272	1,726	528,763
	Life-Cycle	165,153,518	1,726	10,146,830

Program Cost-Effectiveness

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

Table 154 lists the incentive costs from CY 2013 through CY 2014 for the Program.

Table 154. RECIP Incentive Costs

Costs	CY 2014	CY 2013-2014
Incentive Costs	$1,902,083	$2,837,827

The Evaluation Team found the CY 2014 Program to be cost-effective (a TRC benefit/cost ratio greater than 1). Table 155 lists the evaluated costs and benefits.

Table 155. RECIP Costs and Benefits

Cost and Benefit Category	CY 2014	CY 2013-2014
Costs		
Administration Costs	$42,466	$75,113
Delivery Costs	$173,406	$306,716
Incremental Measure Costs	$11,014,565	$13,885,453
Total Non-Incentive Costs	$11,230,437	$14,267,282
Benefits		
Electric Benefits	$8,768,100	$9,428,226
Gas Benefits	$7,505,011	$8,055,147
Emissions Benefits	$4,427,677	$4,653,224
Total TRC Benefits	$20,700,788	$22,136,597
Net TRC Benefits	**$9,470,351**	**$7,869,315**
TRC B/C Ratio	**1.84**	**1.55**