Final Annual Report
to the
Pennsylvania Public Utility Commission

For the Period
June 2013 through May 2014
Program Year 5

For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan

Prepared by ADM Associates, Tetra Tech MA, and West Penn Power Company

For

West Penn Power Company
Docket No. M-2012-2334398
November 17, 2014

This page intentionally left blank

Table of Contents

Acronyms

C&I	Commercial and Industrial
CFL	Compact Fluorescent Lamp
Phase II Verified	Verified/ Ex Post Cumulative Program/Portfolio Phase II Inception to Date
Phase II Reported	Reported/ Ex Ante Cumulative Program/Portfolio Phase II Inception to Date
Phase II+CO	Cumulative Program/Portfolio Phase II Inception to Date including Carry Over Savings from Phase I
DR	Demand Response
EDC	Electric Distribution Company
EE&C	Energy Efficiency and Conservation
EM&V	Evaluation, Measurement, and Verification
GNI	Government, Nonprofit, and Institutional
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light Emitting Diode
LEEP	Low-Income Energy Efficiency Program
LIURP	Low-Income Usage Reduction Program
M&V	Measurement and Verification
MW	Megawatt
MWh	Megawatt-hour
NTG	Net-to-Gross
PUC	Pennsylvania Public Utility Commission
PY5	Program Year 2013, from June 1, 2013 to May 31, 2014
PY6	Program Year 2014, from June 1, 2014 to May 31, 2015
PY7	Program Year 2015, from June 1, 2015 to May 31, 2016
PY8	Program Year 2016, from June 1, 2016 to May 31, 2017
PYX QX	Program Year X, Quarter X
PYTD	Program Year to Date
SEER	Seasonal Energy Efficiency Rating
SWE	Statewide Evaluator
TRC	Total Resource Cost
TRM	Technical Reference Manual

Report Definitions

Note: Definitions provided in this section are limited to terms that are critical to understanding the values presented in this report. For other definitions, please refer to the Act 129 glossary in Appendix E.

REPORTING PERIODS

Phase I

Refers to the Act 129 programs implemented prior to June 1, 2013. Phase I carryover references verified gross Phase I savings in excess of Act 129 Phase I targets.

Phase II

Refers to the period of time from the start of Phase II Act 129 programs on June 1, 2013 through May 31, 2016. Phase II savings are calculated by totaling all program year results, including the current program year-to-date results and subtracting any Phase II savings that expired during the current program year. For example, Phase II results for PY7 Q3 is the sum of PY5, PY6, PY7 Q1, PY7 Q2, and PY7 Q3 results, minus any Phase II savings that expired during PY5, PY6 or PY7.

Program Year-to-Date (PYTD)

Refers to the current reporting program year only. Activities occurring during previous program years are not included. For example, PYTD results for PY7 Q3 will include only results that occurred during PY7 Q1, PY7 Q2, and PY7 Q3; they will not include results from PY5 or PY6.

SAVINGS TYPES

Preliminary

Qualifier used in all reports, except the final annual report, to signify that evaluations are still in progress and that results have not been finalized. Most often used with realization rate or verified gross savings.

Reported Gross

Refers to results of the program or portfolio, determined by the program administrator (e.g., the electric distribution company [EDC] or the program implementer). Also known as ex ante, or "before the fact" savings (using the annual evaluation activities as the reference point for the post period).

Adjusted Ex Ante Gross

References to Adjusted Ex Ante Gross (or Adjusted Ex Ante) savings in this report refer to reported gross savings from the EDC's tracking system that have been adjusted, where necessary, to reflect differences between the methods used to record and track savings and the methods in the Technical Reference Manual (TRM), or to correct data capture errors. These corrections are made to the population, prior to EM&V activities. The adjusted ex ante gross savings are then verified through EM&V activities.

Verified Gross

Refers to the verified gross savings results of the program or portfolio determined by the evaluation activities. Also known as ex post, or "after the fact" savings (using the annual evaluation activities as the reference point for the post period).

TOTAL RESOURCE COST COMPONENTS[1]

Administration, Management, and Technical Assistance Costs

Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.

EDC Costs

Per the Pennsylvania PUC 2013 Total Resource Cost (TRC) Test Order, the total EDC costs refer to EDC-incurred expenditures only. This includes, but is not limited to, administration, management, technical assistance, design & development of EE&C Plans and programs, marketing, evaluation, and incentives.

Participant Costs

Participant Costs as defined by the 2013 Total Resource Cost Test Order.

Total TRC Costs

Total TRC Costs as defined by the 2013 Total Resource Cost Test Order.

Total TRC Benefits

Benefits as defined by the 2013 Total Resource Cost Test Order.

[1] All Total Resource Cost definitions are subject to the Pennsylvania PUC 2013 Total Resource Cost Test Order.

1 Overview of Portfolio

Pennsylvania Act 129 of 2008, which was signed on October 15, 2008, mandated energy savings and demand reduction goals for the largest electric distribution companies (EDCs) in Pennsylvania for Phase I (2008 through 2013). In 2009, each EDC submitted energy efficiency and conservation (EE&C) plans pursuant to these goals, which were approved by the Pennsylvania Public Utility Commission (PUC). Each EDC filed new EE&C plans with the PUC in 2012 for Phase II (June 2013 through May 2016) of the Act 129 programs. These plans were approved by the PUC in 2013.

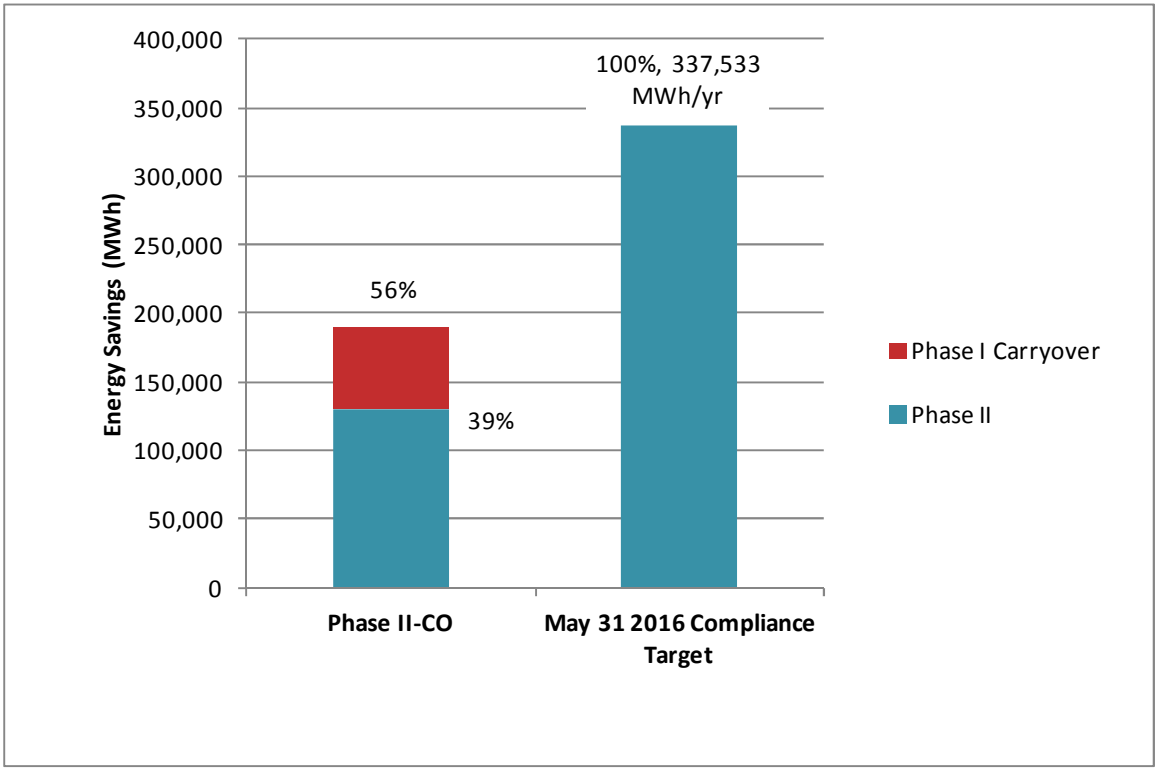
Implementation of Phase II Act 129 programs began June 1, 2013. This report documents the progress and effectiveness of the Phase II EE&C accomplishments for West Penn Power Company (West Penn Power or Company) in Program Year 2014 (PY5), defined as June 1, 2013 through May 31, 2014, as well as the cumulative accomplishments of the programs since inception of Phase II. This report additionally documents the energy savings carried over from Phase I. The Phase I carry-over savings count toward EDC savings compliance targets for Phase II.

The Company's EM&V contractor, ADM Associates, evaluated the programs, which included measurement and verification of the savings.

1.1 Summary of Progress Toward Compliance Targets

West Penn Power has achieved 56 percent of the energy savings compliance target, based on cumulative portfolio Phase II inception to date including carryover savings from Phase I ("Phase II+CO") verified gross energy savings, as shown in Figure 1-1.

Figure 1-1: Cumulative Portfolio Phase II Inception to Date Verified Gross Energy Impacts



According to the Phase II Implementation Order, West Penn Power is allowed by the PUC to "carry over" into Phase II the Phase I verified energy savings that exceeded the Phase I compliance target. Table 1-1 shows how many MWh/yr of savings from Phase I West Penn Power is carrying over into Phase II.

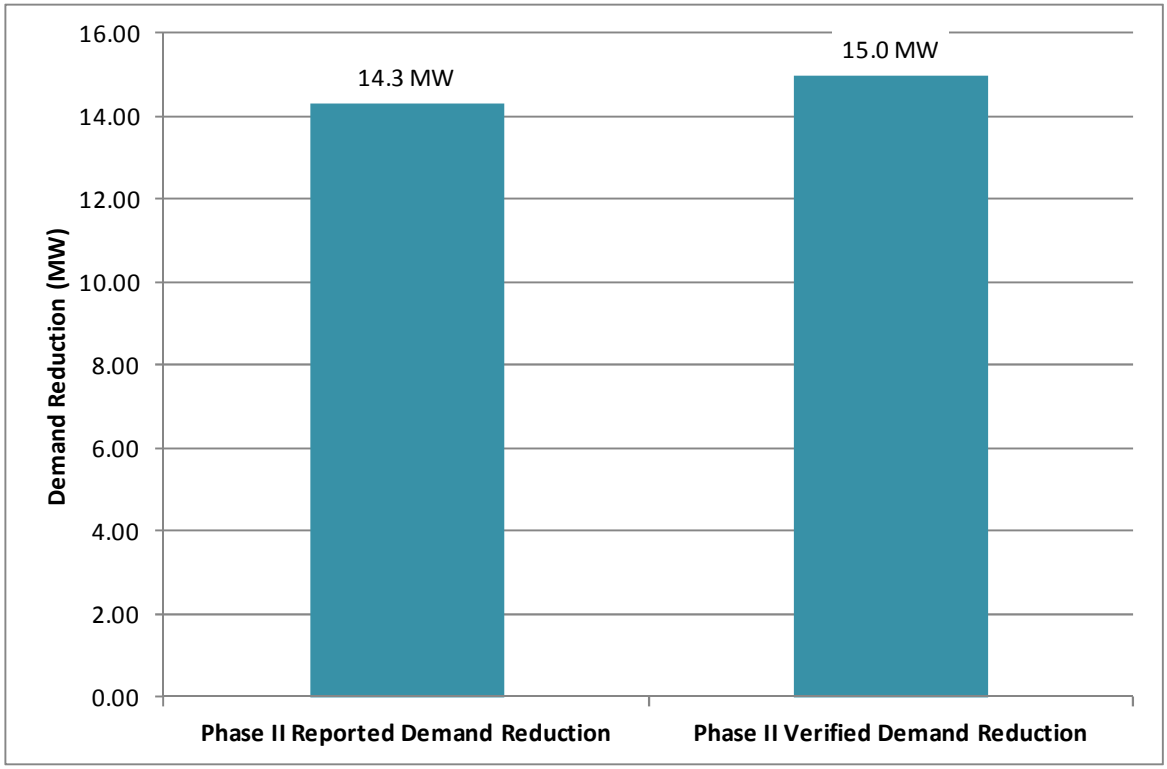
Table 1-1: Savings from PY4 Carried Into Phase II

Sector	Phase II Verified Savings (MWh/Yr)	Verified Savings Carried Over from Phase 1 (MWh/Yr)	Phase II+CO Verified Savings (MWh/Yr)
Residential	95,919	0	95,919
Commercial and Industrial	28,540	0	28,540
GNI	5,978	59,929	65,907
Total	130,437	59,929	190,366

West Penn Power has achieved 15.0 MW of gross verified demand reduction during Program Year 5[2].

[2] Unlike Phase I, there is no compliance target for demand reduction in Phase II.

Figure 1-2: Phase II Portfolio Reported and Verified Demand Reduction



There are 6 broad measure groups available at no cost to low-income customers, out of a total of 40 broad measure groups. As such, these measures offered to the low-income sector comprise 15 percent of the total measures offered. As required by the Phase II goal, this exceeds the fraction of the electric consumption of the utility's low-income households divided by the total electricity consumption in the West Penn Power territory (10.6 percent).[3] The Phase II verified gross energy savings achieved through programs specifically designed for income-eligible customers are 1,722 MWh/yr and 12,018 through other programs[4]; this collectively is 90 percent against the 4.5% Phase II total portfolio verified gross energy savings target for the low-income sector. These values are shown in Table 1-2 and Table 1-3 below.

[3] Act 129 includes a provision requiring electric distribution companies to offer a number of energy efficiency measures to low-income households that are "proportionate to those households' share of the total energy usage in the service territory." 66 Pa.C.S. §2806.1(b)(i)(G).

[4] A discussion of Low Income participation in other residential programs has been included in Appendix C.

Table 1-2: Low-Income Sector Compliance (Number of Measures)

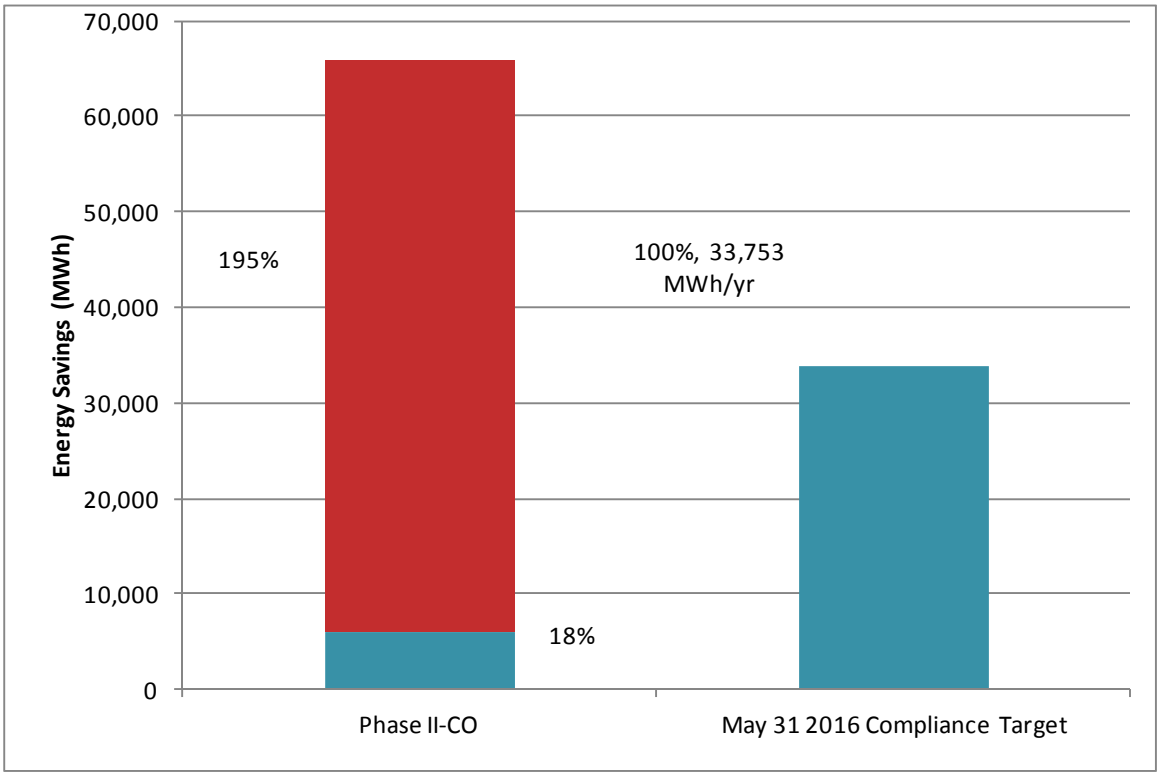
	Low-Income Sector	All Sectors	% Low-Income	Goal
# of Measures Offered	6	40	15%	10.2%

Table 1-3: Low-Income Sector Compliance (Percentage of Savings)

	Low Income Verified Savings from Low Income Programs (MWh/Yr)	Low Income Verified Savings from Other Residential Programs (MWh/Yr)	All Low Income Verified Savings	Progress Towards Low Income Goal	Goal
Phase II Verified Gross Energy Savings	1,722	12,018	13,739	90%	4.50%

West Penn Power achieved 195 percent of the May 31, 2016 energy reduction compliance target for the government, nonprofit, and institutional sector based on cumulative program/portfolio savings from Phase II+CO achieved from the inception of Phase II through Program Year 5 and including carry-over savings from Phase I as shown in Figure 1-3 below.

Figure 1-3: Government, Nonprofit, and Institutional Sector Phase II Verified Energy Impacts



A summary of number of participants, Phase II verified gross energy savings (MWh/Yr), Phase II demand reduction (MW), and incentives paid ($1,000) by sector are shown in Table 1-4.

Table 1-4: Summary of Phase II Performance by Sector

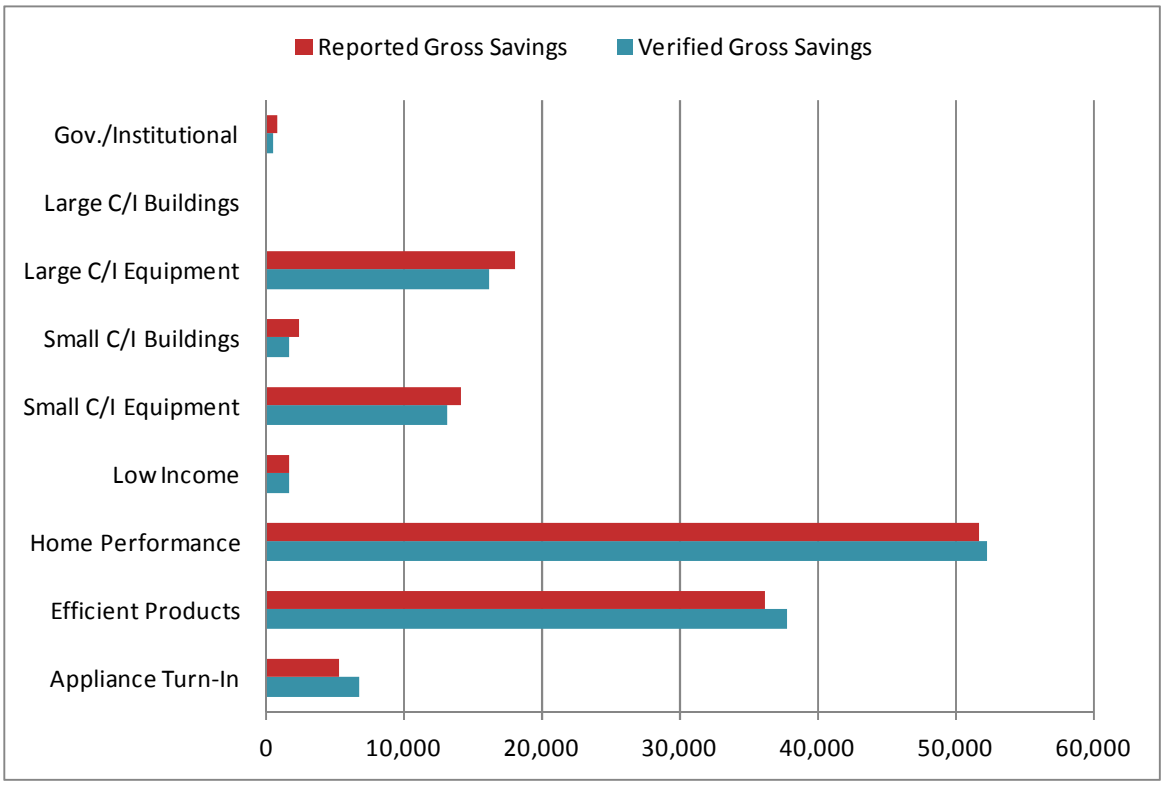
Sector	Participants	Phase II Gross Verified Energy Savings (MWh/yr)	Phase II Gross Verified Demand Reduction (MW)	Incentives ($1,000)
Residential	457,704	94,198	9.89	3,262
Low-Income[5]	5,615	1,722	0	0
Small Commercial and Industrial	2,808	15,465	2.26	809
Large Commercial and Industrial	47	13,075	1.84	713
Government, Nonprofit, and Institutional	267	5,978	0.87	338
Program Year 5 Total	466,441	130,437	14.98	5,122
Phase II Total	466,441	130,437	14.98	5,122

[5] Only includes participation in low income programs, but does not include verified savings from participation in other Residential programs.

1.2 Summary of Energy Impacts

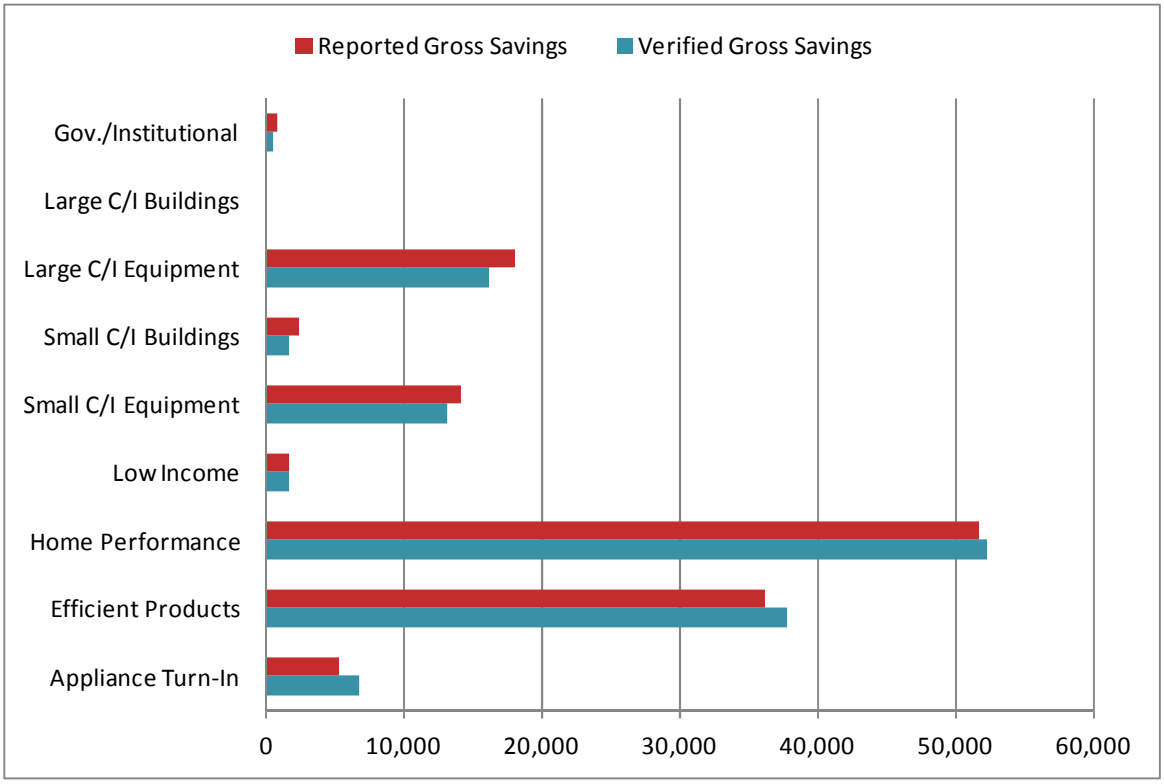
A summary of the reported and verified energy savings by program for Program Year 5 is presented in Figure 1-4.

Figure 1-4: PYTD Reported and Verified Gross Energy Savings by Program (MWh/ yr)



A summary of the Phase II reported and verified energy savings by program is presented in Figure 1-5.

Figure 1-5: Phase II Reported and Verified Gross Energy Savings by Program (MWh/ yr)



Summaries of energy impacts by program through Program Year 5 are presented in Table 1-5 and Table 1-6.

Table 1-5: Reported Participation and Gross Energy Savings by Program

Program	Participants		Reported Gross Impact (MWh/Yr)	
	PYTD	Phase II	PYTD	Phase II
Appliance Turn-In	7,259	7,259	5,346	5,346
Efficient Products	244,904	244,904	36,250	36,250
Home Performance	205,541	205,541	51,667	51,667
Low Income	5,615	5,615	1,792	1,792
Small C/I Equipment	401	401	14,187	14,187
Small C/I Buildings	2,621	2,621	2,512	2,512
Large C/I Equipment	83	83	18,125	18,125
Large C/I Buildings	0	0	0	0
Gov./Institutional	17	17	833	833
Total Portfolio	466,441	466,441	130,712	130,712

Table 1-6: Verified Gross Energy Savings by Program

Program	PYTD Reported Gross Energy Savings (MWh/Year)	PYTD Energy Realization Rate	PYTD Verified Gross Energy Savings (MWh/Year)	PYTD Achieved Precision[1]	Phase II Verified Gross Energy Savings (MWh/Year)	Phase II Achieved Precision[2]
Appliance Turn-In	5,346	128.4%	6,864	8.3%	6,864	9.5%
Efficient Products	36,250	104.3%	37,800	0.9%	37,800	1.0%
Home Performance*	51,667	101.1%	52,260	11.4%	52,260	13.1%
Low Income	1,792	96.1%	1,722	6.0%	1,722	6.9%
Small C/I Equipment	14,187	92.8%	13,165	13.5%	13,165	15.4%
Small C/I Buildings	2,512	67.6%	1,698	14.3%	1,698	16.4%
Large C/I Equipment	18,125	90.0%	16,319	13.8%	16,319	15.9%
Large C/I Buildings	0	n/a	0	0.0%	0	0.0%
Gov./Institutional	833	73.2%	610	9.1%	610	10.5%
TOTAL PORTFOLIO	130,712	99.8%	130,437	5.1%	130,437	5.8%
Phase 1 Carryover	59,929	n/a	59,929	n/a	59,929	n/a
Total Ph II+CO	190,641	n/a	190,366	n/a	190,366	4.0%

***The impacts for the Home Performance program include the impacts of the Home Energy Reports program component, which have a one-year measure life. For this program component, only impacts from PY7 will toward the compliance targets.

1.3 Summary of Fuel Switching Impacts

Per Commission Order, the EDCs are to report on the amount of electric to non-electric fuel switching in their annual reports. The following measure categories are those the Fuel Switching working group identified as potential "fuel switching measures":

- Water Heating
- Heating and Air Conditioning
- Clothes Drying
- Combined Heat and Power Distributed Generation
- Residential Micro Combined Heat and Power.

Solar Water Heaters are the only electric to non-electric fuel switching measure offered in the Company's approved EE&C Plan for the residential sector. No solar water heaters were rebated in PY5. Absorption chillers and combined heat and power projects may also be eligible under the approved commercial and industrial equipment programs, but no associated rebate applications were approved in PY5.

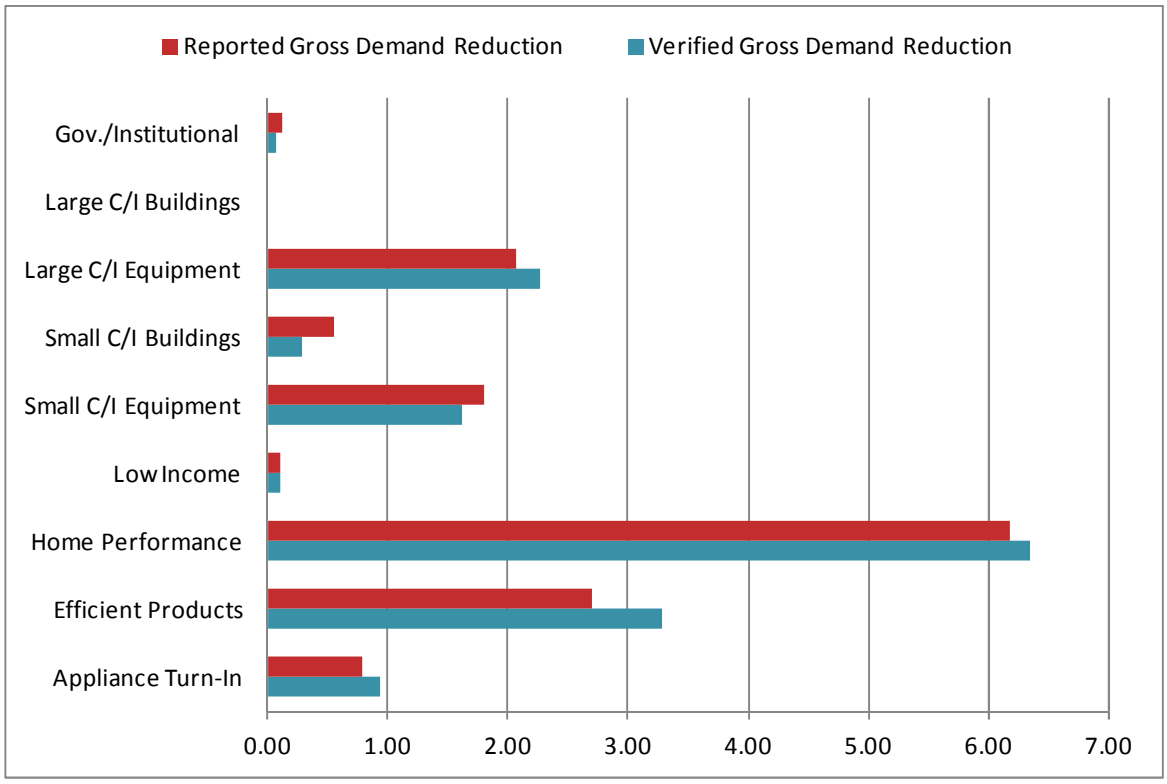
Measures that could possibly involve non-electric to electric fuel switching are Water Heating, Heating and Air Conditioning and Clothes Drying. The Company only provides incentives under its EE&C Plan for the purchase and installation of efficient electric heat pump water heaters and heat pumps which could involve customers switching from non-electric to electric technologies. The following summarizes participant responses to questions related to natural gas availability and possible non-electric to electric fuel switching during PY5:

- The reported availability of natural gas was limited for the heat pump water heater and heat pump HVAC participants.
- Of 103 participants who purchased heat pump water heaters, 3 reported replacing a gas water heater.
- Of 565 participants who purchased heat pumps, 17 reported replacing a gas furnace.

1.4 Summary of Demand Impacts

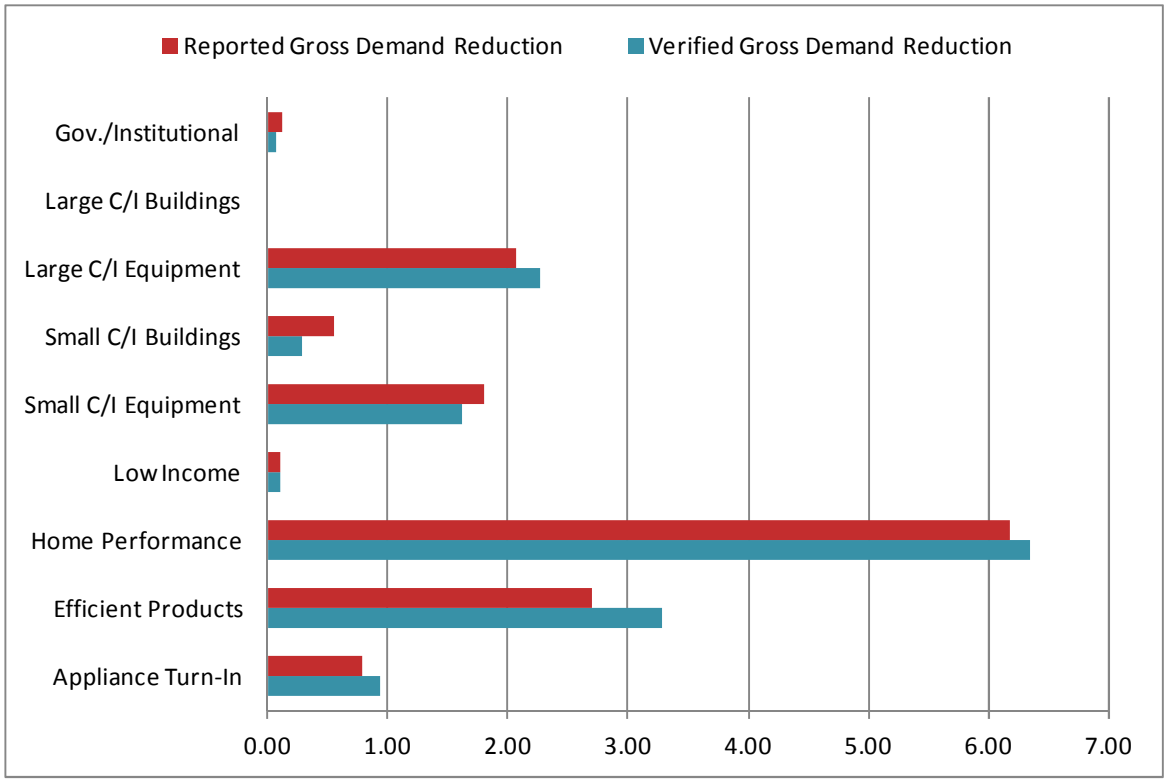
A summary of the reported and verified demand reduction by program for Program Year 5 is presented in Figure 1-6. The impacts below reflect the line loss factors shown in Table 1-11.

Figure 1-6: PYTD Reported and Verified Demand Reduction by Program



A summary of the cumulative reported and verified demand reduction by program is presented in Figure 1-7.

Figure 1-7: Phase II Reported and Verified Demand Reduction by Program



A summary of demand reduction impacts by program through Program Year 5 is presented in Table 1-7 and Table 1-8.

Table 1-7: Reported Participation and Gross Demand Reduction by Program

Program	Participants		Reported Gross Impact (MW)	
	PYTD	Phase II	PYTD	Phase II
Appliance Turn-In	7,259	7,259	0.78	0.78
Efficient Products	244,904	244,904	2.70	2.70
Home Performance	205,541	205,541	6.17	6.17
Low Income	5,615	5,615	0.11	0.11
Small C/I Equipment	401	401	1.81	1.81
Small C/I Buildings	2,621	2,621	0.55	0.55
Large C/I Equipment	83	83	2.06	2.06
Large C/I Buildings	0	0	0.00	0.00
Gov./Institutional	17	17	0.12	0.12
Total Portfolio	466,441	466,441	14.31	14.31

Table 1-8: Verified Gross Demand Reduction by Program

Program	PYTD Reported Gross Demand Savings (MW)	PYTD Demand Realization Rate	PYTD Verified Gross Demand Savings (MW)	PYTD Achieved Precision[1]	Phase II Verified Gross Demand Savings (MW)	Phase II Achieved Precision[2]
Appliance Turn-In	0.78	120.3%	0.94	7.2%	0.94	8.3%
Efficient Products	2.70	121.6%	3.29	3.6%	3.29	4.1%
Home Performance	6.17	102.8%	6.34	13.0%	6.34	14.9%
Low Income	0.11	98.2%	0.11	7.0%	0.11	8.1%
Small C/I Equipment	1.81	92.1%	1.66	12.6%	1.66	14.4%
Small C/I Buildings	0.55	52.2%	0.29	14.3%	0.29	16.4%
Large C/I Equipment	2.06	110.1%	2.27	14.6%	2.27	16.8%
Large C/I Buildings	0.00	n/a	0.00	0.0%	0.00	0.0%
Gov./Institutional	0.12	64.0%	0.08	9.0%	0.08	10.3%
TOTAL PORTFOLIO	14.31	104.7%	14.98	6.2%	14.98	7.1%
Phase 1 Carryover	n/a	n/a	n/a	n/a	n/a	n/a
Total Ph II+CO	14.31	104.7%	14.98	6.2%	14.98	7.1%
[1] At the 85% confidence level						
[2] At the 90% confidence level						

1.5 Summary of Program Year 5 Net-to-Gross Ratios

Per the 2013 TRC Order, EDCs are required to conduct net-to-gross (NTG) research. NTG ratios are not applied to gross savings and are not used for compliance purposes, but are used for cost effectiveness reporting and future program planning purposes. Table 1-9 presents a summary of NTG ratios by program. NTG reporting is not an annual requirement. ADM and Tetra Tech conducted a needs assessment and determined that NTG research should begin in PY6 rather than in PY5. The decision is motivated by the fact that, in the nonresidential sector, the Companies contracted with a new implementation conservation service provider (ICSP) at the start of Phase II. To develop an informative, forward looking NTG analysis, it would be prudent to wait until sufficient Phase II applications initiated and processed by the new ICSP are available for sampling. The residential offerings, on the other hand, have not changed in a significant manner. As such the NTG results from Phase I are still applicable for PY5. West Penn Power's evaluation contractor has begun NTG research in both the residential and nonresidential sectors, and will report results for most program components in PY6.

Table 1-9: Program Year 5 NTG Ratios by Program

Program Name	Free Ridership	Spillover	NTG Ratio Program Year 5	NTG Categories Included[6]
All Programs	n/a	n/a	n/a	n/a
(weighted by program savings for Programs reporting NTG Ratios)	n/a	n/a	n/a	n/a

[6] For example, free-ridership, nonparticipant spillover, and participant spillover.

1.6 Summary of Portfolio Finances and Cost-Effectiveness

A breakdown of the portfolio finances is presented in Table 1-10.

Table 1-10: Summary of Portfolio Finances

	Actual PYTD Costs ($1,000)	Actual Phase II Costs ($1,000)
EDC Incentives to Participants	$5,122	$5,122
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$5,122**	**$5,122**
Design & Development	$109	$109
Administration, Management, and Technical Assistance[1]	$11,632	$11,632
Marketing[2]	$1,051	$1,051
Subtotal EDC Implementation Costs	**$12,792**	**$12,792**
EDC Evaluation Costs	$181	$181
SWE Audit Costs	$750	$750
Total EDC Costs[3]	**$18,846**	**$18,846**
Participant Costs[4]	$16,077	$16,077
Total NPV TRC Costs[5]	$29,800	$29,800
Total NPV Lifetime Energy Benefits	$41,666	$41,666
Total NPV Lifetime Capacity Benefits	$4,694	$4,694
Total NPV TRC Benefits[6]	$46,360	$46,360
TRC Benefit-Cost Ratio[7]	**1.56**	**1.56**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

1.7 Summary of Cost-Effectiveness by Program

TRC benefit-cost ratios are calculated by comparing the total NPV TRC benefits and the total NPV TRC costs. Table 1-11 shows the TRC ratios by program and other key factors used in the TRC ratio calculation for Phase II programs.

Table 1-11: PYTD TRC Ratios by Program

Program	TRC NPV Benefits ($1000)	TRC NPV Costs ($1000)	TRC Benefit-Cost Ratio	Discount Rate	Energy Line Loss Factor	Demand Line Loss Factor
Appliance Turn-In	2,964	1,328	2.23	9.15%	9.10%	9.10%
Efficient Products	15,857	6,012	2.64	9.15%	9.10%	9.10%
Home Performance	7,722	6,910	1.12	9.15%	9.10%	9.10%
Low Income	667	1,828	0.37	9.15%	9.10%	9.10%
Small C/I Equipment	8,238	7,752	1.06	9.15%	9.10%	9.10%
Small C/I Buildings	514	609	0.84	9.15%	9.10%	9.10%
Large C/I Equipment	10,141	4,379	2.32	9.15%	7.90%	7.90%
Large C/I Buildings	0	189	0.00	9.15%	7.90%	7.90%
Gov./Institutional	256	794	0.32	9.15%	9.10%	9.10%
Total Portfolio	46,360	29,800	1.56	9.15%	8.84%	8.81%

1.8 Comparison of Program Year 5 Performance to Approved EE&C Plan

Table 1-12 below shows Program Year 5 expenditures compared to the budget estimates set forth in the EE&C plan.

Table 1-12: Comparison of Program Expenditures to EE&C Plan

Program	Budget from EE&C Plan	Actual Expenditures	% Difference from EE&C Plan [(Actual – Planned)/Planned]
Appliance Turn-In	$1,526,052	$1,327,968	-13%
Efficient Products	$3,781,969	$3,774,723	0%
Home Performance	$4,787,839	$6,428,740	34%
Low Income	$2,400,585	$1,827,786	-24%
Small C/I Equipment	$4,520,404	$2,613,980	-42%
Small C/I Buildings	$1,867,784	$659,962	-65%
Large C/I Equipment	$2,361,182	$1,458,951	-38%
Large C/I Buildings	$1,326,916	$188,613	-86%
Gov./Institutional	$979,819	$565,076	-42%
Total Portfolio	$23,552,549	$18,845,799	-20%

Table 1-13 show Program Year 5 program savings compare to the energy and demand savings estimates filed in the EE&C plan.

Table 1-13: Comparison of Actual Program Savings to EE&C Plan

Program	MWh Savings Projected in EE&C Plan	Actual Reported MWh Savings	% Difference [(Actual – Planned)/Planned]	MW Savings Projected in EE&C Plan	Actual Reported MW Savings	% Difference [(Actual – Planned)/Planned]
Appliance Turn-In	5,567	5,346	-4%	0.58	0.78	34%
Efficient Products	23,347	36,250	55%	0.85	2.70	219%
Home Performance	21,748	51,667	138%	1.87	6.17	229%
Low Income	1,426	1,792	26%	0.37	0.11	-70%
Small C/I Equipment	24,996	14,187	-43%	3.02	1.81	-40%
Small C/I Buildings	6,751	2,512	-63%	0.82	0.55	-33%
Large C/I Equipment	23,232	18,125	-22%	3.09	2.06	-33%
Large C/I Buildings	7,641	0	-100%	0.81	0.00	-100%
Gov./Institutional	1,372	833	-39%	0.16	0.12	-27%
Total Portfolio	116,080	130,712	13%	11.59	14.31	23%

In general, the residential programs are exceeding the Plan MWh savings assumptions, while the nonresidential programs were short of the targeted budget and savings assumptions as of the end of PY5. The residential programs were relatively straightforward when transitioning into Phase II because the program designs, at the component level, are nearly identical to the programs as operated in PY4 of Phase I. Furthermore, the ICSPs were unchanged from PY4. As a result, the residential programs continued their strong performance with relatively little transition and ramp up. On the other hand, the nonresidential sector experienced a slow Q1 and Q2, but ramped up the implementation rate significantly in Q3 and achieved much of the PY5 savings in Q4. The relatively low implementation rate during Q1 and Q2 is primarily accounted for by a change in the ICSP and the fact that many projects that would ordinarily have been approved and processed in the first and second quarter of PY5 were reported as Phase I savings due to project installation dates. The Phase II programs therefore started with a much lower volume of pending applications than in previous years. As of this writing, the implementation rate in the nonresidential sector exceeds the design rate in the EE&C plan. Of the nonresidential programs, the efficient equipment programs are the most significant, and they have been the first to ramp up to full capacity. The Efficient Buildings programs involve high capital cost and complex or time intensive projects such as new construction, retro-commissioning, and extensive envelope improvements. Programs targeting higher capital cost and complex projects generally require much more marketing, trade ally education, and M&V coordination per unit of MWh savings, as well as much longer time frames, and as such have been slower to scale to full capacity.

Program level TRCs are generally tracking at or above expectations in the EE&C plans.

1.9 Portfolio Level/Cross-cutting Process Evaluation Summary for Program Year 5

As with Net-to-Gross evaluation, a process evaluation is planned for each program during Phase II. After an initial assessment conducted in October 2013, the evaluation team decided that most process evaluation activities should start in PY6. The decision is motivated by the fact that, in the nonresidential sector, the Companies contracted with a new implementation ICSP at the start of Phase II. To develop an informative, forward looking process evaluation, it would be prudent to wait until there are sufficient Phase II applications available from the new ICSP to sample. The residential offerings, on the other hand, have not changed in a significant manner. As such, the process results from Phase I are still considered applicable for PY5.

For many programs, the evaluation team includes process-evaluation related questions in customer surveys that are used primarily for gross impact evaluation. One general theme from the PY5 surveys is that the initial in-service rate for CFLs is lower than in past years. Although the primary reason cited for not yet having installed CFLs continues to be that the customer is waiting for other lamps to burn out, another reason is that the customer already has CFLs. In open-ended answers to survey questions, customers are also increasingly citing the need for dimmable light sources. Based on this feedback, the Company will consider reducing the number of general service CFLs provided directly, with possible replacement by other lighting types such as LEDs or dimmable CFLs.

2 Energy Efficient Products Program

Through the Residential Energy Efficient Products Program, customers receive incentives for installing ENERGY STAR® qualified appliances, energy efficient HVAC equipment, and energy efficient water heaters. The program also provides incentives to retailers for point of sale price cuts for customers purchasing energy efficient light bulbs. Qualifying appliances include items such as clothes washers, dehumidifiers, and refrigerators. HVAC equipment qualifying as part of the program include central air conditioners, air source heat pumps, ground source heat pumps, and mini-split heat pumps. The program also provides incentives to customers for the maintenance (tune-ups) of existing HVAC equipment. Water heaters rebated under the program include heat pump water heaters and solar water heaters.

2.1 Program Updates

During PY5, the consumer electronics component was added to the Residential Energy Efficient Products Program. Through this program component, retailers are paid incentives to promote and sell ENERGY STAR® qualified televisions, energy efficient computers, and other efficient office equipment to customers. The HVAC program component was a standalone program in Phase I, but has been subsumed into the Energy Efficient Products Program in Phase II.

2.1.1 Definition of Participant

The count of participants differs from the count of measures for this program. The participant count is the count of unique account numbers in the PY5 tracking and reporting data. The measure count typically exceeds the participant count as some participants complete multiple qualifying measures.

2.2 Impact Evaluation Gross Savings

The program can be broadly divided in five components: Upstream Lighting, Upstream Electronics, Efficient HVAC Equipment, HVAC Tune-Ups, and Energy Star Appliances. The details of the methodologies are described in the subsections below.

Gross Impact Evaluation for Upstream Products

The lighting and consumer electronics program components are similar in structure. Both program components provide retailers incentives for point of sale purchases on energy efficient products. The efficient lighting products are discounted to the customers, while consumer electronics are not required to be discounted to the customers by program design. From a gross impact evaluation perspective, the salient shared characteristic between the two program components is that customer contact information is not available.

The similar nature of these programs allows for a similar evaluation approach for consumer electronics and efficient lighting products. The following verification elements were applied to these two program components:

Review of Sales Invoices

ADM conducted a review and obtained invoices for the CFLs, LEDs, LED holiday lights, desktop computers, smart strips, monitors, and televisions sold by participating retailers. These invoices are matched to the tracking and reporting (T&R) system to confirm proper counts and characteristics of the lighting and consumer electronic equipment. A few discrepancies were discovered, and they related to incentive amounts rather than quantities or types of equipment. In a few cases, paid incentive amounts in the invoices were not entered into the T&R system. ADM shared the findings with the Company in advance of the annual report and, and the Company confirmed that the T&R system is not the official system of record keeping for incentives or other financial information, so the few cases of missing or mismatching incentive amounts did not affect any aspect of reporting.

General Review of Tracking and Reporting System

ADM reviewed of the T&R system to assure there are no duplicate entries and that all equipment model types are eligible for being counted toward PY5 achievements based on sales dates.

Detailed Review of CSP Energy Savings and Demand Reduction Calculations for Lighting Products

In early PY5, ADM developed an *ex ante* wattage equivalency map for use by the ICSP. The wattage equivalency was not make/model specific, but was rather designed to facilitate accurate if somewhat conservative, reporting of MWh and MW impacts for the upstream program.
To calculate verified impacts, ADM developed a make/model specific wattage equivalency map. This map includes 2040 separate make/model descriptions[7]. For each unique stock keeping unit (SKU) description, ADM determined the lamp type as one of the following:

General Service.
Reflector (with subcategories having different lumen to baseline wattage mappings),
Globe,
Decorative,
3-Way,
LED Holiday Lights

For each category, the baseline wattage was determined, according to the TRM, as a function of the efficient lamp's lumen output. With the baseline and efficient watts determined, the impacts for all

[7] The large number is partially due to the comprehensiveness of the program, but is also due to alternate descriptions for the exact same product (for example, an EDC name or associated acronym may be added on as a prefix to the general SKU description).

lamps are determined through TRM algorithms. Cross sector sales adjustments apply to residential lighting. Cross-sector sales determination and the associated adjustments to verified impacts and incentives are discussed in detail in Appendix D.

Detailed Review of CSP Energy Savings and Demand Reduction Calculations for Upstream Electronics

ADM reviewed upstream electronics manufacturer names and model numbers to verify that the models are in the ENERGY STAR® database and to check the ENERGY STAR tier. In the 2013 TRM, the diagonal screen size is a key parameter in the partially deemed savings algorithm for televisions. ADM verified the diagonal screen size and calculated TRM-specified energy and demand impacts, accordingly. The approximate 10% variance between reported and verified impacts is attributed to differences between the actual and assumed diagonal screen size distributions.

Gross Impact Evaluation for Appliances

The gross impact evaluation for appliances includes the following components:

Invoice and Application Review

ADM obtained invoices and applications from the Company. For each application, ADM verified that the manufacturer name and model number in the T&R system matches those on the invoice and rebate application. In general, the all sampled appliances were matched to the qualifying ENERGY STAR® product lists[8]. ADM independently retrieved the attributes necessary for TRM calculations from the ENERGY STAR® database. In certain cases, the make or model numbers were entered in with minor typographic errors or with missing or inserted dashes, spaces, or other delimiting characters. Such occurrences do not pose an evaluation difficulty as ADM concentrates the verification effort on a random sample of rebated appliances, rather than the entirety of the database.

Customer Verification Surveys

ADM performed telephone surveys on a random sample of customers selected from the T&R data. All contacted customers verified that they have purchased and installed the stated appliances. The telephone surveys are also an opportunity to collect additional data that are exclusive to the T&R system. For example, the water heat and clothes dryer fuel types are determined through customer surveys for clothes washers.

Review of Energy Savings and Demand Reduction Calculations

For appliance measures with partially deemed TRM protocols, the T&R system calculated impacts with one savings scenario rather than with specific scenarios that occur in measure implementation. For example, market average values for capacity, efficiency, are used rather than appliance-specific values.

[8] The only exception involved one water heater for West Penn Power, which was found to be a standard efficiency model.

For clothes washers, TRM default fractions of electric water heating and clothes drying are used. In general, the per-unit savings reported by the ICSP are rather conservative (the assumed average efficiency levels or capacities are lower than actual average values), although savings for some measures, such as room air conditioners and dehumidifiers are reported with 2012 TRM protocols and thus overstate savings. For all reviewed records, ADM used site-specific attributes to calculate "On-TRM" impacts.

Gross Impact for Evaluation HVAC Equipment and Tune-Ups

The gross impact evaluation approach for HVAC equipment is similar to that of appliances. The process involves invoice and application reviews, telephone verification surveys, and independent TRM-specific gross impact calculations for sampled items. The three activities are described in more detail below.

Invoice and Application Review

ADM obtained invoices and applications from the Company. For each application, ADM verified that the manufacturer name and model number in the T&R system matches those on the invoice and rebate application. In general, the sampled equipment were verified as more efficient than standard HVAC systems. ADM independently retrieved the attributes necessary for TRM calculations from the AHRI database. In certain cases, the make or model numbers were entered in with minor typographic errors or with missing or inserted dashes, spaces, or other delimiting characters. Such occurrences do not pose an evaluation difficulty as ADM concentrates the verification effort on a random sample of rebated appliances, rather than the entirety of the database. Upon review of the application materials and the T&R system, it was discovered that many ductless mini-split heat pumps were rebated and reported as air source heat pumps. Ductless mini-split heat pumps tend to have higher energy savings that air source heat pumps on a per-ton basis, primarily because through customer surveys a non-negligible fraction of such units were found to replace electric resistance heating. The realization rates for air source heat pumps are high primarily for this reason. ADM has communicated the misidentification issue to the Company and the ICSP, and will provide the ICSP with a list of mini-split make/model numbers so that the ICSP may cross check the heat pump type prior to rebate approval. Through review of tune-up invoices and applications, ADM determines the average cooling and heating capacities of participating air conditioners and heat pumps. These values, along with verification rates from telephone surveys, are used to calculate the verified impacts for tune-ups.

Customer Verification Surveys

ADM performed telephone surveys on a random sample of customers selected from the T&R data. All contacted customers verified that they have purchased and installed the stated HVAC equipment, and all tune-up participants recalled the tune-up event. The telephone surveys are also an opportunity to collect additional data that are exclusive to the T&R system. For example, the installation space and baseline HVAC system types were determined through customer surveys for ductless mini-split heat pumps.

Review of Energy Savings and Demand Reduction Calculations

As with appliances, the ICSP reports energy savings due to market average values for capacity and efficiency, rather than project-specific attributes. The default parameters used in the savings estimations are conservative in the sense that the ICSP systematically underestimates reported impacts. This is particularly true for ground source heat pumps, air source heat pumps, and tune-ups.

For all reviewed records, ADM used site-specific attributes to calculate "On-TRM" impacts. The process is somewhat more involved in that the make/model lookups involve the Air Conditioning, Heating, and Refrigeration Institute (AHRI) certification directory along with using the TRM's zip-code to archetypal city map to establish equivalent full load hours. For ductless mini-split heat pumps, customer surveys are required to establish equivalent full load hours of operation and a baseline system type. Although there are at times significant variations between reported and verified savings, the overall variance is insignificant at the program level.

2.2.1 Program Sampling

For the upstream lighting and consumer electronics program components, the census of shipment invoices and the calculations in the T&R system were reviewed to ensure that the energy savings and demand reductions are claimed according to the protocols in the PA TRM.

The sampling approach for the appliance and HVAC program components is stratified random sampling with the stratification defined by measure types. This is a more detailed stratification scheme than in past years, and is partially motivated by the desire to report measure-specific TRC scores to assist program design. Note that sample sizes may be small for certain small strata, but the overall number of sample points, exclusive of the upstream program components, is nearly 200[9]. The impacts of certain measures that have an insignificant number of applications such as solar water heaters (one rebate in PY5) and mini-split ACs (two rebates in PY5) are not verified through surveys or invoice applications, but are rather passed through to verified impacts provided that the per-unit savings are consistent with values from the PA TRM.

[9] The measure-level sampling stratification results in certain strata with insignificant reported impacts (less than one *per mil* of program impacts. The reported impacts for these strata passed through to verified impacts provided that the per-unit savings are consistent with values from the PA TRM. The associated evaluation activity is designated as "PT" in Table 2-2.

Table 2-1: Phase II Energy Efficient Products Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	234,005	33,524	2.02	1,639
Low-Income	0	0	0.00	0
Small Commercial and Industrial*	10,899	2,726	0.68	33
Large Commercial and Industrial	0	0	0.00	0
Government, Non-Profit, and Institutional	0	0	0.00	0
Program Total	244,904	36,250	2.70	1,672
*Impacts and participation in the small commercial sector result from cross sector sales, and are discussed in Appendix D.				

Table 2-2: Energy Efficient Products Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
Upstream Lighting	221,082	0%	221,082	221,082	CR,IR,AR,S*,L*
Upstream Televisions	15,832	0%	15,832	15,832	CR,IR,AR
Refrigerators / Freezers	2,995	32%	5	20	CR,IR,AR,S
Heat Pump Water Heaters	75	31%	5	12	CR,IR,AR,S
ASHP	401	32%	5	20	CR,IR,AR,S
Clothes Washers	2,178	32%	5	42	CR,IR,AR,S
GSHP	38	30%	5	10	CR,IR,AR,S
HVAC Tune-Ups	976	32%	5	64	CR,IR,AR,S
Dehumidifiers	497	32%	5	8	CR,IR,AR,S
CAC	305	32%	5	8	CR,IR,AR,S
Mini-split HP	40	0%	0	0	CR,IR,AR,S
RAC	84	31%	5	1	CR,IR,AR,S
Smart Strips	1	0%	0	0	n/a
Upstream Smart Strips	150	0%	150	150	CR,IR,AR
Electric Resistance Water Heaters	18	27%	5	3	CR,IR,AR,S
Upstream Computers/Monitors	223	0%	223	223	CR,IR,AR
Solar Water Heaters	0	0%	0	0	CR
ECM Fans	3	0%	5	3	CR
Dishwashers	8	27%	5	1	n/a
Mini-split AC	0	0%	0	0	PT
Tune-Up with ECM	1	0%	0	0	n/a
Program Total	244,904	5%	237,347	237,479	
CR=Calculation Review, IR=Invoice Review, AR=Application Review, S=Survey, PT=Pass Through S*=Survey to establish cross sector sales, L*=logging to establish hours of use and CF for “cross-sector” lamps.					

Table 2-3: PY5 Energy Efficient Products Program Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
Upstream Lighting	30,366	104.8%	31,826	0.5	0.8%
Upstream Televisions	4,277	87.4%	3,739	0.5	0.0%
Refrigerators / Freezers	395	105.2%	416	0.5	16.0%
Heat Pump Water Heaters	125	115.9%	145	0.5	19.0%
ASHP	280	178.7%	500	1.0	31.4%
Clothes Washers	208	161.6%	336	0.5	11.0%
GSHP	130	172.2%	224	0.5	19.6%
HVAC Tune-Ups	277	152.2%	422	1.0	17.4%
Dehumidifiers	89	97.7%	87	0.5	25.3%
CAC	50	106.4%	53	0.5	25.1%
Mini-split HP	12	100.0%	12	0.5	100.0%
RAC	2	110.0%	2	0.5	71.6%
Smart Strips	0	100.0%	0	0.5	100.0%
Upstream Smart Strips	28	100.0%	28	0.5	0.0%
Electric Resistance Water Heaters	3	82.9%	3	0.5	37.8%
Upstream Computers/Monitors	5	100.0%	5	0.5	0.0%
Solar Water Heaters	0	n/a	0	0.5	100.0%
ECM Fans	1	100.0%	1	0.5	0.0%
Dishwashers	0	100.0%	0	0.5	69.9%
Mini-split AC	0	n/a	0	0.5	100.0%
Tune-Up with ECM	1	100.0%	1	0.5	100.0%
Program Total	36,250	104.3%	37,800	n/a	0.9%

Table 2-4: PY5 Energy Efficient Products Program Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
Upstream Lighting	1.47	142.3%	2.09	0.5	5.3%
Upstream Televisions	0.69	82.7%	0.57	0.5	0.0%
Refrigerators / Freezers	0.05	100.6%	0.05	0.5	16.0%
Heat Pump Water Heaters	0.01	115.9%	0.01	0.5	19.0%
ASHP	0.05	221.4%	0.11	0.5	15.7%
Clothes Washers	0.04	98.0%	0.03	0.5	11.0%
GSHP	0.03	205.1%	0.06	0.5	19.6%
HVAC Tune-Ups	0.26	109.2%	0.29	0.5	8.7%
Dehumidifiers	0.06	10.0%	0.01	0.5	25.3%
CAC	0.03	153.8%	0.05	0.5	25.1%
Mini-split HP	0.01	100.0%	0.01	0.5	100.0%
RAC	0.01	100.0%	0.01	0.5	71.6%
Smart Strips	0.00	100.0%	0.00	0.5	100.0%
Upstream Smart Strips	0.00	100.0%	0.00	0.5	0.0%
Electric Resistance Water Heaters	0.00	45.2%	0.00	0.5	37.8%
Upstream Computers/Monitors	0.00	97.1%	0.00	0.5	0.0%
Solar Water Heaters	0.00	n/a	n/a	0.5	100.0%
ECM Fans	0.00	100.0%	0.00	0.5	0.0%
Dishwashers	0.00	100.0%	0.00	0.5	69.9%
Mini-split AC	0.00	n/a	n/a	0.5	100.0%
Tune-Up with ECM	0.00	100.0%	0.00	0.5	100.0%
Program Total	2.70	121.6%	3.29	n/a	3.6%

2.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

2.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

2.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

2.6 Financial Reporting

A breakdown of the program finances is presented in Table 2-5.

Table 2-5: Summary of Energy Efficient Product Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$1,672	$1,672
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$1,672**	**$1,672**
Design & Development	$13	$13
Administration, Management, and Technical Assistance[1]	$1,790	$1,790
Marketing[2]	$196	$196
Subtotal EDC Implementation Costs	**$1,999**	**$1,999**
EDC Evaluation Costs	$17	$17
SWE Audit Costs	$87	$87
Total EDC Costs[3]	**$3,775**	**$3,775**
Participant Costs[4]	$3,909	$3,909
Total NPV TRC Costs[5]	**$6,012**	**$6,012**
Total NPV Lifetime Energy Benefits	$14,499	$14,499
Total NPV Lifetime Capacity Benefits	$1,359	$1,359
Total NPV TRC Benefits[6]	**$15,857**	**$15,857**
TRC Benefit-Cost Ratio[7]	**2.64**	**2.64**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

3 Residential Home Performance Program

Through the Residential Home Performance Program, customers are either incentivized to improve the energy efficiency performance of their homes. The home performance program components include a whole house direct install component, direct delivery of energy conservation kits (including a new school education component), efficient residential new construction, and home energy usage reports. Through the whole house direct install program component, customers receive diagnostic assessments, followed by the direct installation of low-cost measures or incentivized installation of building shell measures. Customers that received energy conservation kits completed an online or phone audit and received an energy conservation kit. The new construction component provides incentives to builders that choose to build new homes to higher efficiencies through the installation of efficient building shell measures, HVAC systems, appliances, lighting, or other features. The home energy reports provide customers with comparative electric energy usage data and offer tips and advice on behavioral and low-cost energy saving measures.

3.1 Program Updates

During PY5, a school education component was added to the Residential Home Performance Program. Through this program, energy efficiency education is provided to elementary school children with take home curriculum or home work to engage their parents. Energy efficiency kits that include items such as CFLs, smart strips, and LED night lights are provided upon request based on this engagement. The Home Energy Reports component was a standalone program in Phase I, but is subsumed into the Home Performance Program for Phase II.

3.1.1 Definition of Participant

The participant counts for this program are determined based on the unique customer receiving a kit or the unique account number in the T&R database for the other program components.

3.2 Impact Evaluation Gross Savings

The gross impact evaluation methodology for each program component is discussed below.

Gross Impact Evaluation for Home Energy Audit Conservation Kits

Two separate energy conservation kits were sent to customers depending on their hot water fuel source. The kit provided to customers with electric water heating consists of CFLs, LED night lights, aerators and aerator adapters, a furnace whistle, a “smart” power strip, and a low flow showerhead. The kit provided to customers with non-electric water heating consists of CFLs, LED night lights, a furnace whistle, and a “smart” power strip.

In evaluating the gross impact analysis for the energy conservation kits in PY5, four items must be determined:

1. The average energy savings and demand reduction for the kit elements that are installed;
2. The number and type of kits mailed to customers during PY5,
3. The installation rate for the various kit elements
4. The delivery rate, or percentage of reported kits sent to customers that were not received by customers, either because of shipping problems, customer moving, or other such scenarios.

The first item has been determined through application of the partially deemed savings protocols in the 2013 TRM. The second item, the total number and type of kits mailed to customers in PY5, is determined by reviewing the program T&R system

The third item, installation rates, are determined through online customer, except for CFLs which are given "deemed" installation rates of 0.84 (later multiplied by the kit receipt rate as determined through surveys), consistent with the TRM.

For a particular site in a sample, the installation rate for each kit element takes on a binary value of 1, if the element is installed in accordance to the principles that define that element as an energy efficiency measure, and 0 otherwise. In particular, faucet aerators and low flow showerheads are only counted as "installed" if they are installed in a home that has electric water heating. Smart power strips are counted as "installed" if: (1) there are appliances plugged into the "controlled" sockets that are turned on and off by the smart strip; and (2) an appliance that is not uniformly on is installed in the "master" socket.

The final item, the delivery rate is determined through the online and phone survey instrument. Online and phone survey respondents are asked to indicate whether they received the conservation kit that was mailed to them. The reported in-service rates reflect the kit non-receipt rate as they are calculated as the ratio of the number of items installed to the number of items claimed to be delivered.

The survey instrument that was used to verify that the shipped energy conservation kits were installed asks a series of questions that determine how many of each item was installed and where each item was installed. The accuracy of the survey instrument was verified in prior program years through supplementary on-site data collection activities of a nested sample of the survey respondents. The results of this analysis indicate that the variance in savings attributable to this program is primarily a result of installation rates. This variance is best captured in the survey instrument, as it allows for a large sample size not easily obtained through on-site data collection.

Gross Impact Evaluation for School Kits

School kit program component is similar in construct to the Home Energy Audit conservation kit component, but the program is targeted to families with children who attend schools in the Company's service territory. The school kits contents include CFLs, LED night lights, and smart strips. The information available for review includes invoices, shipment lists, and results from a survey that was included in the kit. The invoices and shipment lists were reviewed to verify the accuracy of the T&R system, and were all found to be consistent. The survey that was included in the kit was found to be appropriate for M&V purposes, with minor modifications discussed below. The survey results were analyzed for program measure installation practices and were found to be consistent with ADM's survey results for the Home Energy Audit conservation kits. However, ADM made two modifications to the survey results. First, the "kit receipt rate" could not be used, as only those who received the kit would receive the survey invite. Due to the similarity of the programs and the consistency of the results of both surveys, the energy conservation kit receipt rate of 97.5% was applied to the school kits program. A second adjustment regards the smart power strip installation rate. The survey in the business reply cards asked whether the smart power strip is installed, to which approximately 70% of customers replied affirmatively. ADM's surveys also find that, on average, 73% of customers reported installing the smart power strips. However, ADM's surveys contain additional questions to help determine if the smart power strips are installed in a manner that is in accordance to TRM savings assumptions and algorithms. On average, 72% of smart strips that are reported to be installed are also installed in a manner that will generate energy savings in accordance to the TRM. As such, the basic installation rate, as reported in the business reply card surveys, are scaled down with a factor of 72%. All other in-service rates were found to be in good agreement with corresponding in-service rates from the Home Energy Audit conservation kits.

Gross Impact Evaluation for New Construction

This program contributes a relatively small portion of the program level savings for PY5. The PY5 evaluation approach is similar to that employed in PY4.

For the PY5 evaluation, ADM focused on conducting engineering reviews of a sample of projects. The engineering review involved inspection of the REM/Rate models associated with the rebated buildings. For each sampled home, ADM analysts ran the REM/Rate input files and made the following considerations:

1. Are the baseline specifications in accordance to those in the 2013 PA TRM?

2. Are the claimed impacts attributable to improved construction practices and premium efficiency HVAC systems and appliances, or do they result from modifications that are not supportable by the PA TRM[10]
3. Is the REM/Rate modeling performed correctly and does it provide accurate results[11]?
4. Are the participating HERS raters accurately describing the homes in the REM/Rate models and HERS ratings?

The first three topics can be resolved through a REM/Rate model review. To determine the correspondence of the model inputs to actual building characteristics, ADM reviews detailed notes, photographs, and measurements from the ICSP's on-site Quality Assurance/ Quality Control (QA/QC) inspections.

For each sampled project, ADM recalculates energy and demand impacts if the above steps result in adjustments to model parameters.

Gross Impact Evaluation for Whole House Direct Install Measures

This program component is divided into three sub-components for evaluation purposes. Most participants in the direct install component receive an initial home audit which includes installation of low-cost measures by the auditor. The auditor may also recommend capital cost energy savings improvements, and a relatively small number of customers follow through with comprehensive measures that include attic insulation, air sealing, and replacement of HVAC and water heating equipment. Most of the impacts associated with whole house component are attributable to measures such as CFLs, low-flow showerheads and faucet aerators, and hot water pipe insulation. For these "light measures", ADM reviewed a sample of applications and invoices were reviewed for accuracy and also reviewed the T&R system to verify that the proper TRM algorithms are applied. Customers that received comprehensive measures were placed into to savings strata: Those with reported savings above 2 MWh and those with reported savings below 2 MWh. ADM performed an exploratory billing analysis for the former set. The main intention of the billing analysis is to provide a feasibility check against a small number of customers that are reported to save well over 5 MWh. Although the small sample size results in significant uncertainties in the billing analysis results, the main conclusion for the high-savings homes is that the apparent bill reductions are large and significant, but are also significantly lower than reported savings amount. The second stratum of comprehensive measure customers - those

[10] For example, it would not be appropriate to claim energy savings based on differences in the 'reference' and 'as built' models' thermostat settings, or by virtue of using different heating or cooling degree days in the two models.

[11] There can be relatively minor variations in savings because the HERS raters may have different versions of REM/Rate. ADM used version 14.4.1 to conduct the simulation for most model reviews.

with savings below 2 MWh, account for about one *per mil* of reported program savings. The reported impacts for these customers are passed through to verified impacts.

Gross Impact Evaluation for Home Energy Reports

This program component results in significant energy savings, but has a one-year measure life. The savings reported in PY5 do not contribute to the achievement against the May 31, 2016 compliance target. As such, ADM did not conduct an independent billing analysis in PY5, but rather reviewed the ICSP's M&V results to verify that the per-home impacts are in reasonable agreement with the PY4 impact evaluation.

3.2.1 Program Sampling

The five program components are treated as separate sub-programs, each with distinct populations, samples, and realization rates.

Home Energy Audit Conservation Kits

The sampling approach for the Home Energy Audits energy conservation kits program component is random sampling. Randomly selected customers are invited to complete online surveys, with gift cards offered to the first 200 to complete surveys.

Stratification by kit type was done to ensure that appropriate realization rates are determined for the two individual kit types. The sample size for verification surveys was sufficiently large to determine gross impact with ±10% relative precision at the 90% confidence level. This large sample size is motivated by the fact that installation rates for some items in the kit are relatively low that only a large sample can accurately capture a true estimate of the installation rate. This is the main advantage of a survey instrument as compared to on-site data collection for this program.

Schools Conservation Kits

There is no direct sampling effort for the Schools energy conservation kits program: All recipients are invited to complete the survey. As discussed above the Schools Conservation Kit survey results are in excellent agreement with the Home Energy Audit kit survey results, despite the different survey design and recruitment practices.

New Construction

The sampling approach for this program is simple random sampling. The sample size is sufficient to determine this program's gross impact with ±35% relative precision at the 85% confidence level. ADM sampled homes that been selected for quality control inspections by the program implementer. It is important to note that the implementer does not adjust the energy savings for homes that undergo the

QC process. This facilitates ADM's evaluation effort because the gross reported numbers for these homes are unbiased with respect to the implementers QA/QC process.

Whole House Direct Install

There were very few whole house projects completed in PY5. As described in the methodology section, the projects under this program component are placed into three categories. Projects that solely involve low-cost measures are tracked by measure in the T&R system, and ADM performs calculation review on the census of projects. Comprehensive upgrade projects are placed into two strata, with the high-savings stratum evaluated by a combination of billing analysis and invoice reviews, and the low-savings stratum evaluated solely through invoice reviews.

Table 3-1: PY5 Home Performance Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	205,541	51,667	6.17	1,256
Low-Income	0	0.0	0.00	0
Small Commercial and Industrial	0	0.0	0.00	0
Large Commercial and Industrial	0	0.0	0.00	0
Government, Non-Profit, and Institutional	0	0.0	0.00	0
Program Total	205,541	51,667	6.17	1,256

Table 3-2: Home Performance Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
HEA Kits	21,944	10%	52	189	CR,S
School Kits	4,066	10%	52	515	CR,S
New Construction	211	50%	3	3	CR,DR
Direct Install, Prescriptive Measures	73	10%	census	census	CR
Weatherization, > 2MWh	8	100%	1	4	EBA
Weatherization, < 2MWh	8	100%	0	0	PT
Home Energy Reports*	179,231	100.0%	0	0	PT*
Program Total	205,541	1.9%	181	784	

CR=TRM Calculation Review, S=Survey, DR=Desk Review of REM/Rate Models, On-Site QA/QC findings, BA= Billing Analysis, PT=Pass Through (Certain measures that account for less than 0.1% of reported savings are passed through to verified impacts, on the condition that the reported savings per unit are reasonably close to TRM values.)

*Home Energy Reports have 1-year measure life, the impacts are reported here but will not contribute to the compliance metric associated with the May 31 2016 gross verified energy savings target.

Table 3-3: PY5 Home Performance Program Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
HEA Kits	9,747	103.5%	10,088	0.5	5.2%
School Kits	1,798	106.2%	1,910	0.5	3.0%
New Construction	413	137.0%	565	0.5	41.3%
Direct Install, Prescriptive Measures	50	97.7%	49	0.5	0.0%
Weatherization, > 2MWh	49	75.4%	37	1.0	50.9%
Weatherization, < 2MWh	7	100.0%	7	0.5	100.0%
Home Energy Reports	39,604	100.0%	39,604	n/a	15.0%
Program Total	51,667	101.1%	52,260		11.4%

Table 3-4: PY5 Home Performance Program Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
HEA Kits	0.51	105%	0.53	0.5	5.2%
School Kits	0.09	108%	0.09	0.5	3.0%
New Construction	0.08	280%	0.21	0.5	41.3%
Direct Install, Prescriptive Measures	0.00	109%	0.00	0.5	0.0%
Weatherization, > 2MWh	0.00	n/a	0.00	1.0	50.9%
Weatherization, < 2MWh	0.00	n/a	0.00	0.5	100.0%
Home Energy Reports	5.50	100%	5.50	n/a	15.0%
Program Total	6.17	102.8%	6.34		13.0%

3.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

3.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

3.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

3.6 Financial Reporting

A breakdown of the program finances is presented in Table 3-5.

Table 3-5: Summary of Home Performance Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$1,256	$1,256
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$1,256**	**$1,256**
Design & Development	$29	$29
Administration, Management, and Technical Assistance[1]	$4,703	$4,703
Marketing[2]	$219	$219
Subtotal EDC Implementation Costs	**$4,951**	**$4,951**
EDC Evaluation Costs	$20	$20
SWE Audit Costs	$202	$202
Total EDC Costs[3]	**$6,429**	**$6,429**
Participant Costs[4]	$1,737	$1,737
Total NPV TRC Costs[5]	**$6,910**	**$6,910**
Total NPV Lifetime Energy Benefits	$6,868	$6,868
Total NPV Lifetime Capacity Benefits	$854	$854
Total NPV TRC Benefits[6]	**$7,722**	**$7,722**
TRC Benefit-Cost Ratio[7]	**1.12**	**1.12**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

4 Residential Appliance Turn-In Program

Residential customers are eligible for a cash incentive and disposal of up to two large older inefficient appliances (refrigerators or freezers); and two Room Air Conditioners (RAC) per household per calendar year. All units must be working and meet established size requirements.

4.1 Program Updates

No changes to this program during PY5.

4.1.1 Definition of Participant

The participant counts are based on the number of unique account numbers, while measure counts correspond to the number of removed refrigerators, freezers, and RACs.

4.2 Impact Evaluation Gross Savings

The reported impacts for this program are based on the energy savings associated with the removal of working refrigerators, freezers and RACs out of service. The gross impact evaluation method includes the following steps:

1) Through customer verification surveys, determine the fraction of refrigerators, freezers and RACs that were drawing power from the grid prior to retirement.
2) For refrigerators and freezers, also determine the fraction of recycled units that were replaced with Energy Star qualified units, and the fraction that were replaced with standard efficiency units.

The first step above is a basic verification step: Zero savings are credited if an appliance was reported to be non-functional (unable to draw power from the grid) prior to pick-up. The second step helps to select the proper path in the TRM algorithm, as the energy usage of the replacement unit is subtracted from the energy use of the recycled unit. A final step is necessary to avoid double-counting of savings in the case that a refrigerator is replaced with an Energy Star unit and rebated under the Efficient Products program. ADM conducted a database lookup to identify customers that recycled a refrigerator or freezer, and also received rebates for EnergyStar refrigerators or freezers during the same program year. The savings associated with the EnergyStar refrigerators or freezers were then subtracted from the gross verified savings for the program.

The Company updated the reported per-unit savings for refrigerators and freezers by blending the impacts that result from “recycling without replacement” and “recycling with replacement” scenarios. The reported energy savings are heavily weighted to the “recycling with replacement” scenarios, and result in conservative savings estimates. The realization rate for the program is attributable almost

entirely to the differences between the ex ante and ex post weights for the three replacement type scenarios. Program Sampling

The sampling approach for this program is a simple random sample. Sample sizes target 90% confidence level and 10% precision.

Table 4-1: PY5 Residential Appliance Turn-In Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	7,259	5,346	0.78	368
Low-Income	0	0.0	0.00	0
Small Commercial and Industrial	0	0.0	0.00	0
Large Commercial and Industrial	0	0.0	0.00	0
Government, Non-Profit, and Institutional	0	0.0	0.00	0
Program Total	7,259	5,346	0.78	368

Table 4-2: PY5 Residential Appliance Turn-In Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
Refrigerators	5,841	11.3%	40	52	CR,S,X
Freezers	1,344	16.0%	20	24	CR,S,X
RACs	281	22.4%	10	25	CR,S
Program Total	7,466	9.4%	70	101	

CR=TRM Calculation Review, S=Survey X=Cross-check against EE Products to identify potential double-counting of savings for Energy-Star refrigerators and freezers.

Table 4-3: PY5 Residential Appliance Turn-In Program Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
Refrigerators	4,147	127.6%	5,292	0.5	9.9%
Freezers	1,129	132.8%	1,499	0.5	14.6%
RACs	70	102.4%	72	0.5	13.7%
Program Total	5,346	128.4%	6,864		8.3%

Table 4-4: PY5 Residential Appliance Turn-In Program Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
Refrigerators	0.47	122.3%	0.57	0.5	9.9%
Freezers	0.13	135.7%	0.18	0.5	14.6%
RACs	0.18	103.6%	0.19	0.5	13.7%
Program Total	0.78	120.3%	0.94		7.2%

4.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

4.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

4.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

4.6 Financial Reporting

A breakdown of the program finances is presented in Table 4-5.

Table 4-5: Summary of Residential Appliance Turn-In Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$368	$368
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$368**	**$368**
Design & Development	$9	$9
Administration, Management, and Technical Assistance[1]	$685	$685
Marketing[2]	$194	$194
Subtotal EDC Implementation Costs	**$889**	**$889**
EDC Evaluation Costs	$6	$6
SWE Audit Costs	$65	$65
Total EDC Costs[3]	**$1,328**	**$1,328**
Participant Costs[4]	$368	$368
Total NPV TRC Costs[5]	**$1,328**	**$1,328**
Total NPV Lifetime Energy Benefits	$2,622	$2,622
Total NPV Lifetime Capacity Benefits	$342	$342
Total NPV TRC Benefits[6]	**$2,964**	**$2,964**
TRC Benefit-Cost Ratio[7]	**2.23**	**2.23**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

5 Residential Low Income Program

The Low Income Program provides basic to comprehensive whole building measures at no cost to low-income households. This program also educates customers about their home's energy use and ways to save energy. The program is broadly organized into three different delivery types: direct install, giveaway and direct delivery kit programs.

The Direct Install component is comprised of the WARM Plus, WARM Extra Measures and WARM Multifamily programs. These programs included an onsite home energy audit for income qualified customers and the direct install of energy efficient measures at no cost to participants by the Company's implementation contractor. The WARM Multifamily program was introduced this year to provide energy efficient measures to customers who live in multifamily housing units. Appliance replacements were also expanded in Phase II. Measures installed under these programs include[12]:

- CFLs
- Smart Power Strips
- Furnace whistles
- Faucet aerators
- Energy-saving showerheads
- LED nightlights
- Heat pump water heaters
- ENERGY STAR refrigerators
- Energy-efficient freezers
- Energy-efficient water heaters
- Programmable thermostats
- Pipe insulation for hot water pipes

The efficiency of refrigerators and freezers were also tested during the in-home audit process. If these appliances were found to be inefficient, customers had the option to have their old units removed and replaced with energy-saving appliances through the program.

The Giveaway component, which is a subset of the Low Income Low Use Program, was targeted to low income customers at community events. CFLs, and limited numbers of faucet aerators, furnace whistles

[12] Many other energy saving measures are provided to customers through the program; however, the expected savings from these other measures are nominal. No ex ante savings were claimed for measures outside of this list.

and energy-saving showerheads, were either distributed directly by the Company or sent to non-profit organizations contracted by the Company that then distributed the items to Company customers.

Low Income, Low Use Program (LILU) kits were directly mailed to income-qualified customers. There were two types of kits: the first type was for homes with electric water heaters, the second type for homes with non-electric water heaters. These kits were identical to the ones sent out by the Home Energy Audit (HEA) program. Items in these kits (depending on the recipients' water heater type) may have included:

- CFLs
- Furnace whistle
- LED nightlights
- Smart Power Strip
- Faucet aerators
- Energy-saving showerhead
- Adapters for faucet aerators.

5.1 Program Updates

In Phase II, the WARM Plus program component has a greater emphasis on targeting lighting and appliances rather than weatherization. Weatherization measures are still provided to qualified customers under the non-Act 129 funded WARM programs, and to a lesser extent under the WARM Plus program. Audits for multifamily customers were added in Phase II.

5.1.1 Definition of Participant

For the WARM Plus, Multifamily, and WARM Extra Measure programs, a participant is defined as a home that received direct install measures. For the Giveaway component the participant is defined as a family unit who received the energy efficiency measures, such as faucet aerator or a CFL. In the LILU kit program, a participant is defined as a home to which a kit was delivered.

5.2 Impact Evaluation Gross Savings

This section provides details of evaluation findings, including reported savings, sample design, and verified savings for the three components of the Low Income Program.

Gross Impact Evaluation for Direct Install Components

During Phase I, verified savings from the WARM Program were determined using a billing analysis of prior-year participants' billing data. This is not possible for PY5 because the Phase II program has been redesigned, and is not represented by the PY4 program or the general WARM LIURP program.

ADM's verification activities for these direct install programs included a review of tracking data and a review of on-site verification forms completed by third party quality assurance contractors. These verification forms noted any discrepancy between what was listed as installed by the implementation contractor and what was still installed in the home. ADM used these forms to verify installation rates for energy efficiency measures and to calculate verified impacts. A small number of homes received envelope improvement measures with impacts that are not readily calculable through TRM algorithms. The Company did not report any impacts for these measures.

Gross Impact Evaluation for Giveaway Events

The Company provided to ADM their list of invoices and measures given out through the Low Income Giveaway program component. ADM checked the invoice list against the quantities of give-away items listed in the Company's official tracking database. ADM did not find any discrepancies between the invoice list and the tracking database. However, the in-service rates for certain measures are not directly knowable, and the historically verified in-service rates for measures such as night lights and furnace whistles are below the TRM defaults. As such, ADM applied to furnace whistles, night lights, aerators, and showerheads, the in-service rates derived from the LILU direct delivery program. This resulted in a slight reduction in verified savings, but the overall realization rate was close to 100% because most of the impacts are attributed to CFLs.

Gross Impact Evaluation for LILU Energy Conservation kits

Two separate energy conservation kits were sent to customers depending on their hot water fuel source. The kit provided to customers with electric water heating consists of CFLs, LED night lights, aerators and aerator adapters, a furnace whistle, a "smart" power strip, and an energy-saving showerhead. The kit provided to customers with non-electric water heating consists of CFLs, LED night lights, a furnace whistle, and a "smart" power strip.

In evaluating the gross impact analysis for the energy conservation kits in PY5, four items must be determined:

1. The average energy savings and demand reduction for the kit elements that are installed;
2. The number and type of kits mailed to customers during PY5,
3. The installation rate for the various kit elements
4. The delivery rate, or percentage of reported kits sent to customers that were not received by customers, either because of shipping problems, customer moving, or other such scenarios.

The first item has been determined through application of the partially deemed savings protocols in the 2013 TRM. The second item, the total number and type of kits mailed to customers in PY5, is determined by reviewing the program T&R system. Specifically, the T&R system is checked to ensure

that duplicate shipments to the same physical address are not double counted and that all kits being claimed for PY5 are eligible based on shipment dates.

The third item, installation rates, are determined through customer surveys, except for CFLs which are given "deemed" installation rates of 0.84 (later multiplied by the kit receipt rate as determined through surveys), consistent with the TRM.

For a particular site in a sample, the installation rate for each kit element takes on a binary value of 1, if the element is installed in accordance to the principles that define that element as an energy efficiency measure, and 0 otherwise. In particular, faucet aerators and low flow showerheads are only counted as "installed" if they are installed in a home that has electric water heating. Smart power strips are counted as "installed" if: (1) there are appliances plugged into the "controlled" sockets that are turned on and off by the smart strip; and (2) an appliance that is not uniformly on is installed in the "master" socket.

The final item, the delivery rate is determined through the customer surveys. Survey respondents are asked to indicate whether they received the conservation kit that was mailed to them. The reported in-service rates reflect the kit non-receipt rate as they are calculated as the ratio of the number of items installed to the number of items claimed to be delivered.

The survey instrument that was used to verify that the shipped energy conservation kits were installed asks a series of questions that determine how many of each item was installed and where each item was installed.

Although the survey results from the LILU program are closely correlated to corresponding results from the Home Energy Audit kits and the Schools kits, although the average kit receipt rate is slightly lower for LILU than it is for the Home Energy Audits program. The receipt rate is 92% (statewide) for LILU and 97.5% for the Home Energy Reports program. Additionally LILU respondents – particularly those that responded to telephone surveys rather than online surveys, were somewhat less likely to have installed aerators and showerheads. Review of responses to open-ended questions provides anecdotal evidence that the LILU recipients are somewhat more dependent on others' assistance or permission to install these measures.

5.2.1 Program Sampling

The three program components are treated as separate sub-programs, each with distinct populations, samples, and realization rates.

LILU Conservation Kits

The sampling approach for LILUs energy conservation kits program component is random sampling, but with specific targets for data acquisition modes and kit types. While the Home Energy Audit kit surveys

were administered online, ADM used both telephone and online surveys for this program evaluation. The primary reason for using telephone surveys is that only about 30% of LILU customers provided emails addresses to the Company. As such, a 3:1 telephone to online survey ratio was targeted.

Stratification by kit type was done to ensure that appropriate realization rates are determined for the two individual kit types. The sample size for verification surveys was sufficiently large to determine gross impact with ±10% relative precision at the 90% confidence level. This large sample size is motivated by the fact that installation rates for some items in the kit are relatively low that only a large sample can accurately capture a true estimate of the installation rate. This is the main advantage of a survey instrument as compared to on-site data collection for this program.

Giveaway Events

Sampling was not conducted for the giveaway event evaluation. ADM reviewed invoices and calculations for all reported measures.

Direct Install Programs

The Company's QA/QC contractor performs random on-site verification inspections. ADM received from the company a list of on-site inspections, and then requested the data collection forms and on-site notes for projects that are in the PY5 program population.

Table 5-1: PY5 Low Income Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	0	0	0.00	0
Low-Income	5,615	1,792	0.11	0
Small Commercial and Industrial	0	0.0	0.00	0
Large Commercial and Industrial	0	0.0	0.00	0
Government, Non-Profit, and Institutional	0	0.0	0.00	0
Program Total	5,615	1,792	0.11	0

Table 5-2: Low Income Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
Direct Install	1,076	13.2%	29	30	CR,IR,OS
CFL Give-away	3,026	0.0%	3,026	3,026	CR, IR
LILU Standard Kits	831	7.8%	78	78	CR,S
LILU All Electric Kits	682	8.9%	60	60	CR,S
Program Total	5,615	6.3%	3,193	3,194	
CR=TRM Calculation Review, IR= Invoice Review S=Survey, OS = Review of On-Site QA/QC Visit Documentation					

Table 5-3: PY5 Low Income Program Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
Direct Install	797	98.1%	782	0.5	13.0%
CFL Give-away	302	101.4%	306	0.5	0.0%
LILU Standard Kits	367	88.9%	326	0.5	7.8%
LILU All Electric Kits	326	94.3%	308	0.5	8.9%
Program Total	1,792	96.1%	1,722		6.0%

Table 5-4: PY5 Low Income Program Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
Direct Install	0.06	97.5%	0.06	0.5	13.0%
CFL Give-away	0.02	102.6%	0.02	0.5	0.0%
LILU Standard Kits	0.02	93.7%	0.02	0.5	7.8%
LILU All Electric Kits	0.02	101.0%	0.02	0.5	8.9%
Program Total	0.11	98.2%	0.11		7.0%

5.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

5.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

5.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

5.6 Financial Reporting

A breakdown of the program finances is presented in Table 5-5.

Table 5-5: Summary of Low Income Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$0	$0
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$0**	**$0**
Design & Development	$23	$23
Administration, Management, and Technical Assistance[1]	$1,543	$1,543
Marketing[2]	$40	$40
Subtotal EDC Implementation Costs	**$1,605**	**$1,605**
EDC Evaluation Costs	$70	$70
SWE Audit Costs	$152	$152
Total EDC Costs[3]	**$1,828**	**$1,828**
Participant Costs[4]	$0	$0
Total NPV TRC Costs[5]	**$1,828**	**$1,828**
Total NPV Lifetime Energy Benefits	$626	$626
Total NPV Lifetime Capacity Benefits	$42	$42
Total NPV TRC Benefits[6]	**$667**	**$667**
TRC Benefit-Cost Ratio[7]	**0.37**	**0.37**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

6 C/I Small Energy Efficient Equipment Program

This program provides for the implementation of cost effective, high efficiency measures through lighting, HVAC, Motors and Drives, Specialty Equipment, and Custom incentive programs. The program also offers appliance recycling, and the program component is operated in a similar manner to the residential appliance recycling program.

This program provides for the implementation of cost effective, high efficiency measures through lighting, HVAC, Motors and Drives, Specialty Equipment, and Custom incentive programs. In addition to rebates, the program distributed conservation kits consisting of CFLs and smart power strips to several master metered multi-family communities. The program also offers appliance recycling, and the program component is operated in a similar manner to the residential appliance recycling program.

6.1 Program Updates

Early in PY5 the Company hired a new ICSP - CLEAResult. The program is similar in structure to PY4, however, the new CSP has updated the existing rebate application forms and calculators to comply with the 2014 PA TRM. The new CSP is also working on revamping the existing program website plus launching an online application portal; these should be ready for launch for PY6. The CSP has also rolled out number of new marketing pieces that are both, sector & measure specific. Company also has made available these marketing pieces to its own Customer Support Staff & Area Managers to use as a "leave behind" piece when they call upon their assigned accounts. To increase participation in this program, CLEAResult continues to build one-on-one relationship with large program allies and conduct outreach to small program allies through participation in trade shows and trade association and hosting table-top-display and breakfast sessions at distributors' locations. Certain custom projects such as new construction and building envelope improvements are excluded from this program, and are redirected to the Commercial / Industrial Small Sector Efficient Buildings programs. The appliance recycling program component is new for Phase II. In October 2013 the Company imposed M&V criteria for large savings projects: All new lighting projects with expected savings above 1,000 MWh, and all new non-lighting projects with expected savings above 500 MWh, were evaluated prior to rebate approval. These thresholds have been lowered for PY6.

6.1.1 Definition of Participant

Each separate rebated project is counted as a participant.

6.2 Impact Evaluation Gross Savings

The program has three categorical components: Equipment incentives, appliance recycling, and conservation kits to multi-family establishments. The majority of the gross reported energy savings for

this program were attributable to lighting measures, followed by custom projects and then prescriptive and custom motors projects, and the remainder to custom projects. The M&V methodology for this program is described below.

Gross Impact Evaluation for Efficient Equipment Incentives

The equipment incentives account for over 99% of program impacts for PY5. For each sampled project, the gross impact evaluation process starts with a desk review, and often continues to an on-site verification visits, metering or logging, and data analysis. The steps are described below for lighting projects, custom projects, and prescriptive (HVAC and food service) projects.

Lighting Projects

Each sampled lighting project first undergoes a desk review. The desk review includes reconciliation of invoices, fixture specification sheets (cut sheets), and re-calculating reported savings using TRM algorithms and/or ex ante assumptions, and identifying key parameters to be researched in the M&V plan.

Evaluation of all but the simplest of projects requires an M&V plan. The first step in the M&V planning process is to check that the project is sufficiently documented. For example, contractors working on large projects often have detailed, space-by-space inventories of the baseline and new lighting fixtures. If such detailed information is found to be lacking, ADM analysts will contact the applicant or the contractor directly, or through a request to the ICSP, and ask if such documentation is available. For large lighting projects, the M&V plan may call for sampling within the project. In such cases, the targeted precision level is ±20% at the 90% confidence level (90/20), with the sampling unit as the line item in the lighting calculator.

The desk review and M&V plan inform the data acquisition activities needed to evaluate the project. For most lighting projects, the default activities are on-site verification and logging hours of use. Most lighting projects are metered unless there is a good reason to *not* to meter[13,14]. In rare cases, the desk

[13] The most frequent reasons are that the affected lights are installed outdoors and controlled by photocells or time clocks. Increasingly, high quality trending data are available from energy management systems, and the data may be used in-lieu of logging. Other rate cases may be customer-driven, such as the requirement for explosion proof loggers in a chemical plant.

[14] Primary and secondary schools are the general exception. TRM hours of use are applied to whole-school lighting upgrades, but logging is still recommended for projects that are confined to just one location such as a gym or library.

review process may indicate that an on-site visit would not add sufficient value to the evaluation effort. In such cases, a verification interview may suffice to reduce uncertainty regarding the project. Data analysis is finalized upon the retrieval of loggers. For projects that involve formal samples, only the sampled line items are included in the realization rate calculation. This reduces uncertainty and subjectivity from the process of assigning hours of use from loggers to line items in the calculator.

As a final step in lighting project analysis, ADM analysts determine the incremental material and labor costs, and "dual-baseline" energy savings in cases that involve T12 or incandescent lamps. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to other sources as needed and described in Appendix A.

Custom Commercial and Industrial Projects

As with lighting projects, each sampled custom project undergoes a desk review prior to M&V plan construction. The desk review includes a full documentation review and if needed, additional topical research. Evaluation of most projects requires an M&V plan[15]. The first step in the M&V planning process is to check that the project is sufficiently documented, and that the evaluation engineer can articulate the mechanism or process that will yield the expected energy savings. ADM engineers are encouraged to contact the applicant early on in the M&V planning process to ask for additional documentation, clarification, or even to seek feedback on the feasibility of the proposed data acquisition and analysis methodology. The desk review and M&V plan will depend on the opportunities and constraints posed by each project. However, some defaults or "modes" are discussed for certain categories of projects below:

Air Compressor Projects: In many cases, vendors perform a baseline metering study prior to air compressor upgrades. The data collected from such studies are very useful, provided that they appear to be consistent with the overall project documentation. In many cases it is possible to use metered flow data or power data along with compressor curves to establish the facility's compressed air load profile. The energy usage of the proposed air compressor may then be derived from application of compressor curves to the compressed air load profile. Additional activities such as post-installation metering or a billing analysis may be recommended, depending on project specifics. In some cases baseline meter data are not available. In these cases ADM will meter the new air compressor and use compressor curves to establish the underlying compressed air load profile, and then determine the

[15] Some projects already have transparent M&V documentation including baseline and post-implementation meter data and production records. In such cases the M&V focus shifts to analysis, rather than new research and data collection.

baseline usage through application of the baseline compressor curves and (if needed) compressor staging practices.

Water Pumping Projects: Pumping projects are typically evaluated through billing analysis, using water throughput as the normalizing variable.

General Process Improvements: For general process improvements, the evaluation determines the change in the energy usage intensity associated with the creation or maintenance of one production unit[16].

General Space and Process Cooling Improvements: Data acquisition for such projects involves the determination of independent variables that predict the cooling load (units produced, degree-days, etc.) along with utility bills, EMS trending data, or sub-metering. The data analysis may involve regressions or energy simulation models.

Prescriptive Projects

These projects are evaluated at the basic level or rigor because they tend to represent an insignificant amount of reported impacts in the program-level sampling scheme. The process verification involves a desk review and an on-site verification or verification by interview and review of invoices and other documentation.

As with lighting projects, incremental costs are evaluated as the gross impact evaluation nears completion. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to other sources as needed and described in Appendix A.

Gross Impact Evaluation for Appliance Recycling and CFL Kits

As with prescriptive projects, these projects are evaluated at the basic level or rigor because they also represent an insignificant amount of the program's reported impacts. The default evaluation activity involves telephone verification surveys coupled with calculation reviews.

[16] The production unit depends on the project and is determined through documentation review and interviews with the applicant. Examples include a ton of steel produced by a mill, a desired level of dissolved oxygen in a wastewater treatment plan, a ton of refrigeration, and a day of snowmaking at a ski park.

6.2.1 Program Sampling

ADM evaluated the commercial and industrial programs using stratified ratio estimation. After October 2013, lighting projects with expected savings above 1,000 MWh, and other projects with expected savings above 500 MWh, were automatically selected for evaluation prior to rebate approval, and were thus placed in a 'certainty' or non-sampling stratum[17].

At the end of the second and fourth quarter ADM reviewed tracking data to define a discrete list of rebates that became the sample population for that quarter. Once separated into their respective operating companies and programs, this population was then stratified according to qualitative measure categories, and then by quantitative subcategories defined by expected energy savings. ADM used a coefficient of variation (CV) of 0.5 for all projects.

Table 6-1: PY5 C/I Small Energy Efficient Equipment Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	0	0	0.00	0
Low-Income	0	0	0.00	0
Small Commercial and Industrial	346	12,013	1.43	642
Large Commercial and Industrial	0	0	0.00	0
Government, Non-Profit, and Institutional	55	2,173	0.38	116
Program Total	401	14,187	1.81	758

[17] In this program there was one formal "above threshold" lighting project in the certainty stratum. However, the customer involved was found to have 18 other lighting projects at the same manufacturing facility. All 19 projects were placed in to the certainty stratum. The other 18 projects were approved prior to evaluation, thus the realization rate is not identically 100% for the certainty stratum.

Table 6-2: C/I Small Energy Efficient Equipment Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
CFL Kits-1	19	100.0%	19	19	DR
Lighting-1	7	23.6%	4	4	DR,OS,L,B
Lighting-2	17	27.1%	5	5	DR,OS,L,B
Lighting-3	51	21.8%	9	9	DR,OS,L,B
Lighting-4	132	26.5%	7	7	DR,OS,L,B
Custom-1	12	68.9%	1	1	DR,OS,M,B,ES
Custom-2	0	n/a	0	0	DR,OS,M,B,ES
Custom-3	0	n/a	0	0	DR,OS,M,B,ES
Custom-4	0	n/a	0	0	DR,OS,M,B,ES
HVAC and DHW-1	0	n/a	0	0	DR,OS,S
HVAC and DHW-2	21	70.3%	1	1	DR,OS,S
Appliance Turn-in-1	0	n/a	0	0	DR
Appliance Turn-in-2	109	n/a	0	0	DR
Kitchen/Appliances-1	33	39.6%	3	3	DR,OS
Kitchen/Appliances-2	0	n/a	0	0	DR,OS
Certainty-1	0	n/a	0	0	DR,OS,L,M,B,ES
Program Total	401	12.1%	49	49	

DR=Desk Review, S=Survey, OS = On-Site Verification, L=Logging, M=Metering, B=Billing Analysis. Not all activities are performed for all projects or strata.

Table 6-3: PY5 C/I Small Energy Efficient Equipment Program
Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits-1	61	98.0%	60	0.5	100.0%
Lighting-1	2,726	100.5%	2,739	0.5	23.6%
Lighting-2	3,601	66.0%	2,376	0.5	27.1%
Lighting-3	4,320	74.3%	3,210	0.5	21.8%
Lighting-4	2,512	115.9%	2,912	0.5	26.5%
Custom-1	730	218.5%	1,595	0.5	68.9%
Custom-2	0	n/a	0	0.5	0.0%
Custom-3	0	n/a	0	0.5	0.0%
Custom-4	0	n/a	0	0.5	0.0%
HVAC and DHW-1	0	n/a	0	0.5	0.0%
HVAC and DHW-2	45	86.9%	39	0.5	70.3%
Appliance Turn-in-1	0	n/a	0	0.5	0.0%
Appliance Turn-in-2	89	n/a	89	0.5	100.0%
Kitchen/Appliances-1	103	141.5%	145	0.5	39.6%
Kitchen/Appliances-2	0	n/a	0	0.5	0.0%
Certainty-1	0	n/a	0	0.5	0.0%
Program Total	14,187	92.8%	13,165		13.5%

Table 6-4: PY5 C/I Small Energy Efficient Equipment Program
Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) in Sample Design	Relative Precision at 85% C.L.
CFL Kits-1	0.00	111.8%	0.00	0.5	100.0%
Lighting-1	0.17	114.6%	0.19	0.5	23.6%
Lighting-2	0.51	76.6%	0.39	0.5	27.1%
Lighting-3	0.62	78.3%	0.48	0.5	21.8%
Lighting-4	0.38	108.9%	0.42	0.5	26.5%
Custom-1	0.06	187.2%	0.12	0.5	68.9%
Custom-2	0.00	n/a	0.00	0.5	0.0%
Custom-3	0.00	n/a	0.00	0.5	0.0%
Custom-4	0.00	n/a	0.00	0.5	0.0%
HVAC and DHW-1	0.00	n/a	0.00	0.5	0.0%
HVAC and DHW-2	0.05	85.4%	0.04	0.5	70.3%
Appliance Turn-in-1	0.00	n/a	0.00	0.5	0.0%
Appliance Turn-in-2	0.01	n/a	0.01	0.5	100.0%
Kitchen/Appliances-1	0.01	134.3%	0.01	0.5	39.6%
Kitchen/Appliances-2	0.00	n/a	0.00	0.5	0.0%
Certainty-1	0.00	n/a	0.00	0.5	0.0%
Program Total	1.81	92.1%	1.66		12.6%

6.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

6.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

6.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

6.6 Financial Reporting

A breakdown of the program finances is presented in Table 6-5.

Table 6-5: Summary of C/I Small Energy Efficient Equipment Program Finances

	PYTD	Phase II
	($1,000)	($1,000)
EDC Incentives to Participants	$758	$758
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$758**	**$758**
Design & Development	$18	$18
Administration, Management, and Technical Assistance[1]	$1,491	$1,491
Marketing[2]	$197	$197
Subtotal EDC Implementation Costs	**$1,706**	**$1,706**
EDC Evaluation Costs	$26	$26
SWE Audit Costs	$123	$123
Total EDC Costs[3]	**$2,614**	**$2,614**
Participant Costs[4]	$5,896	$5,896
Total NPV TRC Costs[5]	**$7,752**	**$7,752**
Total NPV Lifetime Energy Benefits	$7,392	$7,392
Total NPV Lifetime Capacity Benefits	$846	$846
Total NPV TRC Benefits[6]	**$8,238**	**$8,238**
TRC Benefit-Cost Ratio[7]	**1.06**	**1.06**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

7 C/I Small Energy Efficient Buildings Program

This is a new program for Phase II. The program has two broad components. The first component is energy conservation kits delivered by mail to nonresidential customers. The second component includes custom "whole building" projects such as new construction, retro-commissioning, and building envelope improvements. Only the first component was active in PY5.

7.1 Program Updates

In early PY5, the Company hired a new ICSP - CLEAResult. In Q3 & Q4 of PY5, through the launch of the C&I Kits program, we have achieved certain level of savings in this program. However, to date, we have not approved building performance type projects in this program. The new CSP has updated the existing program website to launch this new program. Plus the CSP also updated the existing calculators to comply with the 2014 PA TRM. To increase participation in this program, CLEAResult in marketing this program to upstream program allies – e.g., consulting engineers, designers, & building owners and operators. CLEAResult is also promoting this program to organizations like US Green Building Council and Green Building Alliance. To help ease the participation in this program, CLEAResult has created a corporate level technical team that works directly with customer's design team. In October 2013 the Company imposed M&V criteria for large savings projects: All new lighting projects with expected savings above 1,000 MWh, and all new non-lighting projects with expected savings above 500 MWh, were evaluated prior to rebate approval. These thresholds have been lowered for PY6.

7.1.1 Definition of Participant

Each conservation kit is listed as a separate line item in the T&R system and is counted as a participant.

7.2 Impact Evaluation Gross Savings

The program distributed conservation kits consisting of 13W and 23W CFLS to customers in PY5. ADM's evaluation strategy is to first place the CFLs into one of the following categories

1) Whereabouts unknown: The customer did not receive the CFL conservation kit
2) The CFL was found to be broken upon arrival
3) The CFL has arrived, and is installed in a non-residential setting
4) The CFL has been taken to business owner's residence for residential use, or has been distributed to an employee, parishioner, etc. for residential use.
5) The CFL is in storage, and will likely replace other CFLs that arrived in the kit
6) The CFL is in storage, and will likely replace other, non-kit lamps as they burn out.

CFLs that are determined to be in categories 1, 2, and 5 above are credited zero kWh and kW impacts. CFLs that are in category 4 are evaluated according to the 2013 TRM protocols for CFLs in the residential sector. CFLs in category 3 are evaluated with nonresidential TRM protocols, and with hours of use and coincidence factors as determined from two metering studies: ADM's PY3 C/I CFL kit metering study, and ADM's PY5 C/I CFL kit metering study. CFLs in category 6 are evaluated as CFLs in category 3. However, we note that the number of CFLs determined to be in category 6 (CFLs that are shelved in the non-residential use and will replace non-kit lamps) is only about 8% of the number in category 3 (CFLs that are already installed in the nonresidential sector). In most cases, customers stated that the shelved CFLs would eventually replace CFLs that came from the same kit (category 5 above).

The fractions of distributed CFLs in each of the above six categories are determined primarily through surveys, although for the subset of PY5 C/I CFL metering study participants, ADM field engineers were able to perform on-site verification.

The hours of use for the CFLs installed in the commercial sector are determined from two relatively small metering efforts. The results of the two studies are shown in the table below.

Table 7-1: PY5 Small C/I Sector CFL Metering Results

Study	Hours	CF	N Loggers	RP @85% CL
PY5	2,129	0.44	24	33%
PY3	1,713	0.34	51	33%
All	1,846	0.37	75	19%

The nonresidential TRM protocols also include HVAC interactive effects. ADM applied the 12% and 34% values for energy and demand respectively, but also included a 70% applicability factor to account for our estimation that approximately 30% of the CFLs are not installed in air conditioned space.

As a last step, ADM identified the fraction of CFLs that were originally sent to a business, but were later distributed for residential use by the business owner. This "cross sector" sales percentage accounts for the participants and impacts reported in the residential sector below.

7.2.1 Program Sampling

The sampling scheme is a simple random sample with each separate kit[18] as the sampling unit.

[18] More accurately stated, the line item in the T&R system is the sampling unit. Some addresses received multiple or extra-large CFL kits.

Table 7-2: C/I Small Energy Efficient Buildings Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	0	0	0.00	0
Low-Income	0	0	0.00	0
Small Commercial and Industrial	2,462	2,353	0.51	133
Large Commercial and Industrial	0	0	0.00	0
Government, Non-Profit, and Institutional	159	159	0.04	9
Program Total	2,621	2,512	0.55	142

Table 7-3: C/I Small Energy Efficient Buildings Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
CFL Kits	2,621	13.6%	30	27	S,OS,L
Program Total	2,621	13.6%	30	27	
S=Survey, OS = On-Site Verification, L=Logging					

Table 7-4: PY5 C/I Small Energy Efficient Buildings Program Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits	2,512	67.6%	1,698	0.5	14.3%
Program Total	2,512	67.6%	1,698	0.5	14.3%

Table 7-5: PY5 C/I Small Energy Efficient Buildings Program Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits	0.55	52.2%	0.29	0.5	14.3%
Program Total	0.55	52.2%	0.29	0.5	14.3%

7.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

7.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

7.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

7.6 Financial Reporting

A breakdown of the program finances is presented in Table 7-6. The low TRC benefit to cost ratio is expected for PY5 because a disproportionate fraction of Phase II fixed costs are incurred in PY5. The TRC benefit to cost ratio as calculated without administrative costs is well above 1.0, suggesting that the TRC ratio will climb in subsequent years.

Table 7-6: Summary of C/I Small Energy Efficient Buildings Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$142	$142
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$142**	**$142**
Design & Development	$6	$6
Administration, Management, and Technical Assistance[1]	$392	$392
Marketing[2]	$72	$72
Subtotal EDC Implementation Costs	**$470**	**$470**
EDC Evaluation Costs	$4	$4
SWE Audit Costs	$44	$44
Total EDC Costs[3]	**$660**	**$660**
Participant Costs[4]	$91	$91
Total NPV TRC Costs[5]	**$609**	**$609**
Total NPV Lifetime Energy Benefits	$433	$433
Total NPV Lifetime Capacity Benefits	$81	$81
Total NPV TRC Benefits[6]	**$514**	**$514**
TRC Benefit-Cost Ratio[7]	**0.84**	**0.84**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

8 C/I Large Energy Efficient Equipment Program

This program provides for the implementation of cost effective, high efficiency measures through lighting, HVAC, Motors and Drives, Specialty Equipment, and Custom incentive programs. The program also offers appliance recycling, and the program component is operated in a similar manner to the residential appliance recycling program.

8.1 Program Updates

Early in PY5 the Company hired a new ICSP - CLEAResult. The program is similar in structure to PY4, however, the new CSP has updated the existing rebate application forms and calculators to comply with the 2014 PA TRM. The new CSP is also working on revamping the existing program website plus launching an online application portal; these should be ready for launch for PY6. The CSP has also rolled out number of new marketing pieces that are both, sector & measure specific. Company also has made available these marketing pieces to its own Customer Support Staff & Area Managers to use as a "leave behind" piece when they call upon their assigned accounts. To increase participation in this program, CLEAResult continues to build one-on-one relationship with large program allies and conduct outreach to small program allies through participation in trade shows and trade association and hosting table-top-display and breakfast sessions at distributors' locations. Certain custom projects such as new construction, retro-commissioning, and building envelope improvements are excluded from this program, and are redirected to the Commercial / Industrial Small Sector Efficient Buildings programs. The appliance recycling program component is new for Phase II. In October 2013 The Company imposed M&V criteria for large savings projects: All new lighting projects with expected savings above 1,000 MWh, and all new non-lighting projects with expected savings above 500 MWh, were evaluated prior to rebate approval. These thresholds have been lowered for PY6.

8.1.1 Definition of Participant

Each separate rebated project is counted as a participant.

8.2 Impact Evaluation Gross Savings

The program has three categorical components: Equipment incentives, appliance recycling, and conservation kits to multi-family establishments. The majority of the gross reported energy savings for this program were attributable to lighting measures, followed by custom projects and then prescriptive and custom motors projects, and the remainder to custom projects. The M&V methodology for this program is described below.

Gross Impact Evaluation for Efficient Equipment Incentives

The equipment incentives account for over 99% of program impacts for PY5. For each sampled project, the gross impact evaluation process starts with a desk review, and often continues to an on-site verification visits, metering or logging, and data analysis. The steps are described below for lighting projects, custom projects, and prescriptive (HVAC and food service) projects.

Lighting Projects

Each sampled lighting project first undergoes a desk review. The desk review includes reconciliation of invoices, fixture specification sheets (cut sheets), and re-calculating reported savings using TRM algorithms and/or ex ante assumptions, and identifying key parameters to be researched in the M&V plan.

Evaluation of all but the simplest of projects requires an M&V plan. The first step in the M&V planning process is to check that the project is sufficiently documented. For example, contractors working on large projects often have detailed, space-by-space inventories of the baseline and new lighting fixtures. If such detailed information is found to be lacking, ADM analysts will contact the applicant or the contractor directly, or through a request to the ICSP, and ask if such documentation is available. For large lighting projects, the M&V plan may call for sampling within the project. In such cases, the targeted precision level is ±20% at the 90% confidence level (90/20), with the sampling unit as the line item in the lighting calculator.

The desk review and M&V plan inform the data acquisition activities needed to evaluate the project. For most lighting projects, the default activities are on-site verification and logging hours of use. Most lighting projects are metered unless there is a good reason to *not* to meter[19,20]. In rare cases, the desk review process may indicate that an on-site visit would not add sufficient value to the evaluation effort. In such cases, a verification interview may suffice to reduce uncertainty regarding the project. Data analysis is finalized upon the retrieval of loggers. For projects that involve formal samples, only the

[19] The most frequent reasons are that the affected lights are installed outdoors and controlled by photocells or time clocks. Increasingly, high quality trending data are available from energy management systems, and the data may be used in-lieu of logging. Other rate cases may be customer-driven, such as the requirement for explosion proof loggers in a chemical plant.

[20] Primary and secondary schools are the general exception. TRM hours of use are applied to whole-school lighting upgrades, but logging is still recommended for projects that are confined to just one location such as a gym or library.

sampled line items are included in the realization rate calculation. This reduces uncertainty and subjectivity from the process of assigning hours of use from loggers to line items in the calculator.

As a final step in lighting project analysis, ADM analysts determine the incremental material and labor costs, and "dual-baseline" energy savings in cases that involve T12 or incandescent lamps. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to other sources as needed and described in Appendix A.

Custom Commercial and Industrial Projects

As with lighting projects, each sampled custom project undergoes a desk review prior to M&V plan construction. The desk review includes a full documentation review and if needed, additional topical research. Evaluation of most projects requires an M&V plan[21]. The first step in the M&V planning process is to check that the project is sufficiently documented, and that the evaluation engineer can articulate the mechanism or process that will yield the expected energy savings. ADM engineers are encouraged to contact the applicant early on in the M&V planning process to ask for additional documentation, clarification, or even to seek feedback on the feasibility of the proposed data acquisition and analysis methodology. The desk review and M&V plan will depend on the opportunities and constraints posed by each project. However, some defaults or "modes" are discussed for certain categories of projects below:

Air Compressor Projects: In many cases, vendors perform a baseline metering study prior to air compressor upgrades. The data collected from such studies are very useful, provided that they appear to be consistent with the overall project documentation. In many cases it is possible to use metered flow data or power data along with compressor curves to establish the facility's compressed air load profile. The energy usage of the proposed air compressor may then be derived from application of compressor curves to the compressed air load profile. Additional activities such as post-installation metering or a billing analysis may be recommended, depending on project specifics. In some cases baseline meter data are not available. In these cases ADM will meter the new air compressor and use compressor curves to establish the underlying compressed air load profile, and then determine the baseline usage through application of the baseline compressor curves and (if needed) compressor staging practices.

[21] Some projects already have transparent M&V documentation including baseline and post-implementation meter data and production records. In such cases the M&V focus shifts to analysis, rather than new research and data collection.

Water Pumping Projects: Pumping projects are typically evaluated through billing analysis, using water throughput as the normalizing variable.

General Process Improvements: For general process improvements, the evaluation determines the change in the energy usage intensity associated with the creation or maintenance of one production unit[22].

General Space and Process Cooling Improvements: Data acquisition for such projects involves the determination of independent variables that predict the cooling load (units produced, degree-days, etc.) along with utility bills, EMS trending data, or sub-metering. The data analysis may involve regressions or energy simulation models.

Prescriptive Projects

These projects are evaluated at the basic level or rigor because they tend to represent an insignificant amount of reported impacts in the program-level sampling scheme. The process verification involves a desk review and an on-site verification or verification by interview and review of invoices and other documentation.

As with lighting projects, incremental costs are evaluated as the gross impact evaluation nears completion. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to other sources as needed and described in Appendix A.

Gross Impact Evaluation for Appliance Recycling and CFL Kits

As with prescriptive projects, these projects are evaluated at the basic level or rigor because they also represent an insignificant amount of the program's reported impacts. The default evaluation activity involves telephone verification surveys coupled with calculation reviews.

8.2.1 Program Sampling

ADM evaluated the commercial and industrial programs using stratified ratio estimation. After October 2013, lighting projects with expected savings above 1,000 MWh, and other projects with expected

[22] The production unit depends on the project and is determined through documentation review and interviews with the applicant. Examples include a ton of steel produced by a mill, a desired level of dissolved oxygen in a wastewater treatment plan, a ton of refrigeration, and a day of snowmaking at a ski park.

savings above 500 MWh, were automatically selected for evaluation prior to rebate approval, and were thus placed in a 'certainty' or non-sampling stratum[23].

At the end of the second and fourth quarter ADM reviewed tracking data to define a discrete list of rebates that became the sample population for that quarter. Once separated into their respective operating companies and programs, this population was then stratified according to qualitative measure categories, and then by quantitative subcategories defined by expected energy savings. ADM used a coefficient of variation (CV) of 0.5 for all projects.

Table 8-1: PY5 C/I Large Energy Efficient Equipment Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	0	0	0.00	0
Low-Income	0	0	0.00	0
Small Commercial and Industrial	0	0	0.00	0
Large Commercial and Industrial	47	14,523	1.67	713
Government, Non-Profit, and Institutional	36	3,603	0.39	177
Program Total	83	18,125	2.06	890

[23] In this program there was one formal "above threshold" lighting project in the certainty stratum. However, the customer involved was found to have 18 other lighting projects at the same manufacturing facility. All 19 projects were placed in to the certainty stratum. The other 18 projects were approved prior to evaluation, thus the realization rate is not identically 100% for the certainty stratum.

Table 8-2: C/I Large Efficient Equipment Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
CFL Kits-1	31	100.0%	31	31	S,OS,L
Lighting-1	2	50.9%	1	1	DR,OS,L,B
Lighting-2	7	23.6%	4	4	DR,OS,L,B
Lighting-3	29	49.1%	2	2	DR,OS,L,B
Lighting-4	0	n/a	0	0	DR,OS,L,B
Custom-1	7	43.0%	2	2	DR,OS,M,B,ES
Custom-2	0	n/a	0	0	DR,OS,M,B,ES
Custom-3	0	n/a	0	0	DR,OS,M,B,ES
Custom-4	0	n/a	0	0	DR,OS,M,B,ES
HVAC and DHW-1	0	n/a	0	0	DR,OS,S
HVAC and DHW-2	1	n/a	0	0	DR,OS,S
Appliance Turn-in-1	0	n/a	0	0	S
Appliance Turn-in-2	0	n/a	0	0	S
Kitchen/Appliances-1	0	n/a	0	0	DR,OS
Kitchen/Appliances-2	0	n/a	0	0	DR,OS
Certainty-1	6	0.0%	6	6	DR,OS,L,M,B,ES
Program Total	83	13.5%	46	46	

DR=Desk Review, S=Survey, OS = On-Site Verification, L=Logging, M=Metering, B=Billing Analysis. Not all activities are performed for all projects or strata.

Table 8-3: PY5 C/I Large Energy Efficient Equipment Program
Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits-1	150	100.0%	150	0.5	100.0%
Lighting-1	1,696	38.1%	647	0.5	50.9%
Lighting-2	3,623	75.6%	2,740	0.5	23.6%
Lighting-3	4,155	101.6%	4,222	0.5	49.1%
Lighting-4	0	n/a	0	0.5	0.0%
Custom-1	1,286	91.1%	1,171	0.5	43.0%
Custom-2	0	n/a	0	0.5	0.0%
Custom-3	0	n/a	0	0.5	0.0%
Custom-4	0	n/a	0	0.5	0.0%
HVAC and DHW-1	0	n/a	0	0.5	0.0%
HVAC and DHW-2	1	n/a	0	0.5	0.0%
Appliance Turn-in-1	0	n/a	0	0.5	0.0%
Appliance Turn-in-2	0	n/a	0	0.5	0.0%
Kitchen/Appliances-1	0	n/a	0	0.5	0.0%
Kitchen/Appliances-2	0	n/a	0	0.5	0.0%
Certainty-1	7,214	102.4%	7,387	0.5	0.0%
Program Total	18,125	90.0%	16,319		13.8%

Table 8-4: PY5 C/I Large Energy Efficient Equipment Program
Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits-1	0.01	100.0%	0.01	0.5	100.0%
Lighting-1	0.11	102.6%	0.12	0.5	50.9%
Lighting-2	0.42	122.6%	0.51	0.5	23.6%
Lighting-3	0.48	125.6%	0.61	0.5	49.1%
Lighting-4	0.00	n/a	0.00	0.5	0.0%
Custom-1	0.15	88.3%	0.13	0.5	43.0%
Custom-2	0.00	n/a	0.00	0.5	0.0%
Custom-3	0.00	n/a	0.00	0.5	0.0%
Custom-4	0.00	n/a	0.00	0.5	0.0%
HVAC and DHW-1	0.00	n/a	0.00	0.5	0.0%
HVAC and DHW-2	0.00	n/a	0.00	0.5	0.0%
Appliance Turn-in-1	0.00	n/a	0.00	0.5	0.0%
Appliance Turn-in-2	0.00	n/a	0.00	0.5	0.0%
Kitchen/Appliances-1	0.00	n/a	0.00	0.5	0.0%
Kitchen/Appliances-2	0.00	n/a	0.00	0.5	0.0%
Certainty-1	0.89	100.8%	0.90	0.5	0.0%
Program Total	2.06	110.1%	2.27		14.6%

8.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

8.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

8.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

8.6 Financial Reporting

A breakdown of the program finances is presented in Table 8-5.

Table 8-5: Summary of C/I Large Energy Efficient Equipment Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$890	$890
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$890**	**$890**
Design & Development	$4	$4
Administration, Management, and Technical Assistance[1]	$447	$447
Marketing[2]	$53	$53
Subtotal EDC Implementation Costs	**$504**	**$504**
EDC Evaluation Costs	$34	$34
SWE Audit Costs	$31	$31
Total EDC Costs[3]	**$1,459**	**$1,459**
Participant Costs[4]	$3,811	$3,811
Total NPV TRC Costs[5]	**$4,379**	**$4,379**
Total NPV Lifetime Energy Benefits	$8,996	$8,996
Total NPV Lifetime Capacity Benefits	$1,145	$1,145
Total NPV TRC Benefits[6]	**$10,141**	**$10,141**
TRC Benefit-Cost Ratio[7]	**2.32**	**2.32**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

9 C/I Large Energy Efficient Buildings Program

This is a new program for Phase II. The program includes custom "whole building" projects such as new construction, retro-commissioning, and building envelope improvements. The program did not have any participants in PY5.

9.1 Program Updates

In early PY5, the Company hired a new ICSP - CLEAResult. In Q3 & Q4 of PY5, through the launch of the C&I Kits program, we have achieved certain level of savings in this program. However, to date, we have not approved building performance type projects in this program. The new CSP has updated the existing program website to launch this new program. Plus the CSP also updated the existing calculators to comply with the 2014 PA TRM. To increase participation in this program, CLEAResult in marketing this program to upstream program allies – e.g., consulting engineers, designers, & building owners and operators. CLEAResult is also promoting this program to organizations like US Green Building Council and Green Building Alliance. To help ease the participation in this program, CLEAResult has created a corporate level technical team that works directly with customer's design team. In October 2013 The Company imposed M&V criteria for large savings projects: All new lighting projects with expected savings above 1,000 MWh, and all new non-lighting projects with expected savings above 500 MWh, were evaluated prior to rebate approval. These thresholds have been lowered for PY6.

9.1.1 Definition of Participant

This program had no participants in PY5.

9.2 Impact Evaluation Gross Savings

This program had no reported gross impacts in PY5.

9.2.1 Program Sampling

This program had no participants in PY5.

Table 9-1: C/I Large Energy Efficient Buildings Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	0	0	0.00	0
Low-Income	0	0	0.00	0
Small Commercial and Industrial	0	0	0.00	0
Large Commercial and Industrial	0	0	0.00	0
Government, Non-Profit, and Institutional	0	0	0.00	0
Program Total	0	0	0.00	0

Table 9-2: C/I Large Energy Efficient Buildings Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
CFL Kits	0	n/a	0	0	**S,OS,L**
Program Total	0	n/a	0	0	
S=Survey, OS = On-Site Verification, L=Logging					

Table 9-3: PY5 C/I Large Energy Efficient Buildings Program Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits	0	n/a	n/a	n/a	n/a
Program Total	0	n/a	n/a	n/a	n/a

Table 9-4: PY5 C/I Large Energy Efficient Buildings Program Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits	0.00	n/a	n/a	n/a	n/a
Program Total	0.00	n/a	n/a	n/a	n/a

9.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

9.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

9.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

9.6 Financial Reporting

A breakdown of the program finances is presented in Table 9-5. The low TRC benefit to cost ratio is due to a lack of participation in PY5. This program promotes complex and capital cost improvements and requires extensive training for trade allies and lengthy M&V review of incoming applications. As such, the program is expected to be the last in the portfolio to ramp up to full capacity.

Table 9-5: Summary of Large Energy Efficient Buildings Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$0	$0
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$0**	**$0**
Design & Development	$2	$2
Administration, Management, and Technical Assistance[1]	$148	$148
Marketing[2]	$19	$19
Subtotal EDC Implementation Costs	**$170**	**$170**
EDC Evaluation Costs	$2	$2
SWE Audit Costs	$17	$17
Total EDC Costs[3]	**$189**	**$189**
Participant Costs[4]	$0	$0
Total NPV TRC Costs[5]	**$189**	**$189**
Total NPV Lifetime Energy Benefits	$0	$0
Total NPV Lifetime Capacity Benefits	$0	$0
Total NPV TRC Benefits[6]	**$0**	**$0**
TRC Benefit-Cost Ratio[7]	**0.00**	**0.00**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus EDC Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

10 Government and Institutional Program

This program provides for the implementation of cost effective, high efficiency measures through lighting, HVAC, appliances, multifamily and audit programs. Participation in most measures are restricted to certain rate classes that are designated to nonprofit organizations.

10.1 Program Updates

Early in PY5 the Company hired a new ICSP - CLEAResult. The program is similar in structure to PY4, however, the new CSP has updated the existing rebate application forms and calculators to comply with the 2014 PA TRM. The new CSP is also working on revamping the existing program website plus launching an online application portal; these should be ready for launch for PY6. The CSP has also rolled out number of new marketing pieces that are targeted at customers in this sector. To increase participation in this program, CLEAResult is meeting one-on-on with customers such as colleges, universities and hospitals. For small municipalities, CLEAResult is undertaking targeting mailing and participates in trade shows that attract these customers. The Company is also leveraging its Customer Support Staff and Area Managers to directly target decision makers in this sector. The appliance recycling program component is new for Phase II. In October 2013 The Company imposed M&V criteria for large savings projects: All new lighting projects with expected savings above 1,000 MWh, and all new non-lighting projects with expected savings above 500 MWh, were evaluated prior to rebate approval. These thresholds have been lowered for PY6.

10.1.1 Definition of Participant

Each separate rebated project is counted as a participant.

10.2 Impact Evaluation Gross Savings

The program has three categorical components: Equipment incentives, appliance recycling, and conservation kits to multi-family establishments. The majority of the gross reported energy savings for this program were attributable to lighting measures, followed by custom projects and then prescriptive and custom motors projects, and the remainder to custom projects. The M&V methodology for this program is described below.

Gross Impact Evaluation for Efficient Equipment Incentives

The equipment incentives account for all program impacts for PY5. For each sampled project, the gross impact evaluation process starts with a desk review, and often continues to an on-site verification visits, metering or logging, and data analysis. The steps are described below for lighting projects, custom projects, and prescriptive (HVAC and food service) projects.

Lighting Projects

Each sampled lighting project first undergoes a desk review. The desk review includes reconciliation of invoices, fixture specification sheets (cut sheets), and re-calculating reported savings using TRM algorithms and/or ex ante assumptions, and identifying key parameters to be researched in the M&V plan.

Evaluation of all but the simplest of projects requires an M&V plan. The first step in the M&V planning process is to check that the project is sufficiently documented. For example, contractors working on large projects often have detailed, space-by-space inventories of the baseline and new lighting fixtures. If such detailed information is found to be lacking, ADM analysts will contact the applicant or the contractor directly, or through a request to the ICSP, and ask if such documentation is available. For large lighting projects, the M&V plan may call for sampling within the project. In such cases, the targeted precision level is ±20% at the 90% confidence level (90/20), with the sampling unit as the line item in the lighting calculator.

The desk review and M&V plan inform the data acquisition activities needed to evaluate the project. For most lighting projects, the default activities are on-site verification and logging hours of use. Most lighting projects are metered unless there is a good reason to *not* to meter[24,25]. In rare cases, the desk review process may indicate that an on-site visit would not add sufficient value to the evaluation effort. In such cases, a verification interview may suffice to reduce uncertainty regarding the project. Data analysis is finalized upon the retrieval of loggers. For projects that involve formal samples, only the sampled line items are included in the realization rate calculation. This reduces uncertainty and subjectivity from the process of assigning hours of use from loggers to line items in the calculator.

As a final step in lighting project analysis, ADM analysts determine the incremental material and labor costs, and "dual-baseline" energy savings in cases that involve T12 or incandescent lamps. In estimating

[24] The most frequent reasons are that the affected lights are installed outdoors and controlled by photocells or time clocks. Increasingly, high quality trending data are available from energy management systems, and the data may be used in-lieu of logging. Other rate cases may be customer-driven, such as the requirement for explosion proof loggers in a chemical plant.

[25] Primary and secondary schools are the general exception. TRM hours of use are applied to whole-school lighting upgrades, but logging is still recommended for projects that are confined to just one location such as a gym or library.

the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database.

Custom Commercial and Industrial Projects

As with lighting projects, each sampled custom project undergoes a desk review prior to M&V plan construction. The desk review includes a full documentation review and if needed, additional topical research. Evaluation of most projects requires an M&V plan[26]. The first step in the M&V planning process is to check that the project is sufficiently documented, and that the evaluation engineer can articulate the mechanism or process that will yield the expected energy savings. ADM engineers are encouraged to contact the applicant early on in the M&V planning process to ask for additional documentation, clarification, or even to seek feedback on the feasibility of the proposed data acquisition and analysis methodology. The desk review and M&V plan will depend on the opportunities and constraints posed by each project. However, some defaults or "modes" are discussed for certain categories of projects below:

Air Compressor Projects: In many cases, vendors perform a baseline metering study prior to air compressor upgrades. The data collected from such studies are very useful, provided that they appear to be consistent with the overall project documentation. In many cases it is possible to use metered flow data or power data along with compressor curves to establish the facility's compressed air load profile. The energy usage of the proposed air compressor may then be derived from application of compressor curves to the compressed air load profile. Additional activities such as post-installation metering or a billing analysis may be recommended, depending on project specifics. In some cases baseline meter data are not available. In these cases ADM will meter the new air compressor and use compressor curves to establish the underlying compressed air load profile, and then determine the baseline usage through application of the baseline compressor curves and (if needed) compressor staging practices.

Water Pumping Projects: Pumping projects are typically evaluated through billing analysis, using water throughput as the normalizing variable.

[26] Some projects already have transparent M&V documentation including baseline and post-implementation meter data and production records. In such cases the M&V focus shifts to analysis, rather than new research and data collection.

General Process Improvements: For general process improvements, the evaluation determines the change in the energy usage intensity associated with the creation or maintenance of one production unit[27].

General Space and Process Cooling Improvements: Data acquisition for such projects involves the determination of independent variables that predict the cooling load (units produced, degree-days, etc.) along with utility bills, EMS trending data, or sub-metering. The data analysis may involve regressions or energy simulation models.

Prescriptive Projects

These projects are evaluated at the basic level or rigor because they tend to represent an insignificant amount of reported impacts in the program-level sampling scheme. The process verification involves a desk review and an on-site verification or verification by interview and review of invoices and other documentation.

As with lighting projects, incremental costs are evaluated as the gross impact evaluation nears completion. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to other sources as needed and described in Appendix A.

Gross Impact Evaluation for Appliance Recycling and CFL Kits

As with prescriptive projects, these projects are evaluated at the basic level or rigor because they also represent an insignificant amount of the program's reported impacts. The default evaluation activity involves telephone verification surveys coupled with calculation reviews.

10.2.1 Program Sampling

Eight of the 17 projects completed in PY5 were sampled, including the two projects with the highest expected impacts. The relative precision was approximately 9%.

[27] The production unit depends on the project and is determined through documentation review and interviews with the applicant. Examples include a ton of steel produced by a mill, a desired level of dissolved oxygen in a wastewater treatment plan, a ton of refrigeration, and a day of snowmaking at a ski park.

Table 10-1: PY5 C/I Large Energy Efficient Equipment Program Reported Results by Customer Sector

Sector	Participants	Reported Gross Energy Savings (MWh/yr)	Reported Gross Demand Reduction (MW)	Incentives ($1,000)
Residential	0	0	0.00	0
Low-Income	0	0	0.00	0
Small Commercial and Industrial	0	0	0.00	0
Large Commercial and Industrial	0	0	0.00	0
Government, Non-Profit, and Institutional	17	833	0.12	36
Program Total	17	833	0.12	36

Table 10-2: C/I Large Energy Efficient Equipment Program Sampling Strategy for PY5

Stratum	Population Size	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
CFL Kits-1	0	n/a	0	0	S,OS,L
Lighting-1	2	0.0%	2	2	DR,OS,L,B
Lighting-2	15	22.8%	6	6	DR,OS,L,B
Lighting-3	0	n/a	0	0	DR,OS,L,B
Lighting-4	0	n/a	0	0	DR,OS,L,B
Custom-1	0	n/a	0	0	DR,OS,M,B,ES
Custom-2	0	n/a	0	0	DR,OS,M,B,ES
Custom-3	0	n/a	0	0	DR,OS,M,B,ES
Custom-4	0	n/a	0	0	DR,OS,M,B,ES
HVAC and DHW-1	0	n/a	0	0	DR,OS,S
HVAC and DHW-2	0	n/a	0	0	DR,OS,S
Appliance Turn-in-1	0	n/a	0	0	S
Appliance Turn-in-2	0	n/a	0	0	S
Kitchen/Appliances-1	0	n/a	0	0	DR,OS
Kitchen/Appliances-2	0	n/a	0	0	DR,OS
Certainty-1	0	n/a	0	0	DR,OS,L,M,B,ES
Program Total	17	12.1%	8	8	

DR=Desk Review, S=Survey, OS = On-Site Verification, L=Logging, M=Metering, B=Billing Analysis. Not all activities are performed for all projects or strata.

Table 10-3: PY5 C/I Large Energy Efficient Equipment Program
Summary of Evaluation Results for Energy

Stratum	Reported Gross Energy Savings (MWh/yr)	Energy Realization Rate (%)	Verified Gross Energy Savings (MWh/yr)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits-1	0	n/a	0	0.5	0.0%
Lighting-1	426	85.7%	365	0.5	0.0%
Lighting-2	407	60.1%	245	0.5	22.8%
Lighting-3	0	n/a	0	0.5	0.0%
Lighting-4	0	n/a	0	0.5	0.0%
Custom-1	0	n/a	0	0.5	0.0%
Custom-2	0	n/a	0	0.5	0.0%
Custom-3	0	n/a	0	0.5	0.0%
Custom-4	0	n/a	0	0.5	0.0%
HVAC and DHW-1	0	n/a	0	0.5	0.0%
HVAC and DHW-2	0	n/a	0	0.5	0.0%
Appliance Turn-in-1	0	n/a	0	0.5	0.0%
Appliance Turn-in-2	0	n/a	0	0.5	0.0%
Kitchen/Appliances-1	0	n/a	0	0.5	0.0%
Kitchen/Appliances-2	0	n/a	0	0.5	0.0%
Certainty-1	0	n/a	0	0.5	0.0%
Program Total	833	73.2%	610		9.1%

Table 10-4: PY5 I Large Energy Efficient Equipment Program
Summary of Evaluation Results for Demand

Stratum	Reported Gross Demand Savings	Demand Realization Rate (%)	Verified Gross Demand Savings (MW)	Observed Coefficient of Variation (C_v) or Proportion in Sample Design	Relative Precision at 85% C.L.
CFL Kits-1	0.00	n/a	0.00	0.5	0.0%
Lighting-1	0.07	69.5%	0.05	0.5	0.0%
Lighting-2	0.05	57.1%	0.03	0.5	22.8%
Lighting-3	0.00	n/a	0.00	0.5	0.0%
Lighting-4	0.00	n/a	0.00	0.5	0.0%
Custom-1	0.00	n/a	0.00	0.5	0.0%
Custom-2	0.00	n/a	0.00	0.5	0.0%
Custom-3	0.00	n/a	0.00	0.5	0.0%
Custom-4	0.00	n/a	0.00	0.5	0.0%
HVAC and DHW-1	0.00	n/a	0.00	0.5	0.0%
HVAC and DHW-2	0.00	n/a	0.00	0.5	0.0%
Appliance Turn-in-1	0.00	n/a	0.00	0.5	0.0%
Appliance Turn-in-2	0.00	n/a	0.00	0.5	0.0%
Kitchen/Appliances-1	0.00	n/a	0.00	0.5	0.0%
Kitchen/Appliances-2	0.00	n/a	0.00	0.5	0.0%
Certainty-1	0.00	n/a	0.00	0.5	0.0%
Program Total	0.12	64.0%	0.08		9.0%

10.3 Impact Evaluation Net Savings

The NTG research for this program started in PY6 and is being conducted according to the evaluation team's net savings evaluation plan. The NTG findings, including the sampling and results tables, will be discussed in the PY6 report.

10.4 Process Evaluation

A process evaluation is planned for each program during Phase II. The results of the Phase II process evaluations will be attached to subsequent Phase II annual reports.

10.5 Recommendations for Program

The recommendations for each program, along with the Company's disposition to the recommendations, will be reported in the PY6 annual report.

10.6 Financial Reporting

A breakdown of the program finances is presented in Table 10-5. The low TRC benefit to cost ratio is expected for PY5 because a disproportionate fraction of Phase II fixed costs are incurred in PY5. The low TRC for PY5 is in part attributable to customers with low lighting hours of use opting to install premium efficiency (and high incremental cost) solid state lighting. In these cases the 15-year cap on the TRC calculation may be limiting the TRC benefit to cost ratios.

Table 10-5: Summary of Large Energy Efficient Equipment Program Finances

	PYTD ($1,000)	Phase II ($1,000)
EDC Incentives to Participants	$36	$36
EDC Incentives to Trade Allies	$0	$0
Subtotal EDC Incentive Costs	**$36**	**$36**
Design & Development	$4	$4
Administration, Management, and Technical Assistance[1]	$433	$433
Marketing[2]	$61	$61
Subtotal EDC Implementation Costs	**$498**	**$498**
EDC Evaluation Costs	$2	$2
SWE Audit Costs	$28	$28
Total EDC Costs[3]	**$565**	**$565**
Participant Costs[4]	$265	$265
Total NPV TRC Costs[5]	**$794**	**$794**
Total NPV Lifetime Energy Benefits	$229	$229
Total NPV Lifetime Capacity Benefits	$27	$27
Total NPV TRC Benefits[6]	**$256**	**$256**
TRC Benefit-Cost Ratio[7]	**0.32**	**0.32**

NOTES

Per PUC direction, TRC inputs and calculations are required in the Annual Report only and should comply with the 2013 Total Resource Cost Test Order. Please see the "Report Definitions" section of this report for more details.

[1] Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.
[2] Includes the marketing CSP and marketing costs by program CSPs.
[3] Per the 2013 Total Resource Cost Test Order, the Total EDC Costs refer to EDC incurred expenses only. EDC costs include EDC Incentive Costs; Design & Development; Administration, Management, Technical Assistance; Marketing, EDC Evaluation Costs, and SWE Audit Costs categories.
[4] Per the 2013 Total Resource Cost Test Order, the Participant Costs are the costs for the end-use customer.
[5] Total TRC Costs includes Total EDC Costs and Participant Costs, minus Incentive Costs.
[6] Total TRC Benefits equals the sum of Total Lifetime Energy Benefits and Total Lifetime Capacity Benefits. Based upon verified gross kWh and kW savings. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase I are not to be included as a part of Total TRC Benefits for Phase II.
[7] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Appendix A: EM&V Information

Participant Definitions

Table A-0-1: Program Year 5 Participant Definition by Program[28]

Program	Participant Definition	Can there be more than one measure per participant?	Sample Defined By:
EE Products: Upstream Lighting	One package of lamps	Yes	Achieved Census
EE Products: Upstream Televisions	One Television	Yes	Achieved Census
EE Products: Refrigerators / Freezers	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Heat Pump Water Heaters	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: ASHP	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Clothes Washers	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: GSHP	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: HVAC Tune-Ups	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Dehumidifiers	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: CAC	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Mini-split HP	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: RAC	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Smart Strips	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Upstream Smart Strips	Unique Account # in PY5 Tracking Data	Yes	Achieved Census
EE Products: Electric Resistance Water Heaters	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Upstream Computers/Monitors	Unique Account # in PY5 Tracking Data	Yes	Achieved Census
EE Products: Solar Water Heaters	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: ECM Fans	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Dishwashers	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Mini-split AC	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
EE Products: Tune-Up with ECM	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
Appliance Turn-In: Refrigerators	Unique Account # in PY5 Tracking Data	No	Each Appliance
Appliance Turn-In: Freezers	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
Appliance Turn-In: RACs	Unique Account # in PY5 Tracking Data	Yes	Each Appliance
HEA: HEA Kits	Unique Account # in PY5 Tracking Data	No (although the kit itself does have	Each Kit

[28] EDCs can modify table as necessary to provide additional granularity.

Program	Participant Definition	Can there be more than one measure per participant?	Sample Defined By:
		several measures)	
HEA: School Kits	Unique Account # in PY5 Tracking Data	No (the kit is the measure)	Each Kit
HEA: New Construction	Unique Account # in PY5 Tracking Data	No (the home is the measure)	Each Home
HEA: Direct Install, Prescriptive Measures	Unique Account # in PY5 Tracking Data	Yes	Each itemized measure
HEA: Weatherization, > 2MWh	Unique Account # in PY5 Tracking Data	Yes	Each home
HEA: Weatherization, < 2MWh	Unique Account # in PY5 Tracking Data	Yes	Each home
HEA: Home Energy Reports	Unique Account # in PY5 Tracking Data	No	Each home
Low-Income - Lighting Giveaway	One lamp	No	Achieved Census
Low-Income - Furnace Whistle Giveaway	One Furnace Whistle	No	Achieved Census
Low-Income - Showerhead Giveaway	One Showerhead	No	Achieved Census
Low-Income - LED Night Light Giveaway	One LED Night Light	No	Achieved Census
Low-Income - Aerator Giveaway	One Aerator	No	Achieved Census
Low-Income - Direct Install	One Home	Yes	Each Home
Low-Income - LILU Conservation kits	One Kit	No	Each Kit
Nonresidential Programs – Conservation Kit	One Kit	Yes	Each Kit
Nonresidential Programs – Appliance Recycling	One rebate	Yes	Each rebate
Nonresidential Programs – All other projects	One Rebate	Yes	Each rebate

Program Year 5 Evaluation Activities

Table A-0-2: Program Year 5 Actual Evaluation Activities

Programs (Sub Programs if necessary)	Sectors	Records Review	Participant Surveys	Nonparticipant Surveys	Site Visits	Metering[29]	
Upstream Lighting	Res EE Products	Census	827	0	0	0	31,826
Upstream Televisions	Res EE Products	Census	0	0	0	0	3,739
Refrigerators / Freezers	Res EE Products	5	15	0	0	0	416
Heat Pump Water Heaters	Res EE Products	3	9	0	0	0	145
ASHP	Res EE Products	6	14	0	0	0	500
Clothes Washers	Res EE Products	11	31	0	0	0	336
GSHP	Res EE Products	4	6	0	0	0	224
HVAC Tune-Ups	Res EE Products	40	24	0	0	0	422

[29] Does not include statistical billing analysis

Dehumidifiers	Res EE Products	2	6	0	0	0	87
CAC	Res EE Products	1	7	0	0	0	53
Mini-split HP	Res EE Products	0	0	0	0	0	12
RAC	Res EE Products	1	0	0	0	0	2
Smart Strips	Res EE Products	0	0	0	0	0	0
Upstream Smart Strips	Res EE Products	Census	0	0	0	0	28
Resistance Water Heaters	Res EE Products	3	0	0	0	0	3
Upstream Computers/Monitors	Res EE Products	Census	0	0	0	0	5
Solar Water Heaters	Res EE Products	0	0	0	0	0	0
ECM Fans	Res EE Products	3	0	0	0	0	1
Dishwashers	Res EE Products	1	0	0	0	0	0
Mini-split AC	Res EE Products	0	0	0	0	0	0
Tune-Up with ECM	Res EE Products	0	0	0	0	0	1
Refrigerators	Res Appliance Turn-In	Census	52	0	0	0	5,292
Freezers	Res Appliance Turn-In	Census	24	0	0	0	1,499
RACs	Res Appliance Turn-In	Census	25	0	0	0	72
HEA Kits	Res Home Energy Audits	Census	189	0	0	0	10,088
School Kits	Res Home Energy Audits	Census	515	0	0	0	1,910
New Construction	Res Home Energy Audits	3	0	0	0	0	565
Direct Install, Prescriptive	Res Home Energy Audits	Census	0	0	0	0	49
Weatherization, > 2MWh	Res Home Energy Audits	0	0	0	0	4 (billing)	37
Weatherization, < 2MWh	Res Home Energy Audits	Census (Tracking Data Review)	0	0	0	0	7
Home Energy Reports	Res Home Energy Audits	0	0	0	0	0	39,604
Giveaway Measures	Low-Income Res	Census	0	0	0	0	782
Direct Install	Low-Income Res	30	0	0	30	0	306
Conservation Kits	Low-Income Res	Census	138	0	0	0	634
C/I CFL Kits	25	25	0	20 (across all EDCs)	18 (all EDCs)	288	25
C/I Lighting	17	0	0	17	13	4,520	17
C/I Custom	3	0	0	1	1 (plus 1 billing)	983	3
C/I HVAC and DHW	4	0	0	0	0	44	4
C/I Appliance Recycling	All	0	0	0	0	16	All
C/I Kitchen/Appliances	5	0	0	5	0	44	5
C/I Certainty Projects	2	0	0	1	1	1,897	2

Appendix B: TRC Incremental Costs

Incremental costs for most measures offered in the residential sector are taken from the Incremental Cost Database provided by the SWE (SWE IC DB). To facilitate TRC calculations for certain programs, the verified impacts and incremental costs are calculated individually for all evaluated measures, and then are cast into per-unit average impacts and incremental costs, with the incremental costs weighted by gross verified energy savings. For example, the first line in the table below shows a cost of $7.70 for the average package of lamps sold through the upstream lighting program. Exact costs are known for certain measures such as energy conservation kits in the residential sector.

For 'early replacement' measures, exact costs from invoices are preferred to other cost estimates. In the residential sector, exact costs are known for the energy conservation kits distributed by the Home Performance Program and the Low-Income Low-Use program component are provided by the Company. Though the costs of the low-income audits are known, they are incorporated into TRC costs as program administration costs rather than participant costs. For appliance recycling, the incentive cost is taken to approximate the incremental cost of participation, as it is assumed that the incentive is greater or equal to the residual value of the appliance.

For nonresidential measures, ADM develops a project-specific incremental cost for each evaluated project. The program-level incremental cost is developed through the application of the same sample weights as those used to determine verified gross impacts. For nonresidential projects, the order of preference for material and labor costs is as follows: Invoices, SWE IC DB, DEER 2008 Incremental Cost Database (escalated 15% to account for inflation) and industry research. The incremental material cost for most projects is derived from invoices. The SWE IC DB provides costs for the most frequently encountered fixture types, but there are many relatively rare fixture types that are not listed. To expand the applicability of the SWE IC DB to all fixture types listed in the TRM Appendix C, ADM modeled the linear fluorescent fixture costs in the SWE IC DB as a function of wattage, the number of lamps, and lamp types, then applied the modeled costs to all linear fluorescents listed in Appendix C. A similar process, starting with the DEER 2008 incremental cost database, yielded costs for all HID lamp types.

Incremental costs for new construction lighting projects were derived in a two-step process. First, the actual cost of installed fixtures was determined (almost exclusively from invoices). The cost of meeting the baseline lighting power density allowance with typical fixtures (T5, T8, HID, as appropriate for the space type) was then calculated from the aforementioned per-fixture cost models. The incremental cost is taken as the actual cost of the installed fixtures minus the cost of the baseline fixtures. Projects that achieved savings through more efficient application of lamps, rather than relying on premium efficiency lamps, have negative incremental costs (e.g. a customer could have installed 100 fixtures, but installed 77 instead).

Incremental costs for Non lighting measures were taken from SWE IC DB costs in 'replace on burnout' scenarios, and from invoices for early replacement measures. If labor costs were not available in invoices, ADM used labor to material cost fractions as published in or extrapolated from the DOE Report, *Process Equipment Cost Estimation, and Final Report*[30].

Program	Measure	Incremental Cost	Incremental Cost Source
Residential EE Products	Upstream Lighting	7.96	SWE IC DB (Weighted average per package is reported in this table.)
Residential EE Products	Upstream Televisions	1.00	EE&C Plan
Residential EE Products	Refrigerators / Freezers	26.79	SWE IC DB (Weighted for Freezer/Frig Mix)
Residential EE Products	Heat Pump Water Heaters	1,045.00	SWE IC DB
Residential EE Products	ASHP	1,583.41	SWE IC DB (Weighted for tonnage, HSPF)
Residential EE Products	Clothes Washers	150.00	SWE IC DB
Residential EE Products	GSHP	10,897.00	SWE IC DB
Residential EE Products	HVAC Tune-Ups	88.00	SWE IC DB
Residential EE Products	Dehumidifiers	20.00	SWE IC DB
Residential EE Products	CAC	1,670.86	SWE IC DB (Weighted for tonnage, SEER)
Residential EE Products	Mini-split HP	447.75	SWE IC DB
Residential EE Products	RAC	50.00	SWE IC DB
Residential EE Products	Smart Strips	21.00	SWE IC DB
Residential EE Products	Upstream Smart Strips	21.00	SWE IC DB
Residential EE Products	Electric Resistance Water Heaters	89.40	SWE IC DB
Residential EE Products	Upstream Computers/Monitors	1.00	EE&C Plan
Residential EE Products	Solar Water Heaters	7,414.00	SWE IC DB
Residential EE Products	ECM Fans	360.00	SWE IC DB
Residential EE Products	Dishwashers	10.00	SWE IC DB
Residential EE Products	Mini-split AC	447.75	SWE IC DB
Residential EE Products	Tune-Up with ECM	448.00	SWE IC DB
Residential Appliance Turn-In	Refrigerators	50.00	Assume Incentive ≈Incremental Cost
Residential Appliance Turn-In	Freezers	50.00	Assume Incentive ≈Incremental Cost
Residential Appliance Turn-In	RACs	25.00	Assume Incentive ≈Incremental Cost
Residential Home Performance	HEA Kits	43.24	Invoices

[30] *Process Equipment Cost Estimation, Final Report,* H.P. Loh, Jennifer Lyons, and Charles White, III. DOE/NETL-2002.1169, 2002. The labor factors in Table 6 are extrapolated to other equipment such as air compressors.

Program	Measure	Incremental Cost	Incremental Cost Source
Residential Home Performance	School Kits	42.03	Invoices
Residential Home Performance	New Construction	2,561.00	SWE DB
Residential Home Performance	Weatherization, > 2MWh - Per kWh saved	1.06	invoice review
Residential Home Performance	Weatherization, > 2MWh - Per kWh saved	1.06	invoice review
Residential Home Performance	Air Sealing (per home)	1,050.00	SWE DB
Residential Home Performance	20W CFL	2.50	SWE DB
Residential Home Performance	13W CFL	2.50	SWE DB
Residential Home Performance	Attic Insulation	1.85	SWE DB
Residential Home Performance	23W CFL	3.00	SWE DB
Residential Home Performance	Dimmable CFL (27W)	3.00	SWE DB
Residential Home Performance	3 Way CFL	3.00	SWE DB
Residential Home Performance	Energy-Savings Surge Protector	21.00	SWE DB
Residential Home Performance	DHW Pipe Insulation 1ft	3.00	SWE DB
Residential Home Performance	Showerhead	6.00	SWE DB
Residential Home Performance	LED Night Light	2.00	SWE DB
Residential Home Performance	Bath Aerator	2.00	SWE DB
Residential Home Performance	Furnace Whistle	2.00	SWE DB
Residential Home Performance	Kitchen Aerator	2.00	SWE DB
Residential Home Performance	Windows (per 100 sqft)	325.00	SWE DB
Residential Home Performance	Test Out	250.00	Estimate - based on incentive
Residential Home Performance	Test In	250.00	Estimate - based on incentive

Program	Measure	Incremental Cost	Incremental Cost Source
Residential Home Performance	DHW Pipe Insulation - WPP	3.00	SWE DB
Residential Home Performance	Showerhead - WPP	6.00	SWE DB
Residential Home Performance	13W CFL - WPP	2.50	SWE DB
Residential Home Performance	Bath aerator - WPP	2.00	SWE DB
Residential Home Performance	Energy-Savings Surge Protector - WPP	21.00	SWE DB
Residential Home Performance	20W CFL - WPP	2.50	SWE DB
Residential Home Performance	23W CFL - WPP	3.00	SWE DB
Residential Home Performance	Kitchen aerator - WPP	2.00	SWE DB
Residential Home Performance	3 Way CFL - WPP	3.00	SWE DB
Residential Home Performance	LED Night Light - WPP	2.00	SWE DB
Residential Home Performance	Home Energy Reports	0.00	All costs reported as admin costs
Low Income Program	All Measures	0.00	All costs reported as admin costs
Small C/I Equipment	13-4051- Lighting-3	149,619.00	material: Invoice, labor: SWE DB
Small C/I Equipment	13-4052- Lighting-1	100,220.36	material: Invoice, labor: Invoice
Small C/I Equipment	13-4053- Lighting-1	163,227.00	material: Invoice, labor: Invoice
Small C/I Equipment	13-4055- Lighting-2	37,962.00	material: Invoice, labor: SWE DB
Large C/I Equipment	13-4903-Certainty-1	361,424.00	material: Audit report, labor: Audit report
Large C/I Equipment	13-4071- Lighting-2	172,929.90	material: Invoice, labor: SWE DB/DEER
Small C/I Equipment	13-4023- Kitchen/Appliances-1	1,821.00	material: EnergyStar Calculator, labor:
Small C/I Equipment	13-4057- Lighting-2	33,756.65	material: Invoice, labor: Invoice
Large C/I Equipment	13-4072- Lighting-2	310,402.00	material: Invoice, labor: SWE DB (labor cost for LF assumed to be applicable)
Small C/I Equipment	13-4009- Lighting-3	13,717.73	material: Invoice, labor: Zero (per SWE DB this is just relamping, no ballasts)
Small C/I Equipment	13-4058- Lighting-4	8,208.00	material: Invoice, labor: SWE DB
Small C/I Equipment	13-4045- Custom-1	11,973.60	material: Invoice, labor: Invoice
Small C/I Equipment	13-4005- Lighting-1	28,886.74	material: Equipment cost from invoice, labor: Labor cost in invoices

Program	Measure	Incremental Cost	Incremental Cost Source
Gov./Institutional	13-4037- Lighting-2	4,905.86	material: Invoice, labor: SWE DB
Small C/I Equipment	13-4056- Lighting-1	50,781.05	material: Invoice, labor: None - Self Install
Gov./Institutional	13-4040- Lighting-2	2,475.00	material: Invoice, labor: Invoice
Small C/I Equipment	13-4061- Lighting-3	30,492.00	material: Invoice, labor: Invoice
Large C/I Equipment	13-4073- Lighting-2	64,017.00	material: SWE/DEER, labor: SWE DB/DEER
Small C/I Equipment	13-4080- Lighting-3	225,544.30	material: Invoice, labor: Invoice
Small C/I Equipment	13-4008- Lighting-3	38,038.00	material: Invoice, labor: DEER
Small C/I Equipment	13-4062- Lighting-2	81,875.00	material: SWE DB, labor: SWE DB/DEER
Gov./Institutional	13-4063- Lighting-2	10,027.27	material: SWE DB, labor: SWE DB/DEER
Gov./Institutional	13-4064- Lighting-2	13,869.00	material: SWE DB, labor: SWE DB/DEER
Small C/I Equipment	13-4065- Lighting-3	45,493.50	material: SWE DB, labor: SWE DB
Gov./Institutional	13-4081- Lighting-2	14,023.84	material: SWE DB, labor: SWE DB
Gov./Institutional	13-4066- Lighting-1	97,424.00	material: Invoice, labor: Invoice
Large C/I Equipment	13-4902-Certainty-1	682,364.00	material: Audit report, labor: Audit report
Gov./Institutional	13-4035- Lighting-1	32,530.94	material: SWE DB, labor: SWE DB
Gov./Institutional	13-4038- Lighting-2	1,519.11	material: Invoice, labor: None - Self Install
Large C/I Equipment	13-4044- Custom-1	43,062.50	material: Invoice, labor: DOE Report
Small C/I Equipment	13-4067- Lighting-2	164,725.84	material: Invoice, labor: SWE DB
Large C/I Equipment	13-4004- Lighting-3	16,382.00	material: Invoice, labor: SWE DB
Large C/I Equipment	13-4001- Lighting-1	70,400.00	material: Invoice, labor: Invoice
Small C/I Equipment	13-4078- Kitchen/Appliances-1	133.26	material: Invoice, labor: Invoice
Small C/I Equipment	13-4079- Kitchen/Appliances-1	133.26	material: Invoice, labor: Invoice
Small C/I Equipment	13-4025- HVAC and DHW-2	1,118.48	material: SWE DB, labor: Zero - New Const
Small C/I Equipment	13-4069- Lighting-3	8,036.27	material: Invoice, labor: None - Self Install
Large C/I Equipment	13-4904-Certainty-1	143,388.75	material: Invoice, labor: Doe Report
Large C/I Equipment	13-4003-Certainty-1	150,656.00	material: Invoice, labor: Invoice
Small C/I Equipment	13-4006- Lighting-2	12,985.00	material: Invoice, labor: Invoice
Large C/I Equipment	13-4075- Lighting-3	88,333.00	material: Invoice, labor: invoice
Small C/I Equipment	13-4014- Lighting-4	16,092.29	material: Invoice, labor: Zero - New Const
Small C/I Equipment	13-4012- Lighting-4	9,058.18	material: Invoice, labor: DEER
Small C/I Equipment	13-4010- Lighting-3	6,049.51	material: Invoice, labor: Invoice

Program	Measure	Incremental Cost	Incremental Cost Source
Small C/I Equipment	13-4015- Lighting-4	4,628.30	material: Invoice, labor: Invoice
Small C/I Equipment	13-4020- Lighting-4	281.00	material: Invoice, labor: Invoice
Large C/I Equipment	13-4002- Lighting-2	81,579.18	material: Invoice, labor: Invoice
Small C/I Equipment	13-4007- Lighting-3	11,104.92	material: Invoice, labor: Invoice
Large C/I Equipment	13-4043- Custom-1	101,487.50	material: Invoice, labor: DOE Report
Small C/I Equipment	13-4013- Lighting-4	11,396.62	material: Invoice, labor: Invoice
Large C/I Equipment	13-4905-Certainty-1	97,640.63	material: ADM Economic Analysis, labor: None
Large C/I Equipment	13-4901-Certainty-1	-213,771.00	material: Invoice / SWE DB, labor: Invoice / SWE DB
Small C/I Equipment	13-4050- Lighting-4	22,080.00	material: Invoice, labor: Invoice
Small C/I Equipment	All-MF Conservation Kits	791.29	material: Invoice, labor: Invoice
Small C/I Buildings	All-CI CFL Kits	34.80	material: Invoice, labor: Invoice
Large C/I Equipment	All-MF Conservation Kits	1,186.98	material: Invoice, labor: Invoice
Small C/I Equipment	All-Appliance Turn-in	57.50	Assume Incentive ≈Incremental Cost

Appendix C: Low-Income Participation in Non-Low-Income Programs

For PY5 surveys, the evaluation team added two income questions in each residential survey effort to assess low income participation in non-low income specific programs.

Table 1 provides the 2013 income ranges by household sizes, based on 2013 Federal Poverty Level (FPL). The income ranges will be updated annually. The survey will be programmed so that the interviewer reads the annual income ranges associated with their household sizes as listed in Table 1, supporting determination of whether the household is above or below 150% of FPL.31 For example, if the respondent answers that three people lived in the household in 2013, the interviewer will then ask Responses 1 through 5 for Household Size equals 3 as stated in Table 1.

Q1 Including yourself, how many people live in your household?

_____People

Q2 Including all money earned from wages, salaries, tips, commissions, workers' compensation, unemployment insurance, child support, or other sources, about how much was your total annual household income before taxes in 2013? Was it less than $XX [FILL RESPONSES FOR MAX 150% FROM TABLE 1]?

If no, was it over $YY [FILL RESPONSES FOR MIN 200% FROM TABLE 1]? (PROBE: IF R DOESN'T KNOW ANNUAL RANGE, PROMPT WITH MONTHLY RANGE

1 Less than or equal to 150% poverty

2 151%-200% poverty

3 Over 200% poverty

D Don't know

R Refused

[31] Monthly income (annual/12) will be programmed for cases where the respondent answers "Don't know" to the annual value.

Table 1. Income Range Table (2013)[32]

Household Size	Response 1 (<=50% FPL)	Response 2 (51%-100% FPL)	Response 3 (101%-150 FPL)	Response 4 (151%-200% FPL)	Response 5 (>200% FPL)
1	Less than or equal to $5,745	Between $5,745 and $11,490	Between $11,490 and $17,235	Between $17,235 and $22,980	Greater than $22,980
2	Less than or equal to $7,755	Between $7,755 and $15,510	Between $15,510 and $23,265	Between $23,265 and $31,020	Greater than $31,020
3	Less than or equal to $9,765	Between $9,765 and $19,530	Between $19,530 and $29,295	Between $29,295 and $39,060	Greater than $39,060
4	Less than or equal to $11,775	Between $11,775 and $23,550	Between $23,550 and $35,325	Between $35,325 and $47,100	Greater than $47,100
5	Less than or equal to $13,785	Between $13,785 and $27,570	Between $27,570 and $41,355	Between $41,355 and $55,140	Greater than $55,140
6	Less than or equal to $15,795	Between $15,795 and $31,590	Between $31,590 and $47,385	Between $47,385 and $63,180	Greater than $63,180
7	Less than or equal to $17,805	Between $17,805 and $35,610	Between $35,610 and $53,415	Between $53,415 and $71,220	Greater than $71,220
8	Less than or equal to $19,815	Between $19,815 and $39,630	Between $39,630 and $59,445	Between $59,445 and $79,260	Greater than $79,260
++	$2,010	$2,010-$4,020	$4,020-$6,030	$6,030-$8,040	$8,040

The low-income participation in upstream CFLs was determined from a survey in October 2013 that predated the above instrument. That survey asked two questions: 1) The number of persons in the household and (2) The annual or monthly income. Respondents were categorized as low-income qualified if the stated incomes were below 150% of FPL.

[32] Source: http://aspe.hhs.gov/poverty/13poverty.cfm

Appendix D: Residential Lighting Upstream Program Cross-Sector Sales

It is well known and reasonable that some lamps in the upstream programs are purchased and installed in nonresidential settings. As a result, these lamps experience higher annual hours of use and higher peak demand impacts. In October 2013, ADM conducted a "random digit dial" (RDD) telephone survey for residential customers to assess the impact of cross sector sales. The surveys focused on CFLs as they represented over 97% of the upstream programs' impacts.

The extrapolation from the residential surveys is straightforward. Out of 827 respondents (11,745 CFLs over the last two years), 23 reported installing a total of (579) CFLs in commercial settings. The fraction of CFLs that are installed in commercial settings is 579/11745=4.93%.

There are incremental demand reductions and incremental energy savings associated with the crossover of CFLs from the residential sector to the nonresidential sector.

The hours of use and demand coincidence factors applied to the cross-sector CFLs are taken from ADM's PY3 and PY5 C/I CFL metering studies, and are shown below.

The hours of use for the CFLs installed in the commercial sector are determined from two relatively small metering efforts. The results of the two studies are shown in the table below.

Table 0-1: PY5 Small C/I Sector CFL Metering Results

Study	Hours	CF	N Loggers	RP @85% CL
PY5	2,129	0.44	24	33%
PY3	1,713	0.34	51	33%
All	1,846	0.37	75	**19%**

The nonresidential TRM protocols also include HVAC interactive effects. ADM applied the 12% and 34% values for energy and demand respectively, but also included a 70% applicability factor to account for our estimation that approximately 30% of the CFLs are not installed in air conditioned space.

Incentive shifts to account for crossover CFLs.

EDC	Total Incentives for Upstream Lighting	Total Incentives for Residential Sector (95.07%)	Total Incentives for Small Commercial Sector (4.93%)
West Penn Power	$ 761,549	$ 724,006	$ 37,543
West Penn Power	$ 687,489	$ 653,597	$ 33,892
West Penn Power	$ 355,256	$ 337,743	$ 17,513
West Penn	$ 676,857	$ 643,489	$ 33,367

Note that the Companies also included CFLs in their nonresidential sector programs. Based on customer surveys, a small fraction of CFLs distributed to small commercial customers were subsequently redistributed to employees, members, or parishioners for use in their homes. The TRM residential lighting protocols are used to evaluate the energy and demand impacts associated with these "crossover" CFLs. The table below also shows the budget shifts needed to account for the crossover.

"Incentive" shifts to account for crossover CFLs.

EDC	Total Incentives for CFL Kits in the "Buildings" Programs	Total Incentives for Residential Sector	Total Incentives for Residential Sector
West Penn Power	$ 70,450	$ 67,286	$ 3,164
West Penn Power	$ 140.529	$ 130,054	$ 10,475
West Penn Power	$ 36.647	$ 36,647	$ 0
West Penn	$ 142,355	$ 142,355	$ 0

The net funding shift for each EDC is from commercial programs to residential programs, and is as follows: $34,379 for West Penn Power, $23,417 for West Penn Power, $17,513 for West Penn Power, and $33,367 for West Penn Power.

Appendix E: Glossary of Terms

This Glossary of Terms was provided by the SWE.

– A –

Administration Management and Technical Assistance Costs: Includes rebate processing, tracking system, general administration, EDC and CSP program management, general management and legal, and technical assistance.

Avoided Cost: In the context of energy efficiency, the costs that are avoided by the implementation of an energy efficiency measure, program, or practice. Such costs are used in benefit/cost analyses of energy efficiency measures and programs as defined by the Pennsylvania PUC in the 2013 TRC Test Order.

– B –

Baseline: Conditions that would have occurred without implementation of the subject measure or project. Baseline conditions are sometimes referred to as "business-as-usual" conditions and are used to calculate program-related efficiency or emissions savings. Baselines can be defined as either project-specific baselines or performance-standard baselines (e.g., building codes). For the purposes of Act 129, baselines are defined in the Pennsylvania TRM, in approved custom protocols, and in TRM interim approved protocols.

Baseline Data: The information representing the systems being upgraded before the energy efficiency activity takes place.

Benefit/Cost Ratio: The mathematical relationship between the benefits and costs associated with the implementation of energy efficiency measures, programs, or practices. The benefits and costs are typically expressed in dollars. This is the ratio of the discounted total benefits of the program to the discounted total costs over the expected useful life of the energy efficiency measure. The explicit formula for use in Pennsylvania is set forth in the TRC Order. Also see *Benefit-Cost Test*.

Benefit-Cost Test: Also called *Cost-Effectiveness Test,* defined as the methodology used to compare the benefits of an investment to the costs. For programs evaluated under Act 129, the TRC Test is the required benefit-cost test as established in the TRC Order.

Bias: The extent to which a measurement, sampling, or analytic method systematically underestimates or overestimates a value. Some examples of types of bias include engineering model bias; meter bias; sensor bias; an inadequate or inappropriate estimate of what would have happened absent a program or measure installation; a sample that is unrepresentative of a population; and selection of other variables in an analysis that are too correlated with the savings variable (or each other) in explaining the dependent variable (such as consumption).

– C –

Coefficient of Variation: The mean (average) of a sample divided by its standard error.

Coincident Demand: The demand of a device, circuit, or building that occurs at the same time as the system peak demand. For purposes of Act 129 reporting, the coincident demand is during the peak period as defined in the TRM (June through August, excluding weekends and holidays between 2 and 6 PM.

Coincidence Factor: The ratio, expressed as a numerical value or as a percentage of connected load, of the coincident demand of an electrical appliance or facility type to the system peak.

Completed Project: A project in which the energy conservation measure has been installed and is commercially operable, and for which an incentive has been provided.

Confidence: An indication of the probability that an estimate is within a specified range of the true value of the quantity in question. Confidence is the likelihood that the evaluation has captured the true value of a variable within a certain estimated range. Also see *Precision*.

Correlation: For a set of observations, such as for participants in an energy efficiency program, the extent to which values for one variable are associated with values of another variable for the same participant. For example, facility size and energy consumption usually have a high positive correlation.

Cost-Benefit and Cost-Effectiveness Analysis: See *Benefit-Cost Test*.

Cost-Effectiveness: An indicator of the relative performance or economic attractiveness of an investment or practice. In the energy efficiency field, the present value of the estimated benefits produced by an energy efficiency program is compared to the estimated total costs to determine if the proposed investment or measure is desirable from a variety of perspectives (e.g., whether the estimated benefits exceed the estimated costs consistent with definitions in the TRC Order. See *Benefit-Cost Test*.

Cost-Effectiveness Test: See *Benefit-Cost Test*.

Cumulative Energy Savings: The summation of energy savings associated with multiple projects or programs over a specified period of time.

Custom Program: An energy efficiency program intended to provide efficiency solutions to unique situations not amenable to common or prescriptive solutions addressed by the Pennsylvania TRM. Each custom project is examined for its individual characteristics, savings opportunities, efficiency solutions, and often, customer incentives. Under Act 129, these programs fall outside of the jurisdiction of the Pennsylvania TRM, and thus the M&V protocols for each should be approved by the SWE.

– D –

Deemed Savings: An estimate of energy or demand savings for a single unit of an installed energy efficiency measure that: (1) has been developed from data sources and analytical methods that are widely considered acceptable for the measure and purpose, and (2) is applicable to the situation being evaluated. Individual parameters or calculation methods can also be deemed. Deemed savings for measures implemented under Act 129 are stipulated in the Pennsylvania TRM, which undergoes an annual review and update process, as well as in the Interim TRM Measures, which are subject to interim approval by the SWE.

Defensibility: The ability of evaluation results to stand up to scientific scrutiny. Defensibility is based on assessments by experts of the evaluation's validity, reliability, and accuracy. Under Act 129, it is the role of the SWE to determine the defensibility of the verified savings estimates reported by each of the EDCs.

Delta Watts: The difference in the connected load (wattage) between existing or baseline equipment and the energy-efficient replacement equipment, expressed in Watts or kilowatts.

Demand: The rate of energy flow. Demand usually refers to the amount of electric energy used by a customer or piece of equipment over a defined time interval (e.g., 15 minutes), expressed in kW (equals kWh/h). Demand can also refer to natural gas usage over a defined time interval, usually as Btu/hr, kBtu/hr, therms/day, or ccf/day.

Demand Reduction: See *Demand Savings*.

Demand Response: The reduction of customer energy usage at times of peak usage in order to help system reliability, to reflect market conditions and pricing, or to support infrastructure

optimization or deferral of additional infrastructure. Demand response programs may include contractually obligated or voluntary curtailment, direct load control, and pricing strategies.

Demand Savings: The reduction in electric demand from the demand associated with a baseline system to the demand associated with the higher-efficiency equipment or installation. Demand savings associated with energy efficiency measures implemented under Act 129 are calculated according to the approved calculation methods stipulated in the TRM or subsequently approved through alternative methods (e.g., interim measures, custom protocols).

Demand-side Management: Strategies used to manage energy demand including energy efficiency, load management, fuel substitution, and load shedding.

– E –

Energy Efficiency and Conservation (EE&C) Plan: Plan as filed by the EDC and approved by the PUC.

EE&C Plan Estimate for Program Year: An estimate of the energy savings or demand reduction for the current program year as filed in the EDC EE&C plans.

Effective Useful Life: An estimate of the median number of years that efficiency measures installed under a program are still in place and operable. For measures implemented under Act 129, it is required that the effective useful life or 15 years, whichever is less, be used to determine measure assessments.

Electric Distribution Company (EDC): In reference to Act 129, there are seven EDCs with at least 100,000 customers that are required to adopt a plan to reduce energy and demand consumption within their service territory in accordance with 66 Pa. C.S. § 2608. The seven EDCs are: West Penn, Duquesne Light, West Penn Power Company, West Penn Power Company, West Penn Power Company, PECO Energy Company, PPL Electric Utilities and West Penn Power.

End Use: An appliance, activity, system, or equipment that uses energy.

Energy Conservation: Using less of a service in order to save energy. The term often is used unintentionally instead of *energy efficiency*.

Energy Efficiency: The use of less energy to provide the same or an improved level of service to the energy consumer; or the use of less energy to perform the same function.

Energy Efficiency Measure: An installed piece of equipment or a system, modification of equipment systems, or modified operations in customer facilities that reduce the total amount of electrical

or gas energy and the capacity that otherwise would have been needed to deliver an equivalent or improved level of comfort or energy service.

Energy Savings: A reduction in electricity use (kWh) or in fossil fuel use in thermal unit(s).

Evaluation: The conduct of any of a wide range of assessment studies and other activities aimed at documenting an enhanced understanding of a program or portfolio, including determining the effects of a program, understanding or documenting program performance, program-related markets and market operations, program-induced changes in energy efficiency markets, levels of potential demand or energy savings, and/or program cost-effectiveness. Market assessments, monitoring and evaluation, and M&V are aspects of evaluation.

Ex Ante Savings Estimate: Forecasted savings used for program and portfolio planning purposes.

Ex Post Savings Estimate: Savings estimate reported by an evaluator after the energy impact evaluation has been completed.

– F –

Free Driver: A program nonparticipant who adopted a particular efficiency measure or practice as a result of the evaluated program. Also see *Spillover*.

Free-Rider: A program participant who would have implemented the program measure or practice in the absence of the program. Free-riders can be: (1) total, in which the participant's activity would have completely replicated the program measure; (2) partial, in which the participant's activity would have partially replicated the program measure; or (3) deferred, in which the participant's activity would have completely replicated the program measure, but after the program's timeframe.

Free-Ridership Rate: The percent of savings attributable to free-riders.

– G –

Gross Impact: See *Gross Savings*.

Gross Savings: The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated.

Gross kW: Expected demand reduction based on a comparison of standard or replaced equipment with equipment installed through an energy efficiency program.

Gross kWh: Expected kWh reduction based on a comparison of standard or replaced equipment with equipment installed through an energy efficiency program.

– H –

– I –

Impact Evaluation: An evaluation of the program-specific, directly induced quantitative changes (kWh, kW, and therms) attributable to an energy efficiency program.

Incremental Cost: The difference between the cost of an existing or baseline equipment or service and the cost of an alternative energy efficient equipment or service.

Incremental Energy Savings: The difference between the amount of energy savings associated with a project or a program in one period and the amount of energy savings associated with that project or program in a prior period.

– J –

– K –

Kilowatt (kW): A measure of the rate of power used during a pre-set time period (e.g., minutes, hours, days, months) equal to 1,000 Watts.

Kilowatt-Hour (kWh): A common unit of electric energy; one kilowatt-hour is numerically equal to 1,000 Watts used for one hour.

– L –

Lifetime kW: The expected demand savings over the lifetime of an installed measure, equal to the annual peak kW reduction associated with a measure multiplied by the expected lifetime of that measure. It is expressed in units of kW-years.

Lifetime MWh: The expected electrical energy savings over the lifetime of an installed measure, calculated by multiplying the annual MWh reduction associated with a measure by the expected lifetime of that measure.

Lifetime Supply Costs: The net present value of avoided supply costs associated with savings, net of changes in energy use that would have happened in the absence of the program over the life of the energy efficiency measure, factoring in persistence of savings. See *Avoided Cost*.

Load Factor: A percentage indicating the ratio of electricity or natural gas used during a given timeframe to the amount that would have been used if the usage had stayed at the highest demand the whole time. The term is also used to indicate the percentage of capacity of an energy facility, such as a power plant or gas pipeline that is utilized for a given period of time.

Load Management: Steps taken to reduce power demand at peak load times or to shift some of it to off-peak times. Load management may coincide with peak hours, peak days, or peak seasons. Load management may be pursued by persuading consumers to modify behavior or by using equipment that regulates some electric consumption. This may lead to complete elimination of electric use during the period of interest (load shedding) and/or to an increase in electric demand in the off-peak hours as a result of shifting electric usage to that period (load shifting).

– M –

Market Assessment: An analysis that provides an assessment of how and how well a specific market or market segment is functioning with respect to the definition of well-functioning markets or with respect to other specific policy objectives. Generally includes a characterization or description of the specific market or market segments, including a description of the types and number of buyers and sellers in the market, the key factors that influence the market, the type and number of transactions that occur on an annual basis, and the extent to which market participants consider energy efficiency as an important part of these transactions. This analysis may also include an assessment of whether a market has been sufficiently transformed to justify a reduction or elimination of specific program interventions. Market assessments can be blended with strategic planning analysis to produce recommended program designs or budgets. One particular kind of market assessment effort is a baseline study, or the characterization of a market before the commencement of a specific intervention in the market, for the purpose of guiding the intervention and/or assessing its effectiveness later.

Measurement and Verification (M&V): A subset of program impact evaluations that are associated with the documentation of energy savings at individual sites or projects using one or more methods that can involve measurements, engineering calculations, statistical analyses, and/or computer simulation modeling.

Measurement Error: In the evaluation context, a reflection of the extent to which the observations conducted in the study deviate from the true value of the variable being observed. The error can be random (equal around the mean) or systematic (indicating bias).

Megawatt (MW): A unit for measuring electricity equal to 1,000 kilowatts or one million Watts.

Megawatt-Hour (MWh): A unit of electric energy numerically equal to 1,000,000 Watts used for one hour.

Metered Data: Data collected over time through a meter for a specific end use, energy-using system (e.g., lighting, HVAC), or location (e.g., floors of a building, a whole premise). Metered data may be collected over a variety of time intervals. Usually refers to electricity or gas data.

Metering: The collection of energy consumption data over time through the use of meters. These meters may collect information about an end use, a circuit, a piece of equipment, or a whole building (or facility). *Short-term metering* generally refers to data collection for no more than a few weeks. *End-use metering* refers specifically to separate data collection for one or more end uses in a facility, such as lighting, air conditioning, or refrigeration. *Spot metering* is an instantaneous measurement (rather than over time) to determine equipment size or power draw.

Monitoring: The collection of relevant measurement data over time at a facility, including but not limited to energy consumption or emissions data (e.g., energy and water consumption, temperature, humidity, volume of emissions, and hours of operation) for the purpose of conducting a savings analysis or to evaluate equipment or system performance.

– N –

Net Impact: See *Net Savings*.

Net Present Value: The discounted value of the net benefits or costs over a specified period of time (e.g., the expected useful life of the energy efficiency measure).

Net Savings: The total change in load that is attributable to an energy efficiency program. This change in load may include, implicitly or explicitly, the effects of free drivers, free-riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand. Net savings are calculated by multiplying verified savings by a NTG ratio.

Net-to-Gross (NTG): A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts.

Nonparticipant: Any consumer who was eligible but did not participate in the subject efficiency program in a given program year.

– O –

Off-Peak Energy kWh Savings: The kWh reduction that occurs during a specified period of off-peak hours for energy savings (see the PA TRM Table 1-1).

On-Peak Energy kWh Savings: The kWh reduction that occurs during a specified period of on-peak hours for energy savings (see the PA TRM Table 1-1).

– P –

Participant: A utility customer partaking in an energy efficiency program, defined as one transaction or one rebate payment in a program. For example, a customer receiving one payment for two measures within one program counts as one participant. A customer receiving two payments in two programs counts as two participants. A customer partaking in one program at two different times receiving two separate payments counts as two participants.

Participant Costs: Costs incurred by a customer participating in an energy efficiency program.

Peak Demand: The maximum level of metered demand during a specified period, such as a billing month or a peak demand period.

Peak Load: The highest electrical demand within a particular period of time. Daily electric peaks on weekdays typically occur in the late afternoon and early evening. Annual peaks typically occur on hot summer days.

Percent of Estimate Committed: The program year-to-date total committed savings as a percent of the savings targets established in each EDC EE&C Plan, calculated by dividing the PYTD total committed by the EE&C Plan program year estimate.

Portfolio: Can be defined as: (1) a collection of programs addressing the same market (e.g., a portfolio of residential programs), technology (e.g., motor efficiency programs), or mechanisms (e.g., loan programs); or (2) the set of all programs conducted by one or more organizations, such as a utility or program administrator, and which could include programs that cover multiple markets, technologies, etc.

Precision: An indication of the closeness of agreement among repeated measurements of the same physical quantity. It is also used to represent the degree to which an estimated result in social science (e.g., energy savings) would be replicated with repeated studies.

Preliminary Program Year-to-Date (PYTD) Net Impact: Net impacts reported in quarterly reports. These net impacts are preliminary in that they are based on preliminary realization rates.

Preliminary Program Year-to-Date (PYTD) Verified Impact: Verified impacts reported in quarterly reports. These verified impacts are preliminary in that they are based on preliminary realization rates.

Preliminary Realization Rate: Realization rates reported in quarterly reports based on the results of M&V activities conducted on the sample to date. These results are preliminary because the sample-to-date is likely not to have met the required levels of confidence and precision.

Prescriptive Program: An energy efficiency program focused on measures that are one-for-one replacements of the existing equipment and for which anticipated similar savings results across participants.

Process Evaluation: A systematic assessment of an energy efficiency program for the purposes of documenting program operations at the time of the examination and identifying and recommending improvements to increase the program's efficiency or effectiveness for acquiring energy resources, while maintaining high levels of participant satisfaction.

Program Administrator: Those entities that oversee the implementation of energy efficiency programs. This generally includes regulated utilities, other organizations chosen to implement such programs, and state energy offices.

Program Year Energy Savings Target: Energy target established for the given program year as approved in each EDC EE&C Plan.

Program Year Sample Participant Target: Estimated sample size for evaluation activities in the given program year.

Program Incentive: An incentive, generally monetary, that is offered to a customer through an energy efficiency program to encourage their participation. The incentive is intended to overcome one or more barriers that keep the customer from taking the energy efficiency action on their own.

Program Participant: A consumer that received a service offered through an efficiency program in a given program year. The term "service" can refer to one or more of a wide variety of services, including financial rebates, technical assistance, product installations, training, energy efficiency information, or other services, items, or conditions.

Program Year-to-Date (PYTD): Beginning June 1 of the current program year through the end of the current quarter (February 28/29, May 31, August 31, or November 30).

Program Year-to-Date (PYTD) Net Impact: The total change in load that is attributable to an energy efficiency program from June 1 of the current program year through the end of the current quarter (February 28/29, May 31, August 31, or November 30).

Program Year-to-Date (PYTD) Participants: The number of utility customers participating in an energy efficiency program beginning June 1 of the current program year through the end of the current quarter (February 28/29, May 31, August 31, or November 30).

Program Year-to-Date (PYTD) Reported Gross Impact: The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated, beginning June 1 of the current program year through the end of the current quarter (February 28/29, May 31, August 31, or November 30). This value is unverified by an independent third-party evaluator.

Program Year-to-Date (PYTD) Sample Participants: Total participant sample beginning June 1 of the current program year through the end of the current quarter (February 28/29, May 31, August 31, or November 30).

Program Year-to-Date (PYTD) Total Committed: The estimated gross impacts, including reported impacts and in-progress impacts, beginning June 1 of the current program year through the end of the current quarter (February 28/29, May 31, August 31, or November 30), calculated by adding PYTD reported gross impacts for projects in progress.

Project: An activity or course of action involving one or multiple energy efficiency measures at a single facility or site.

Projects in Progress: Energy efficiency and demand response projects currently being processed and tracked by the EDC, but that are not yet complete at the time of the report. See *Completed Project*.

– Q –

– R –

Realization Rate: The term is used in several contexts in the development of reported program savings. The primary applications include the ratio of project tracking system savings data (e.g., initial estimates of project savings) to savings that: 1) are adjusted for data errors, and 2) incorporate the evaluated or verified results of the tracked savings.

Rebate Program: An energy efficiency program in which the program administrator offers a financial incentive for the installation of energy-efficient equipment.

Rebound Effect: Also called "snap back," defined as a change in energy-using behavior that yields an increased level of service that is accompanied by an increase in energy use and occurs as a result of taking an energy efficiency action. The result of this effect is that the savings associated with the direct energy efficiency action are reduced by the resulting behavioral change.

Regression Analysis: Analysis of the relationship between a *dependent variable* (response variable) to specified *independent variables* (explanatory variables). The mathematical model of their relationship is the *regression equation*.

Regression Model: A mathematical model based on statistical analysis where the dependent variable is quantified based on its relationship to the independent variables that are believed to determine its value. In so doing, the relationship between the variables is estimated statistically from the data used.

Reliability: The quality of a measurement process that would produce similar results on: (1) repeated observations of the same condition or event, or (2) multiple observations of the same condition or event by different observers.

Renewable Energy: Energy derived from resources that are naturally replenishing. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Reported Gross Impact: The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated. This value is unverified by an independent third-party evaluator. Also referred to as "ex post" impact.

Reporting Period: The time following implementation of an energy efficiency activity during which results are to be determined.

Representative Sample: A sample that has approximately the same distribution of characteristics as the population from which it was drawn.

Rigor: The level of effort expended to minimize uncertainty due to factors such as sampling error and bias. The higher the level of rigor, the more confidence there is that the results of the evaluation are accurate and precise.

– S –

Sample: In program evaluation, a portion of the population selected to represent the whole. Differing evaluation approaches rely on simple or stratified samples (based on some characteristic of the population).

Sample Design: The approach used to select the sample units.

Sampling Error: The error in estimating a parameter caused by the fact that all of the disturbances in the sample are not zero.

Savings Factor (SVG): The percent of time the lights are off due to lighting controls relative to the baseline controls system (typically a manual switch). Also referred to as the *lighting controls savings factor*.

Simple Random Sample: A method for drawing a sample from a population such that all samples of a given size have an equal probability of being drawn.

Snap Back: See *Rebound Effect*.

Simulation Model: An assembly of algorithms that calculate energy use based on engineering equations and user-defined parameters.

Spillover: Reductions in energy consumption and/or demand caused by the presence of an energy efficiency program, beyond the program-related gross savings of the participants and without financial or technical assistance from the program. There can be participant and/or nonparticipant spillover. *Participant spillover* is the additional energy savings that occur when a program participant independently installs energy efficiency measures or applies energy-saving practices after having participated in the efficiency program as a result of the program's influence. *Nonparticipant spillover* refers to energy savings that occur when a program nonparticipant installs energy efficiency measures or applies energy-saving practices as a result of a program's influence.

Spillover Rate: An estimate of energy savings attributable to spillover effects expressed as a percent of savings installed by participants through an energy efficiency program.

Standard Error: A measure of the variability in a data sample indicating how far a typical data point is from the mean of a sample. In a large sample, approximately two-thirds of observations lie within one standard error of the mean, and 95% of observations lie within two standard errors.

Statistically Adjusted Engineering Models: A category of statistical analysis models that incorporate the engineering estimate of savings as a dependent variable. The regression coefficient in these models is the percentage of the engineering estimate of savings observed in changes in energy usage. For example, if the coefficient of the statistically adjusted engineering term is 0.8, the customers are, on average, realizing 80% of the savings from their engineering estimates.

Stipulated Values: See *Deemed Savings*.

Stratified Random Sampling: The population is divided into subpopulations, called *strata*, that are non-overlapping and together comprise the entire population. A simple random sample of each stratum is taken to create a sample based on stratified random sampling.

Stratified Ratio Estimation: A sampling method that combines a stratified sample design with a ratio estimator to reduce the coefficient of variation by using the correlation of a known measure for the unit (e.g., expected energy savings) to stratify the population and allocate a sample from the strata for optimal sampling.

– T –

Take Back Effect: See *Rebound Effect*.

Total Resource Cost (TRC) Test: A cost-effectiveness test that measures the net direct economic impact to the utility service territory, state, or region. The TRC Order details the method and assumptions to be used when calculating the TRC Test for EE&C portfolios implemented under Act 129. The results of the TRC Test are to be expressed as both a net present value and a benefit-cost ratio.

Total Resource Cost (TRC) Test Benefits: Benefits calculated in the TRC Test that include the avoided supply costs, such as the reduction in transmission, distribution, generation, and capacity costs, valued at a marginal cost for the periods when there is a consumption reduction. The PA TRC benefits will consider avoided supply costs, such as the reduction in forecasted zonal wholesale electric generation prices, ancillary services, losses, generation capacity, transmission capacity, and distribution capacity. The avoided supply costs will be calculated using net program savings, defined as the savings net of changes in energy use that would have happened in the absence of the program. The persistence of savings over time will also be considered in the net savings.

Total Resource Cost (TRC) Test Costs: The costs calculated in the TRC Test will include the costs of the various programs paid for by an EDC (or by a default service provider) and the participating customers, and costs that reflect any net change in supply costs for the periods in which consumption is increased in the event of load shifting. Note that the TRC Test should use the

incremental costs of services and equipment. Thus, for example, this would include costs for equipment, installation, operation and maintenance, removal (less salvage value), and administrative tasks, regardless of who pays for them.

– U –

Uncertainty: The range or interval of doubt surrounding a measured or calculated value within which the true value is expected to fall with some degree of confidence.

Upstream Program: A program that provides information and/or financial assistance to entities in the delivery chain of high-efficiency products at the retail, wholesale, or manufacturing level. Such a program is intended to yield lower retail prices for the products.

– V –

Verification: An independent assessment of the reliability (considering completeness and accuracy) of claimed energy savings or an emissions source inventory.

Verified Gross Impact: Calculated by applying the realization rate to reported gross impacts. Also referred to as "ex ante" impact.

– W –

Watt: A unit of measure of electric power at a point in time as capacity or demand. One Watt of power maintained over time is equal to one Joule per second. The Watt is named after Scottish inventor James Watt, and is shortened to W and used with other abbreviations, as in kWh (kilowatt-hours).

Watt-Hour: One Watt of power expended for one hour, or one-thousandth of a kilowatt-hour.

Whole-Building Calibrated Simulation Approach: A savings measurement approach (defined in the International Performance Measurement and Verification Protocol Option D and in the American Society of Heating, Refrigerating and Air-Conditioning Engineers Guideline 14) that involves the use of an approved computer simulation program to develop a physical model of the building in order to determine energy and demand savings. The simulation program is used to model the energy used by the facility before and after the retrofit. The pre- or post-retrofit models are developed by calibration with measured energy use, demand data, and weather data.

Whole-building Metered Approach: A savings measurement approach (defined in the International Performance Measurement and Verification Protocol Option C and in the American Society of

Heating, Refrigerating and Air-Conditioning Engineers Guideline 14) that determines energy and demand savings through the use of whole-facility energy (end-use) data, which may be measured by utility meters or data loggers. This approach may involve the use of monthly utility billing data or data gathered more frequently from a main meter.

– X –

– Y –

– Z –

References

PAH Associations, prepared by Paul Horowitz. Facilitated by the Northeast Energy Efficiency Partnerships. Glossary of Terms Version 1.0. A project of the Regional Evaluation, Measurement and Verification Forum. March 2009.