May 15, 2013

Docketing Division
Public Utilities Commission of Ohio
180 East Broad Street
Columbus, Ohio 43215-3793

Re: Case No. 13-1140-EL-POR
Case No. 12-2266-EL-WVR

Dear Docketing:

By way of Entry dated January 30, 2013 in *In the Matter of the Joint Application of Ohio Edison Company, the Cleveland Electric Illuminating Company, The Toledo Edison Company, Columbus Southern Power Company, Ohio Power Company, The Dayton Power and Light Company, and Duke Energy Ohio, Inc., for a Waiver with Regard to Rule 4901:1-39-05(C), Ohio Administrative Code*, Case No. 12-2266-EL-WVR, the Commission directed that each electric utility file a cover letter with its portfolio status report referencing the waiver of Rule 4901:1-39-05(C), which permits the utility to file its Annual Portfolio Status Report on or before May 15, 2013.

Pursuant to the entry granting the waiver request, DP&L hereby requests that Docketing Division designate Case No.12-2266-EL-WVR as a related case to *In the Matter of The Dayton Power and Light Company's Portfolio Status Report*, Case No. 13-1140-EL-POR. Thank you.

Very truly yours,

Tyler Teuscher

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of The Dayton Power and Light Company's Portfolio Status Report	))	Case No. 13-1140-EL-POR Case No. 12-2266-EL-WVR

THE DAYTON POWER AND LIGHT COMPANY'S COMBINED NOTICE OF FILING PORTFOLIO STATUS REPORT AND APPLICATION TO ADJUST BASELINES

The Dayton Power and Light Company ("DP&L" or "the Company") hereby submits its annual Portfolio Status Report pursuant to section 4901:1-39-05(C) of the Ohio Administrative Code ("O.A.C"), addressing the performance of all of DP&L's approved energy efficiency and peak demand reduction programs over calendar year 2012. As shown in the attached Portfolio Status Report, DP&L has met its statutory benchmarks for energy efficiency and peak demand reduction.

DP&L also makes application pursuant to section 4928.66(A)(2)(c) of the Ohio Revised Code ("O.R.C.") and O.A.C. §4901:1-39-05(B) to adjust its sales and demand baselines to normalize for weather and changes in numbers of customers and sales. As described in the 2012 Benchmark Report, included within the Portfolio Status Report as Appendix B, the changes requiring adjustments to the baselines were outside of DP&L's reasonable control. Appendix B contains all assumptions, rationales, and calculations, and proposes methodologies and practices to be used in the proposed adjustments or normalizations to support DP&L's application to adjust baselines, as required by O.A.C. §4901:1-39-05(B).

1. DP&L is a public utility and electric light company as defined by sections 4905.02 and 4905.03(C) of the O.R.C. respectively, and an electric distribution utility as defined by O.R.C. §4928.01(A)(6).

2. Pursuant to O.R.C §4928.66(A)(1)(a), DP&L is required to "implement energy efficiency programs that achieve energy savings equivalent to at least three-tenths of one per cent of the total, annual average, and normalized kilowatt-hour sales of the electric distribution utility during the preceding three calendar years to customers in this state. An energy efficiency program may include a combined heat and power system placed into service or retrofitted on or after the effective date of the amendment of this section by S.B. 315 of the 129th general assembly, or a waste energy recovery system placed into service or retrofitted on or after the same date, except that a waste energy recovery system described in division (A)(38)(b) of section 4928.01 of the Revised Code may be included only if it was placed into service between January 1, 2002, and December 31, 2004. For a waste energy recovery or combined heat and power system, the savings shall be as estimated by the public utilities commission. The savings requirement, using such a three-year average, shall increase to an additional five-tenths of one per cent in 2010, seven-tenths of one per cent in 2011, eight-tenths of one per cent in 2012, nine-tenths of one per cent in 2013, one per cent from 2014 to 2018, and two per cent each year thereafter, achieving a cumulative, annual energy savings in excess of twenty-two per cent by the end of 2025."

3. O.R.C. §4928.66(A)(1)(b) requires that DP&L "implement peak demand reduction programs designed to achieve a one per cent reduction in peak demand in 2009

and an additional seventy-five hundredths of one per cent reduction each year through 2018."

4. O.R.C. §4928.66(A)(2)(a) provides: "The baseline for energy savings under division (A)(1)(a) of this section shall be the average of the total kilowatt hours the electric distribution utility sold in the preceding three calendar years, and the baseline for a peak demand reduction under division (A)(1)(b) of this section shall be the average peak demand on the utility in the preceding three calendar years, except that the commission may reduce either baseline to adjust for new economic growth in the utility's certified territory."

5. As more fully described, and supported in DP&L's 2012 Benchmark Report attached hereto, DP&L applies to make adjustments to its baselines to normalize for weather changes, and to reflect changes to DP&L's customer base and corresponding load, which fall outside of the realm of what would be expected in the ordinary course of natural business growth and contraction cycles. Specifically, DP&L seeks to make adjustments to account for both customer load growth and loss of at least 2 MW. This level of change would represent a greater loss or growth than would be counterbalanced under typical business conditions.

6. As more fully explained in the 2012 Benchmark Report, and supported by Schedule 1 and the corresponding Workpapers A, C, D and E, DP&L's 2012 normalized energy efficiency baseline is 13,892,400 MWh and DP&L's 2012 incremental normalized energy efficiency reduction benchmark is 111,139 MWh. DP&L's cumulative energy efficiency reduction benchmark is 325,475 MWh.

7. DP&L's 2012 normalized peak demand reduction baseline, as fully explained in its 2012 Benchmark Report, and supported by Schedule 2 and the corresponding Workpapers B, C, D and E is 2,759 MW and DP&L's 2012 normalized peak demand reduction benchmark is 89.7 MW.

8. DP&L's current energy efficiency and demand reduction programs, designed to achieve the required energy savings and demand reductions through 2012, were filed as part of a comprehensive energy efficiency and peak-demand reduction program portfolio approved in Case No. 08-1094-EL-SSO, *In the Matter of the Application of The Dayton Power and Light Company for Approval of Its Electric Security Plan* ("ESP filing") and supplemented and again approved by the Stipulation and Recommendation filed and approved without modification by Commission Order dated April 27, 2011 in *In the matter of the Application of the Dayton Power and Light Company for a finding that DP&L has Satisfied Program Portfolio Filing Requirements*, Case No. 09-1986-EL-POR.

9. DP&L's energy efficiency and demand reduction programs, designed to achieve the required energy savings and demand reductions from 2013 through 2015, were filed as part of a comprehensive energy efficiency and peak-demand reduction program portfolio in Case No. 13-0833-EL-POR, *In the Matter of the Application of The Dayton Power and Light Company for Approval of Its Energy Efficiency and Demand Reduction Program Portfolio Plan for 2013 through 2015*. This case is currently pending Commission approval.

10. O.A.C. §4901:1-39-05(C) provides: "by March fifteenth of each year, each electric utility shall file a portfolio status report addressing the performance of all

approved energy efficiency and peak-demand reduction programs in its program portfolio plan over the previous calendar year. . ." DP&L sought, and was granted a waiver of O.A.C. § 4901:1-39-05(C) to permit DP&L to file its Annual Portfolio Status Report on or before May 15, 2013.[1]

11. DP&L timely submits the attached Portfolio Status Report ("Report") which includes the following components:

(1) A Compliance Demonstration which includes: (a) an update to DP&L's initial benchmark report (Report, Section 2); (b) a comparison of the applicable benchmarks to the actual energy savings and peak demand reductions achieved (Report, Section 2); and (c) an affidavit regarding compliance with the statutory benchmarks (Exhibit 2).

(2) A Program Performance Assessment, including: (a) a description of each approved energy efficiency or peak-demand reduction program implemented in the previous calendar year (Report, Sections 3-5); (b) an evaluation, measurement, and verification report by The Cadmus Group, Inc. ("Cadmus Report," Exhibit 1); and (c) a recommendation with respect to continuation, modification or elimination of each program (Report, Section 6).

12. As described in the Report, and as attested to in the attached Affidavit of the Senior Vice President of Service Operations, DP&L has met its 2012 statutory benchmarks for energy efficiency and peak demand reduction.

WHEREFORE, DP&L respectfully requests that the Commission issue an order finding that DP&L has complied with its 2012 statutory energy efficiency and peak

[1] Entry dated January30, 2013 in *In the Matter of the Joint Application of Ohio Edison Company, The Cleveland Electric Illuminating Company, The Toledo Edison Company, Columbus Southern Power Company, Ohio Power Company, The Dayton Power and Light Company, and Duke Energy Ohio, Inc., for a Waiver with Regard to Rule 4901:1-39-05(C), Ohio Administrative Code*, Case No. 12-2266-EL-WVR.

demand reduction benchmark requirements and acknowledging DP&L compliance with the Program Portfolio Status Report requirements found in O.A.C. § 4901:1-39-05(C).

Respectfully submitted,

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Dayton Power and Light

May 15

2013

2012 Energy Efficiency and Demand Reduction/Response Portfolio Status Report

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EXECUTIVE SUMMARY

OVERVIEW

On October 10, 2008, The Dayton Power and Light Company (DP&L) filed its energy efficiency and peak demand reduction plan in Book Two of its Electric Security Plan Case No. 08-1094-EL-SSO. DP&L's plan, as modified by the Stipulation filed on February 24, 2009, was approved by the Commission on June 24, 2009. DP&L supplemented the portfolio plan by its Notice of Filing Supplement to Application filed on July 15, 2010 and July 16, 2010 in Case No. 09-1986-EL-POR. DP&L's supplemented plan, as modified by the Stipulation filed March 22, 2011, was approved by the Commission on April 27, 2011.

Since 2009, DP&L has successfully put in place a portfolio of business and residential programs that provide customers with a variety of energy efficiency choices. Specifically, DP&L is offering customers five residential programs, two business programs, and an educational effort that includes a school program and a consumer awareness campaign. Through the process, DP&L has kept the energy efficiency collaborative informed of its progress and is working directly with several collaborative members to either implement programs or market them to various customer groups. DP&L filed a supplement to its energy efficiency and peak demand reduction program portfolio in Case No. 11-610-EL-POR on December 20, 2011, for approval to count the results of its 4 kV to 12 kV conversion project ("conversion project") toward its energy efficiency and peak demand reduction benchmarks. Since the case is still pending Commission approval, no savings from this conversion project have been counted in 2012.

It should be noted that actual energy and demand savings have been reported in each of the previous years as follows:

- 2009 Energy Efficiency and Demand Reduction/Response Portfolio Status Report filed on March 12, 2010, in Case No. 10-0303-EL-POR.
- 2010 Energy Efficiency and Demand Reduction/Response Portfolio Status Report filed on March 15, 2011, in Case No. 11-1276-EL-POR.
- 2011 Energy Efficiency and Demand Reduction/Response Portfolio Status Report filed on May 15, 2012, in Case No. 12-1420-EL-POR.

SAVINGS CALCULATIONS

The energy and demand savings calculations were based mainly on the draft State of Ohio Energy Efficiency Technical Reference Manual (TRM), filed August 6, 2010 under Case No. 09-0512-GE-UNC. However, there were exceptions for measures not included in the TRM or where evaluations resulted in a valid alternate calculation. A discussion of calculation methodology is included in the Cadmus EM&V report, attached as Exhibit 1.

COMPLIANCE SUMMARY

From 2009 through 2011, DP&L reported cumulative energy efficiency program savings of 453,567 MWh and mercantile program savings of 20,504 MWh. The 2012 energy efficiency programs generated 181,011 MWh and mercantile programs generated 5,515 MWh. Therefore, cumulative annualized energy savings for 2009 through 2012 are 660,597 MWh.

From 2009 through 2011, DP&L reported cumulative demand savings from energy efficiency programs of 65.4 MW and 5.0 MW of cumulative demand savings from mercantile commitments. The 2012 energy efficiency programs generated 28.9 MW of demand savings. In addition, mercantile customers committed 20.0 MW of PJM Demand Response and 3.4 MW of energy efficiency demand for integration with DP&L's program portfolio. Therefore, total 2012 cumulative demand savings are 122.7 MW.

Based on this performance, DP&L surpassed its 2012 cumulative benchmark targets of 325,475 MWh and 89.7 MW. A more detailed analysis is provided in Section 2, Compliance Demonstration.

	MWh	MW
2009 Actuals	115,279	16.5
2010 Energy Efficiency Actuals	174,249	24.7
2010 Mercantile Commitments (EE only)*	4,957	1.5
2011 Energy Efficiency Actuals	164,039	24.2
2011 Mercantile Commitments (EE only)*	15,547	3.5
2012 Energy Efficiency Actuals	181,011	28.9
2012 Mercantile Commitments	5,515	23.4
Cumulative 2009 - 2012 Total Savings	660,597	122.7
Cumulative 2012 Benchmarks	325,475	89.7

*Mercantile commitments for PJM Demand Response do not carry over from year to year. Therefore, 2010 and 2011 PJM Demand Response commitments have been removed from the cumulative total.

2012 PROGRAM SUMMARY

2012 Annualized Program Results

Program	2012 Energy (MWh)	2012 Demand (MW)
Residential Lighting (CFL)	80,677	9.65
Residential HVAC Rebates	7,035	2.21
Residential HVAC Diagnostic & Tune Up	1,095	0.19
Residential Appliance Recycling	2,213	0.35
Residential Appliance Rebates(1)	0	0.00
Residential Low Income Affordability	900	0.16
Non-Residential Prescriptive Rebates	71,554	13.73
Non-Residential Custom Rebates	12,993	2.33
Education, School Programs(2)	4,544	0.32
Mercantile Customer Commitments(3)	5,515	23.44
Total	186,526	52.38

(1) With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L transferred the 2012 appliance rebate budget to the appliance recycling program.

(2) 2012 savings are savings from the 2011/2012 school year.

(3) Mercantile Customer Commitments include 20.0 MW of PJM Demand Response committed to DP&L.

BANKED ENERGY SAVINGS

DP&L plans to bank the excess energy savings achieved cumulatively through 2012 and apply the excess toward future benchmarks. The total amount of banked energy savings is 335,122 MWh and is calculated as follows:

2012 Actual Cumulative Energy Savings – 2012 Cumulative Benchmark = Banked Energy Savings

660,597 MWh – 325,475 MWh = 335,122 MWh

PRO-RATED VERSUS ANNUALIZED SAVINGS

Appendix A includes the energy savings and demand calculations on a pro-rated basis for 2012. The 2012 incremental energy savings on a pro-rated basis totals 120,741 MWh and the 2012 incremental demand savings on a pro-rated basis totals 45.4 MW.

Regardless of whether calculated on a pro-rated basis or an annualized basis, DP&L achieved both its energy and demand 2012 cumulative benchmarks.

The compliance calculations on a pro-rated basis are as follows:

	MWh	MW
2009 Actuals	115,279	16.5
2010 Actuals	174,249	24.7
2010 Mercantile Commitments*	4,957	1.5
2011 Actuals	164,039	24.2
2011 Mercantile Commitments*	15,547	3.5
2012 Pro-Rated Actuals	115,226	22.0
2012 Mercantile Commitments	5,515	23.4
Cumulative 2009 - 2012 Total Savings	594,812	115.8
Cumulative 2012 Benchmarks	325,475	89.7

*Mercantile commitments for PJM Demand Response do not carry over from year to year. Therefore, 2010 and 2011 PJM Demand Response commitments have been removed from the cumulative total.

EVALUATION, COST EFFECTIVENESS

Attached to this report, as Exhibit 1, is the 2012 evaluation, measurement, and verification report produced by The Cadmus Group (Cadmus).

In addition, Cadmus performed cost effectiveness tests for each of the programs and for the portfolio as a whole. These are the Total Resource Cost Test (TRC), the Utility Cost Test (UCT), the Participant Cost Test (PCT), the Ratepayer Impact Measure (RIM), and the Societal Test (SCT). DP&L's portfolio was cost effective as measured by the TRC. A detailed review of the cost effectiveness tests and program-specific results can be found in the cost effectiveness section of the EM&V report, included as Exhibit 1.

	Primary	Secondary			
	Total Resource Cost Test	**Utility Cost Test**	**Ratepayer Impact Measure Test**	**Participant Cost Test**	**Societal Cost Test**
DP&L Portfolio	1.54	4.51	0.39	4.25	2.14

2012 PROGRAM COST SUMMARY

Program	2012 Original Filing	2012 Actual
Residential Lighting (CFL)[(1)]		
Incentive Costs	$1,786,762	$2,496,939
Marketing & Admin	$1,179,263	$573,551
Program Total	$2,966,025	$3,070,490
Residential HVAC Rebates[(1)]		
Incentive Costs	$1,003,742	$1,156,700
Marketing & Admin	$702,619	$592,348
Program Total	$1,706,361	$1,749,048
Residential HVAC Tune Up[(1)]		
Incentive Costs	$833,450	$203,840
Marketing & Admin	$416,725	$350,981
Program Total	$1,250,175	$554,821
Residential Appliance Recycling[(1)]		
Incentive Costs	$122,701	$51,825
Marketing & Admin	$269,942	$290,416
Program Total	$392,643	$342,241
Residential Appliance Rebates[(1)]		
Incentive Costs	$136,499	$0
Marketing & Admin	$81,899	$0
Program Total	$218,398	$0
Residential Low Income Affordability		
Incentive Costs	$868,482	$804,236
Marketing & Admin	$231,436	$206,772
Program Total	$1,099,918	$1,011,008
Non-Residential Prescriptive Rebates		
Incentive Costs	$2,268,886	$3,722,997
Marketing & Admin	$998,310	$660,946
Program Total	$3,267,196	$4,383,943
Non-Residential Custom Rebates		
Incentive Costs	$1,470,575	$1,167,726
Marketing & Admin	$808,816	$489,640
Program Total	$2,279,391	$1,657,366
Non-Residential Mercantile Program		
Incentive Costs	$0	$644,871
Marketing & Admin	$0	$155,877
Program Total	$0	$800,748
Education[(1)(2)]		
School Program, Ohio Energy Project		$191,845
General Energy Efficiency Education		$621,916
Program Total	$1,671,553	$813,761
Evaluations, Measurement & Verification[(3)]	$845,320	$669,688
Total Program Costs	**$15,696,980**	**$15,053,114**

[(1)] With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated budgets within the residential portfolio as described below. The original filed budgets are listed in this table.

[(2)] For Education, Awareness Building, and Market Transformation Activities, the filed portfolio plan did not separate budgets for individual activities.

[(3)] EM&V costs include charges from Evergreen Economics and Cadmus.

With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated budgeted dollars within the residential program portfolio. The following table summarizes that reallocation.

Approved Budget Reallocations

Program	Filed 2012 Budget	Change	Revised 2012 Budget
Residential Lighting (CFL)	$2,966,025	+$600,000	$3,566,025
HVAC Rebates	$1,706,361	+$375,000	$2,081,361
HVAC Tune Up	$1,250,175	($375,000)	$875,175
Appliance Recycling	$392,643	+$218,398	$611,041
Appliance Rebates	$218,398	($218,398)	--
Low Income Affordability	$1,099,918	--	$1,099,918
Education, Awareness, Mkt Transformation	$1,671,553	($600,000)	$1,071,553
Total	$9,305,073	$0	$9,305,073

The next table provides a total budget summary compared to actuals, taking into account the approved budget reallocation.

Reallocated 2012 Program Budgets

Program	2012 Budget	2012 Actual
Residential Lighting (CFL)	$3,566,025	$3,070,490
Residential HVAC Rebates	$2,081,361	$1,749,048
Residential HVAC Tune Up	$875,175	$554,821
Residential Appliance Recycling	$611,041	$342,241
Residential Appliance Rebates	$0	$0
Residential Low Income Affordability	$1,099,918	$1,011,008
Non-Residential Prescriptive Rebates	$3,267,196	$4,383,943
Non-Residential Custom Rebates	$2,279,391	$1,657,366
Mercantile	$0	$800,748
Education	$1,071,553	$813,761
Evaluations, Measurement & Verification	$845,320	$669,688
Total Program Costs	**$15,696,980**	**$15,053,114**

COMPLIANCE DEMONSTRATION

BENCHMARK REPORT UPDATE

In accordance with section 4901:1-39-05(C)(1)(a) of the Ohio Administrative Code, DP&L is filing its 2012 Benchmark Report, included in this filing as Appendix B.

DP&L's 2012 cumulative energy and peak demand reduction benchmark targets are as follows:

Normalized Energy Reduction Benchmark (MWh)	325,475
Normalized Peak Demand Reduction Benchmark (MW)	89.7

For informational purposes, included below are Schedules 1 and 2 from DP&L's 2012 Benchmark Report.

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
Energy Efficiency Baseline and Benchmark Calculation

		2009	2010	2011	2012
1	**Baseline Calculation Components**				
2	Retail MWh Sales [1]	13,727,277	14,282,324	14,127,719	
3					
4	**Normalizing Adjustments**				
5	Significantly Reduced Customer Sales [2]	(191,485)	(119,143)	(76,409)	
6	Significantly Expanded Customer Sales [3]	157,551	103,999	6,513	
7	Total Customer Sales Adjustment (5)+(6)	(33,934)	(15,144)	(69,896)	
8	Mercantile Customer Adjustment [4]	17,690	21,112	24,538	
9	Total Adjusted Retail Sales (2)+(7)+(8)	13,711,033	14,288,292	14,082,361	
10	Weather Normalization Factor [5]	1.01859	0.96700	0.98666	
11	Normalized Retail Energy Sales (9)*(10)	13,965,921	13,816,778	13,894,502	
12					
13	**2012 Normalized Energy Efficiency Baseline**				
14	3 Year Normalized Average (MWh)				13,892,400
15					
16	**Calculation of 2012 Energy Efficiency Reduction Benchmark**				
17	Normalized Preceding 3 Year Average Sales (14)				13,892,400
18	2012 Incremental Energy Efficiency Reduction Benchmark % [6]				0.80%
19	2012 Incremental Energy Efficiency Reduction Benchmark (17)*(18)				111,139
20	2010-2011 Energy Efficiency Reduction Benchmark [7]				214,336
21	**2012 Cumulative Energy Efficiency Reduction Benchmark (19)+(20)**				**325,475**

[1] Retail sales for the period 2009-2011 are reported in PUCO Form FE-D1 (Case No. 13-1810-EL-FOR). See Workpaper A, Column (6).

[2] Significantly reduced customer sales include those who ceased or reduced their operations during the period. See Workpaper C for details on load reductions.

[3] Significantly expanded customer sales include those who started or expanded their operations during the period. See Workpaper C for details on load expansions.

[4] See Workpaper D for calculation of Mercantile Customer Adjustment.

[5] See Workpaper F for calculation of the weather normalization factor.

[6] Energy Efficiency benchmark as established in O.R.C. §4928.66(A)(1)(a).

[7] 2011 Cumulative Energy Efficiency Reduction Benchmark as established in Case No. 12-1420-EL-POR, Schedule 1, line 21.

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
Peak Demand Baseline and Benchmark Calculation

		2009	2010	2011	2012
1	**Baseline Calculation Components**				
2	Peak MW Demand [1]	2,912	2,956	3,146	
3					
4	**Normalizing Adjustments**				
5	Significantly Reduced Customer Load [2]	(36)	(31)	(18)	
6	Significantly Expanded Customer Load [3]	47	21	9	
7	Total Customer Load Adjustment (5)+(6)	11	(10)	(9)	
8	Mercantile Customer Adjustment [4]	5	7	8	
9	Total Adjusted Peak Demand (2)+(7)+(8)	2,928	2,953	3,145	
10	Weather Normalization Factor [5]	0.97527	0.91610	0.86364	
11	Normalized Peak Demand (9)*(10)	2,856	2,705	2,716	
12					
13	**2012 Normalized Peak Demand Reduction Baseline**				
14	3 Year Normalized Average (MW)				2,759
15					
16	**Calculation of Normalized 2012 Peak Demand Reduction Benchmark**				
17	Normalized Preceding 3 Year Average Peak Demand (14)				2,759
18	2012 Peak Demand Reduction Benchmark % [6]				3.25%
19	**2012 Peak Demand Reduction Benchmark (17)*(18)**				**89.7**

[1] Peak demand for the period 2009-2011 is reported in PUCO Form FE-D3. See Workpaper B.

[2] Significantly reduced customer load include those who ceased or reduced their operations during the period. See Workpaper C for a complete list of customers.

[3] Significantly expanded customer load include those customers who started or expanded operations during the period. See Workpaper C for a complete list of customers.

[4] See Workpaper D for calculation of Mercantile Customer Adjustment.

[5] See Workpaper F for calculation of weather normalization factor.

[6] Peak Demand Reduction benchmark as established in O.R.C § 4928.66(A)(1)(b).

2012 FILED VERSUS ACTUAL ENERGY SAVINGS

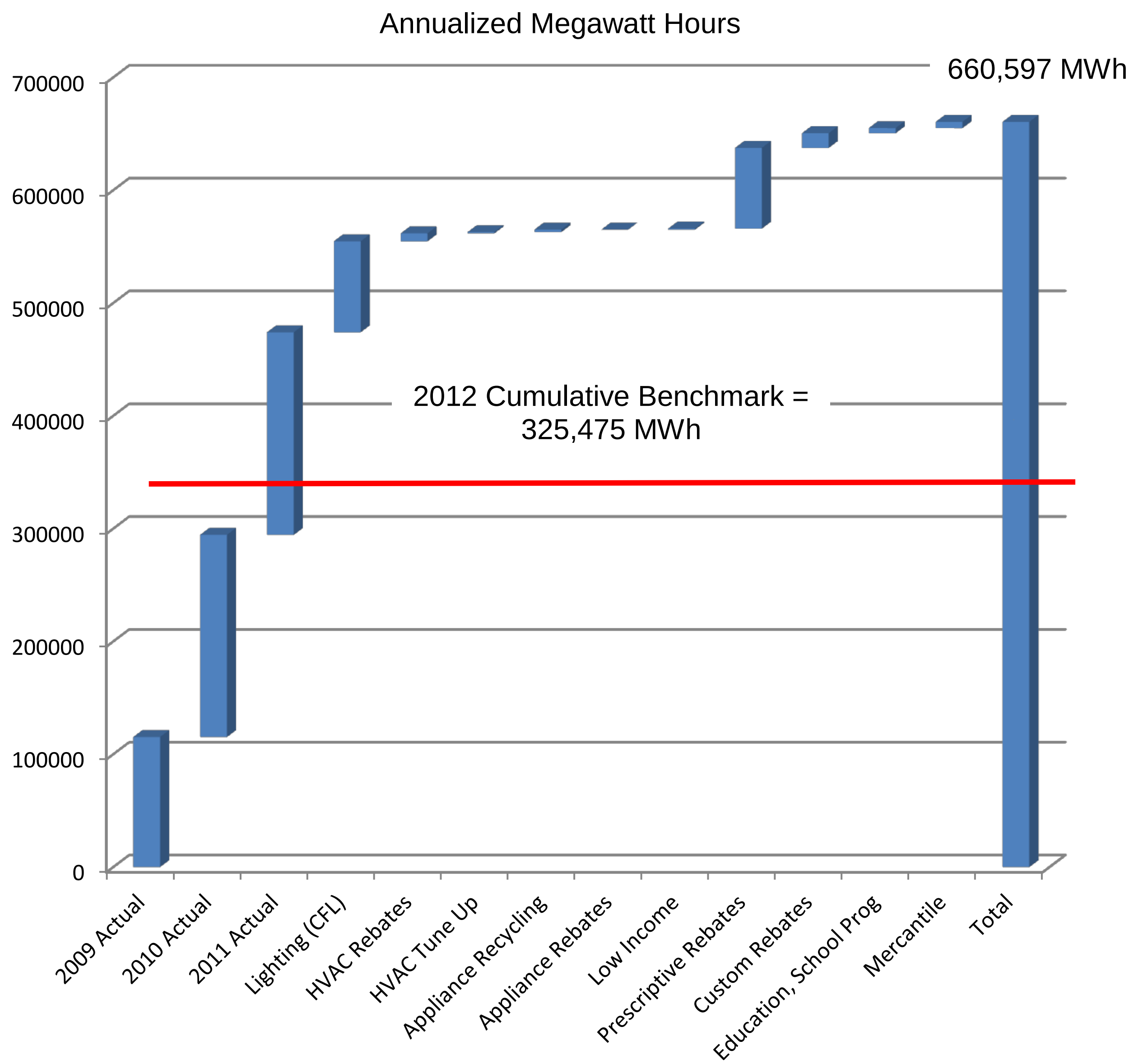
Below, in tabular and graph form, are the programs' energy and demand savings as filed, as well as the corresponding energy and demand forecasts compared to 2012 actual program performance. The actual performance is then compared to the 2012 energy and peak demand reduction benchmarks to demonstrate DP&L's compliance.

Program	Filed 2012 (MWh)	Annualized Actual 2012 (MWh)	Variance (MWh)
Residential Lighting (CFL)	28,603	80,677	52,074
Residential HVAC Rebates	1,691	7,035	5,344
Residential HVAC Diagnostic & Tune Up	2,983	1,095	-1,888
Residential Appliance Recycling	3,965	2,213	-1,752
Residential Appliance Rebates(1)	962	0	-962
Residential Low Income Affordability	1,705	900	-805
Non-Residential Prescriptive Rebates	32,868	71,554	38,686
Non-Residential Custom Rebates	14,844	12,993	-1,851
Education, School Programs	0	4,544	4,544
Mercantile Customer Commitments(2)	0	5,515	5,515
Total	**87,621**	**186,526**	**98,905**

(1) With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L transferred the appliance rebate budget to the appliance recycling program.

(2) Mercantile Customer Commitments for energy represent those mercantile applications filed in 2012 and approved by the PUCO prior to the filing of this report.

2012 ENERGY ACTUALS COMPARED TO CUMULATIVE BENCHMARKS



	MWh
2009 Actuals	115,279
2010 Energy Efficiency Actuals	174,249
2010 Mercantile Commitments	4,957
2011 Energy Efficiency Actuals	164,039
2011 Mercantile Commitments	15,547
2012 Energy Efficiency Actuals	181,011
2012 Mercantile Commitments	5,515
Cumulative 2009-2012 Total Savings	660,597
Cumulative 2012 Benchmark	325,475

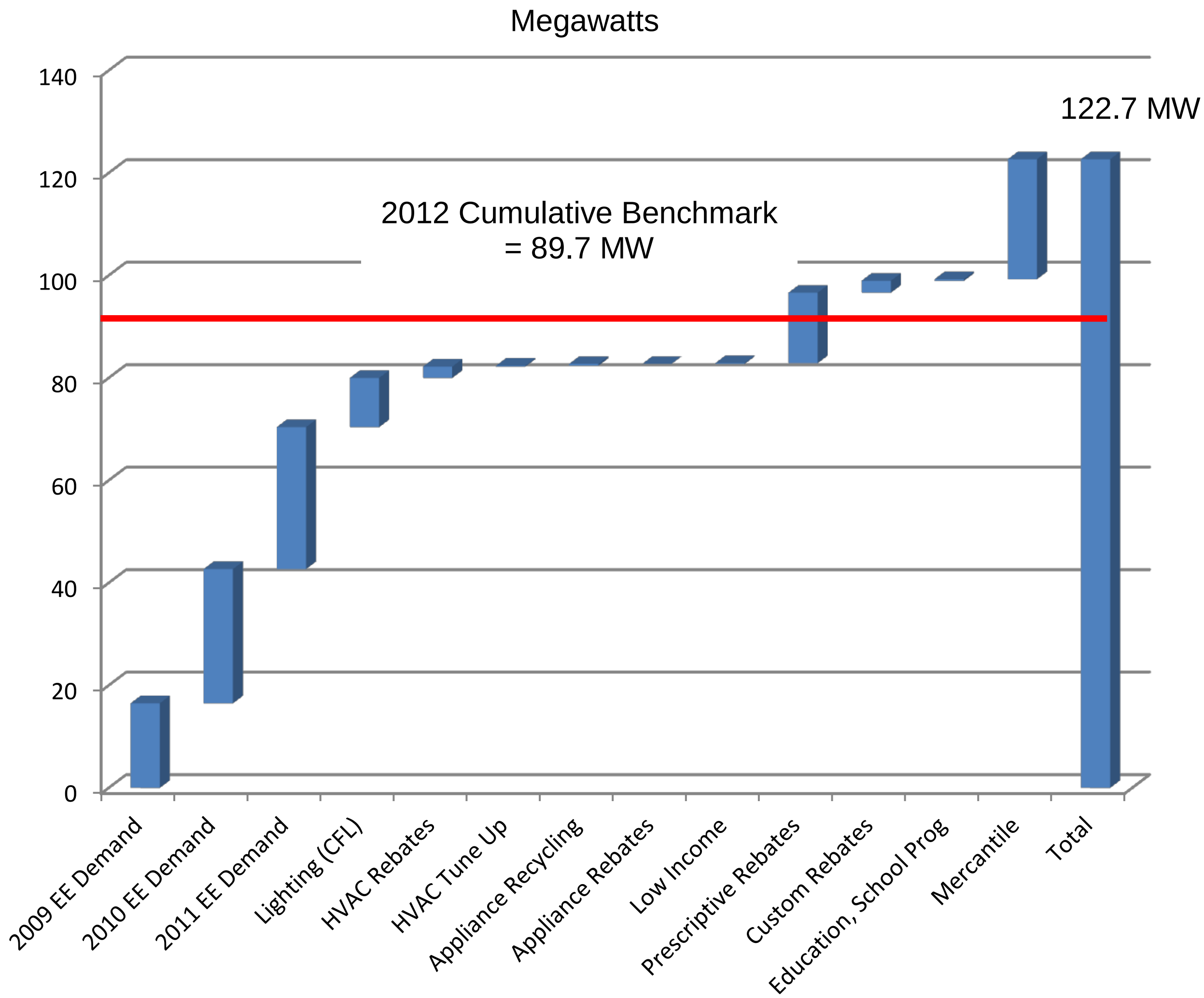
2012 FILED VERSUS ACTUAL DEMAND SAVINGS

Program	Filed 2012 (MW)	Annualized Actual 2012 (MW)	Variance (MW)
Residential Lighting (CFL)	2.43	9.65	7.22
Residential HVAC Rebates	1.51	2.21	0.70
Residential HVAC Diagnostic & Tune Up	2.65	0.19	-2.46
Residential Appliance Recycling	0.62	0.35	-0.27
Residential Appliance Rebates[1]	0.12	0.00	-0.12
Residential Low Income Affordability	0.13	0.16	0.03
Non-Residential Prescriptive Rebates	8.90	13.73	4.83
Non-Residential Custom Rebates	2.80	2.33	-0.47
Education, School Programs	0.00	0.32	0.32
Mercantile Customer Commitments[2]	0.00	23.44	23.44
Total	**19.16**	**52.38**	**33.22**

[1] With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L transferred the appliance rebate budget to the appliance recycling program.

[2] Mercantile Customer Commitments includes 20.00 MW of PJM Demand Response committed to DP&L by mercantile customers.

2012 DEMAND ACTUALS COMPARED TO CUMULATIVE BENCHMARKS



	MW
2009 Actuals	16.5
2010 Energy Efficiency Actuals	24.7
2010 Mercantile Commitments*	1.5
2011 Energy Efficiency Actuals	24.2
2011 Mercantile Commitments	3.5
2012 Energy Efficiency Actuals	28.9
2012 Mercantile Commitments	23.4
Cumulative 2009-2012 Total Savings	122.7
Cumulative 2012 Benchmark	89.7

*Mercantile commitments for PJM Demand Response do not carry over from year to year. Therefore, 2010 and 2011 PJM Demand Response commitments have been removed from the cumulative total.

RESIDENTIAL PROGRAMS

RESIDENTIAL LIGHTING

PROGRAM DESCRIPTION

The Residential Lighting Program is an upstream, manufacturer buy-down of compact fluorescent light bulbs (CFL) sold at the retail level. No coupon or rebate form is required; the customer receives the discount at the register at the time of purchase.

The objective of the program is to increase the number of long-life, Energy Star qualified CFLs sold to DP&L customers by providing incentives to decrease consumer costs. The program increases consumer awareness and acceptance of energy-efficient lighting technology and also has an educational component to promote use, and proper disposal of, CFL bulbs.

The Residential Lighting Program is designed for all DP&L residential customers who purchase bulbs through retail channels. All customers taking delivery service from DP&L are eligible for this program regardless of their choice of generation supplier.

This program started in February 2009 and continued through 2012.

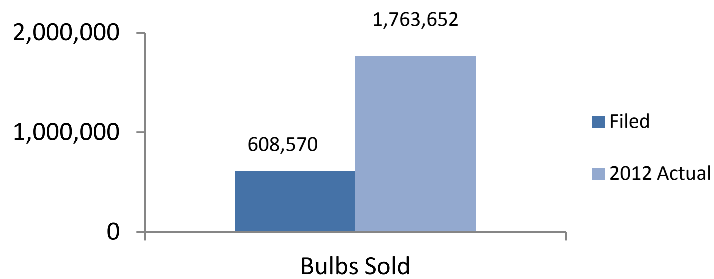
PERFORMANCE SUMMARY

During 2012, a total of 1,763,652 bulbs were sold throughout the DP&L service territory, resulting in gross annualized energy savings of 80,677 MWh and peak demand savings of 9.65 MW. Keys to the program's success include offering customers a wide variety of CFL choices with attractive discounts as well as a broad, and convenient, retail distribution network.

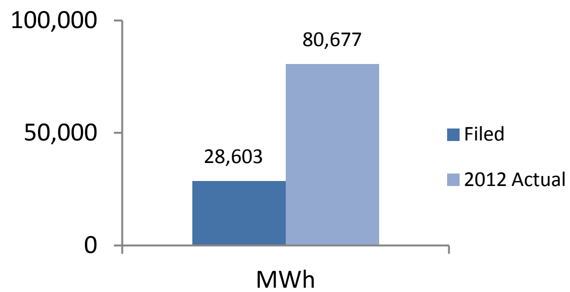
Program evaluations and national trends suggest that five percent of discounted CFLs were purchased by non-residential customers. As a result, five percent of savings and costs from the Residential Lighting Program have been reallocated to the Non-Residential Prescriptive Rebates Program.

2012 Performance

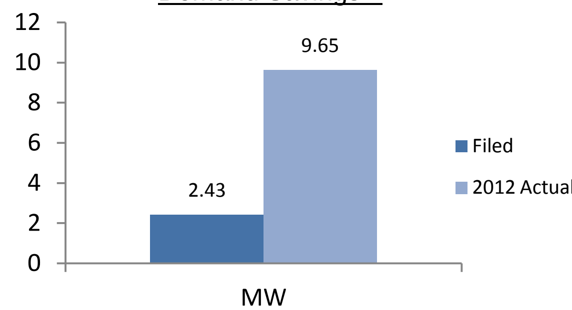
Units



Energy Savings*



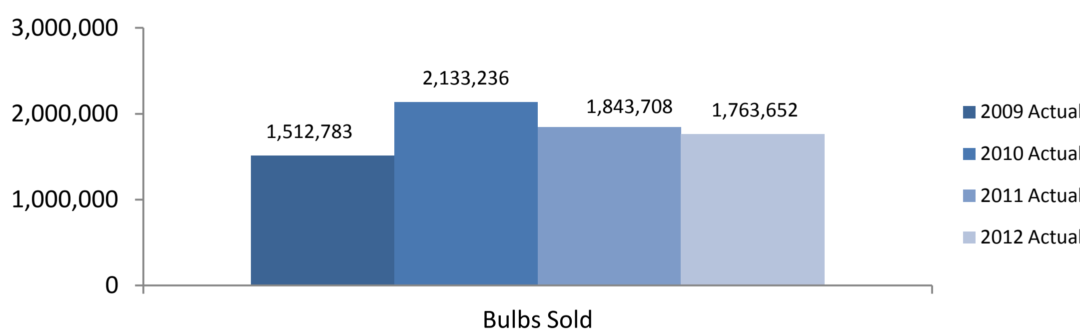
Demand Savings**



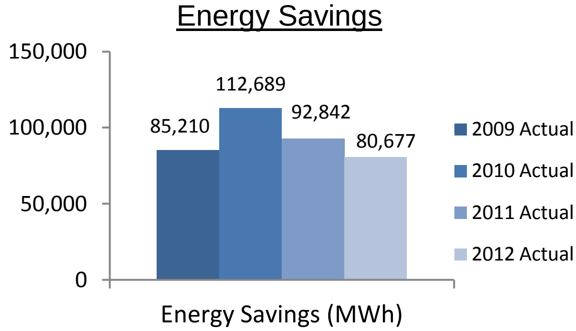
All “filed” numbers are taken from DP&L’s program portfolio filing; Case No. 08-1094-EL-SSO.
*Energy savings are net of 5% reallocation to the Non-Residential Prescriptive Rebates program.
**Demand savings are net of 5% reallocation to the Non-Residential Prescriptive Rebates program.

Four-Year Trend Analysis

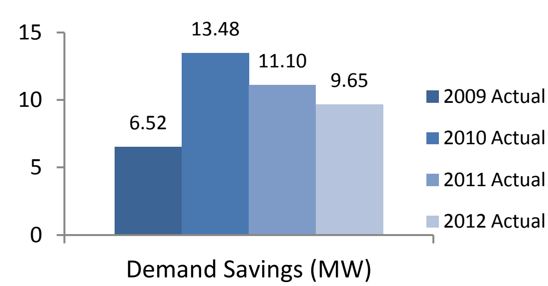
Units



Energy Savings



Demand Savings



Budget, Cost Summary*

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$1,786,762	$2,496,939**
Marketing & Admin	$1,179,263	$573,551**
Total Costs	$2,966,025	$3,070,490**

*With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated 2012 budgets within the residential program portfolio. The reallocation is summarized on page 1-7. Shown above is the original filed budget for 2012.
** Costs are net of 5% reallocation to the Non-Residential Prescriptive Rebates program.

IMPLEMENTATION REVIEW

Implementation Strategy

With a CFL program, a third party implementation vendor offers significant value due to its experience running similar programs as well as existing lighting manufacturer and retailer relationships. As such, DP&L determined that program implementation would be most effectively managed by a third-party implementation partner.

At the conclusion of a request for proposal (RFP) process, Ecova (formerly Ecos IQ), based in Portland, Oregon, was selected as the implementation partner. In its proposal, Ecova demonstrated a sound process for quickly and effectively implementing programs based on its ten year track record of successfully implementing similar programs. Specifically, Ecova had experience implementing CFL programs for Arizona Public Service, the California Public Utilities Commission, Sierra Pacific Power, Puget Sound Energy, Nevada Power, and the Texas Statewide CFL Program.

Targeted Products

DP&L's CFL program was designed to provide customers with an extensive choice of products, so customers can select the types of bulbs that best meet their needs. In total, DP&L's program offers customers a choice of 74 different types of products. The most popular is the 13W twist bulb. Overall, DP&L offers soft white, bright white and daylight colored bulbs, 3-way, dimmable, globe, A-line, and flood bulbs, ranging from 7W to 55W. The average discount was $1.48 per bulb with discounts ranging from $0.63 to $2.50, depending on the type of bulb.

Products Types Offered

Product Name	Units Purchased	Product Name	Units Purchased
32W Spiral 3way	1,252	23W PAR38	1,164
3-Way	362	23W PAR38	29
11W A-Line	144	23W R40	608
14W A-Line	672	23W Twist	123,491
19W A-Line	148	26W PAR38	4,322
9W A-Line	30	26W PAR38	35
9W A-Line	88	26W R40	408
10W Twist	35,474	26W R40	41
10W Twist	40	26W R40 Dim	162
11W A-line	1,702	26W Twist	153,412
11W Globe	2,433	26W Twist Dim	165
11W R20	84	32W Spiral 3Way	979
11W R20	742	3-Way	248
12W Globe	3,474	3-Way	290
13W Twist	921,986	3-Way	2
14W A-Line	6,040	3-Way - 12/21/32	697
14W BR30	1,798	42W Twist	803
14W Globe	1,224	55W Twist	318
14W R20	676	7W A-Line	2
14W R30	15,322	9W A-Line	1,376
14W Twist	292,416	9W Globe	1,504
14W Twist Dim	378	9W Twist	10,877
15W A-Line	2,976	10W Twist	4,758
15W Globe	2,540	13W Twist	3,588
15W R30	6,183	15W Twist	1,992
15W R30 Dim	2,222	23W Twist	5,196
15W Twist	914	11W Globe	213
15W Twist Dim	122	14W Globe	751
16W R30	376	9W Globe	218
16W R30	11,770	9W Globe	465
16W R30 Dim	160	11W R20	43
18W Twist	5,053	14W R30	793
18W Twist	27,950	15W R30	9,587
19W Twist	42,908	15W R30 Dim	664
20W R40 Dim	74	18W R40	1,058
20W Twist	618	9W Torpedo	591
20W Twist	35,371		**1,763,652**
23W A-Line	7,080		

Targeted Retailers, Locations
To make the program convenient and accessible for all customers, DP&L's program enlisted the participation of the traditional "big box" retailers as well as independent hardware and specialty locations. The big box retailers were the first selected to participate, given their previous experience with implementing similar buy-down programs in other regions and their ability to get the programs up and running quickly. Further, big box retailers sell significant volume, allowing the program to reach the largest number of DP&L customers as quickly as possible.

The first participating retail outlets selected were concentrated in the Dayton metropolitan area to match the location of the highest volume of DP&L residential customers. DP&L then expanded the program to outlying areas, giving all residential customers the opportunity to participate. In addition, an online retailer was added to the program to provide an additional convenient option for customers.

Retail locations were carefully selected to minimize the potential for participation from non-DP&L customers. The highest concentration of retailer locations coincides with geographic areas that have the highest concentration of DP&L customers. Retailer locations outside of the DP&L service territory were excluded. In communities served by municipal utilities or on the edge of the DP&L service territory, store locations were minimized.

Participating Retailers

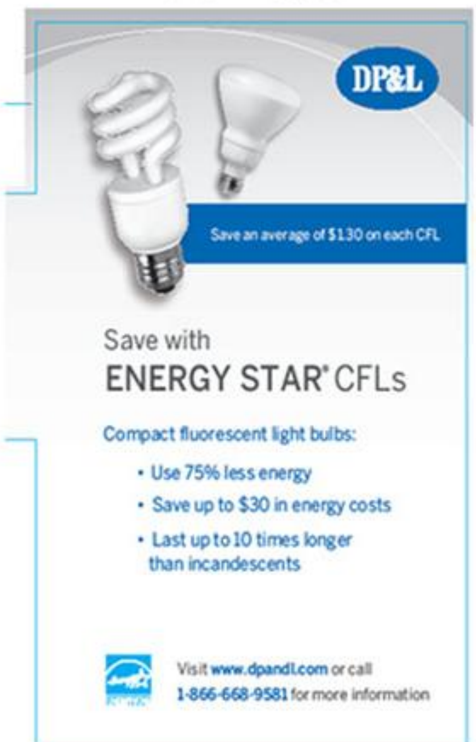
Retailer	# of Locations
Ace	15
Batteries Plus	3
Bed Bath and Beyond	3
Goodwill	22
Home Depot	7
Kroger	26
Lowes	12
Meijer	6
Menards	3
Online	1
Sam's	3
True Value	3
Walmart	17
Total	**121**

Staffing
Two Ecova staff members manage the program locally and serve as DP&L's direct point-of-contact. The local field staff is responsible for visiting participating retail outlets to ensure that discounted products are stocked on the shelves, priced and labeled correctly, so that customers are receiving the discounts at the register. The local field staff is also responsible for promoting the program at a number of community events. This staff is supported by the experienced managers and support team located at the Ecova main office.

Marketing
In order to promote CFLs and the lighting program discounts to its customers, DP&L employed a breadth of marketing methods. Starting with the assumption that approximately 70 percent of purchasing decisions are made in the store at the time of purchase, the core of the marketing efforts focused on point-of-purchase (POP) materials. For instance, DP&L created a special sticker which is placed next to the standard price sticker to alert customers to program discounts. A “shelf wobbler” protrudes into the aisle and calls attention to the available discounts and the benefits of CFLs. A “bulb wheel” hangs off the shelf to help customers pick the right bulb for their fixture and convert the incandescent wattage to the CFL wattage. And, Ecova works with store managers to position the discounted CFLs in highly visible areas whenever possible.

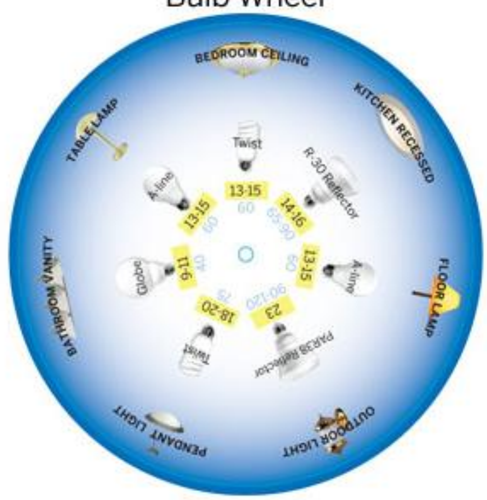
Point-of-Purchase Material Samples:

Shelf Wobbler



Shelf Sticker

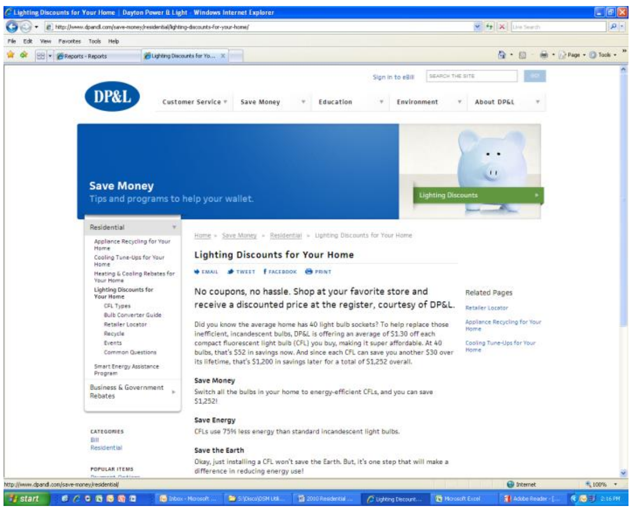
Bulb Wheel



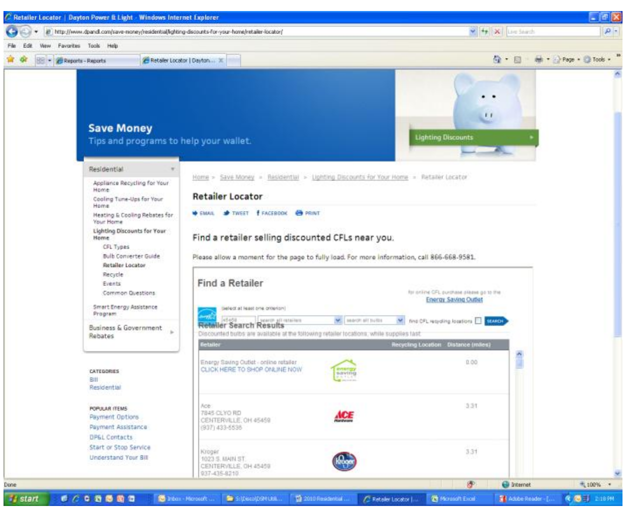
Beyond the POP materials, DP&L also promotes the residential lighting program to customers via a web site, bill inserts, presence at special events, and mass media advertising.

The CFL program web pages on the DP&L company web site provide a description of CFL bulb types and their applications, conversions of wattages from incandescent to CFL, calendar of upcoming events, and answers to frequently asked questions. A page of the web site is devoted to CFL recycling, educating customers about the small amount of mercury in CFLs, and how to properly dispose of a CFL (if broken), and where to recycle (if unbroken).

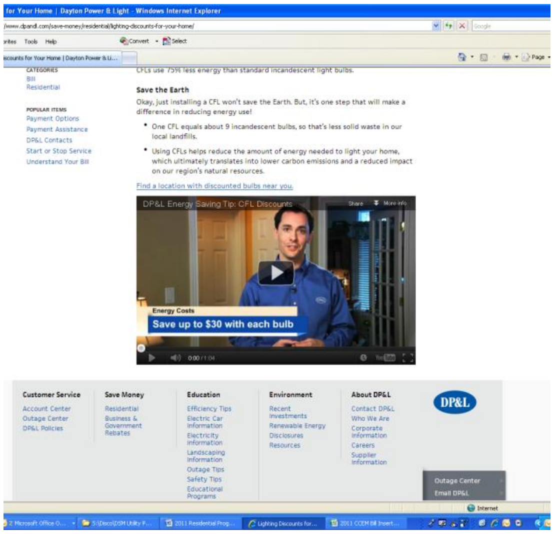
The web site also contains a retailer locator which allows customers to search for participating retailers by their home zip code. The results are shown in terms of the store location's distance from the customer's zip code. Customers can see which bulb types are discounted at each store. Customers can access Techniart, the online retailer, via the retailer locator to place an order. Techniart offers discounts on traditional and specialty bulbs.



Web Site
The CFL program landing page gives a description of the residential lighting program and allows customers to navigate to other pages for more information.



Web Site Retailer Locator
The retailer locator allows customers to search for participating retailers by their home zip code or by desired bulb type.



YouTube Video
The YouTube video, produced by DP&L and posted on the CFL program landing page, educates customers about the benefits of switching to CFLs.

Bill Insert
Bill inserts were mailed to 450,000 residential customers in September and October.

Community Outreach Events
The Ecova local field staff attended 18 local community events to discuss the residential lighting program, CFLs, and their benefits.

Education, General Awareness
DP&L conducted a mass media education and general awareness campaign promoting the value of energy efficiency and the available residential programs. A complete discussion of this campaign can be found in Section 5.

Community Partnerships
DP&L was able to utilize promotional benefits provided via existing corporate sponsorships of local organizations, like the minor league Dayton Dragons baseball team.

Customer Service

In all programs, customer service is a critical element of program success. As such, DP&L designed a number of customer service elements into its program, some of which have been previously discussed.

The program web pages (discussed in the Residential Lighting Program Marketing section) allow DP&L to provide a breadth of information for all customers with internet access. The web pages not only educate about CFLs, but also help customers to locate available discounts near their home.

For those without internet access, or who want to speak to a person, DP&L set up a program hotline number staffed by Ecova employees. The staff has been trained to answer detailed questions about the Residential Lighting Program and help customers locate available discounts. While few customers utilized this service, having a telephone option available when needed is an important customer service element.

DP&L maintains its own customer service center, accepting calls regarding all functions of DP&L. DP&L management staff continues to update customer service center staff regarding program details as needed.

The Ecova local field staff continues to be a large component of DP&L's customer service, ensuring the accuracy of prices and products in stores, which helps to meet customers' expectations. In a retail environment, it is possible for point-of-purchase materials to be inadvertently removed or placed next to products that may or may not be discounted as restocking occurs. Regular, in-person store visits are an essential element of the program. In addition, the local field staff was in direct contact with customers at 18 local community events in 2012, answering questions and helping to educate customers about the program.

RESIDENTIAL HVAC REBATES

PROGRAM DESCRIPTION

The Residential HVAC Rebates Program offers rebates for the installation of new or replacement, high efficiency central air conditioning and heat pump systems. The customer receives an instant discount as a line item on the invoice from a participating HVAC contractor.

The objective of the program is to reduce energy consumption and peak demand savings by incentivizing customers to purchase efficient HVAC equipment that goes above and beyond the current minimum standard for efficiency.

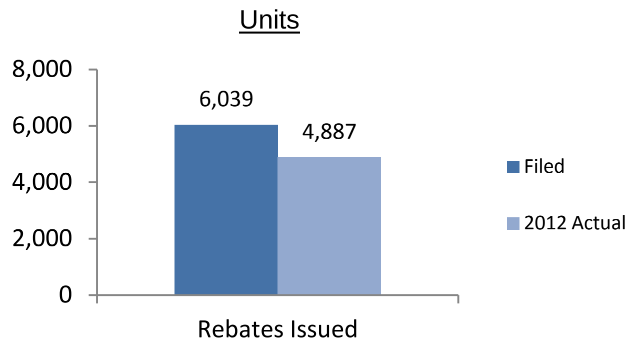
This program is designed for any homeowner or landlord purchasing a new or replacement HVAC unit that will be installed at a residence within the DP&L service territory. All customers taking delivery service from DP&L are eligible for this program regardless of their choice of generation supplier.

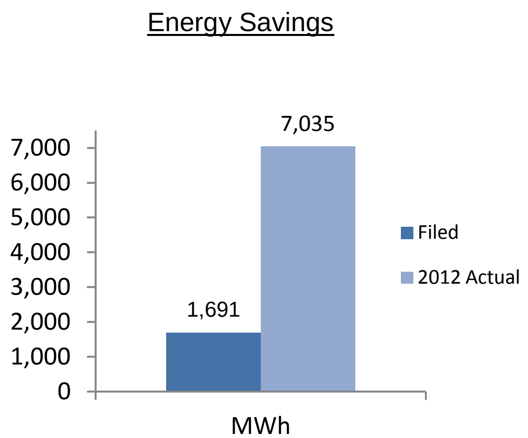
The program started in June 2009 with a core group of 23 participating contractors and has increased to 225 participating contractors by the end of 2012.

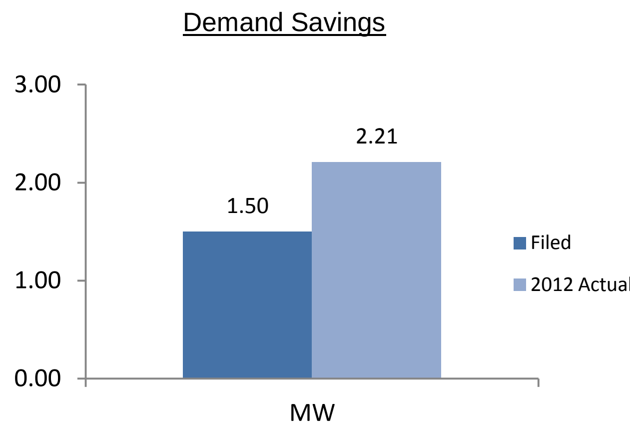
PERFORMANCE SUMMARY

During 2012, a total of 4,887 HVAC rebates were issued throughout the DP&L service territory, resulting in gross annualized energy savings of 7,035 MWh and peak demand savings of 2.21 MW. This performance exceeded the anticipated energy savings of 1,691 MWh. The DP&L savings estimates did not include heat pump winter usage savings. The addition of these savings coupled with a stronger than expected heat pump volume had a significant effect on the energy savings results.

2012 Performance

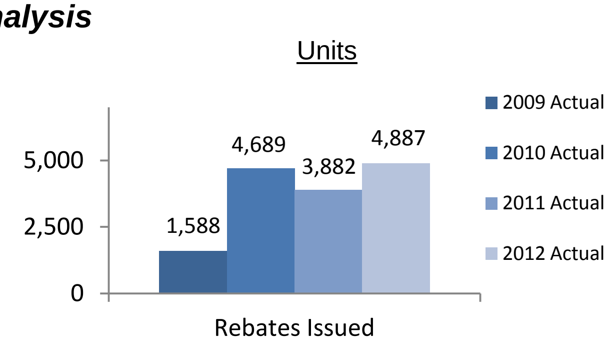


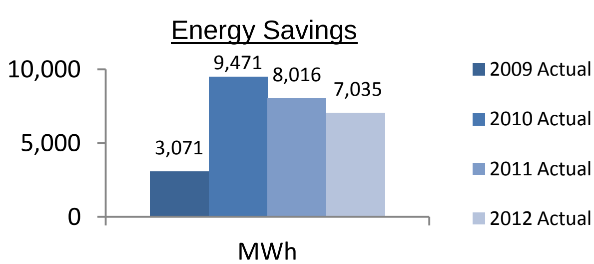


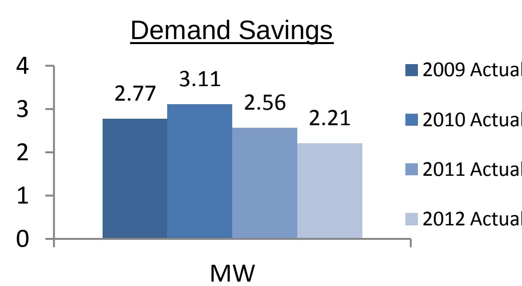


All “filed” numbers are taken from DP&L’s program portfolio filing; Case No. 08-1094-EL-SSO.

Four-Year Trend Analysis







Budget, Cost Summary*

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$1,003,742	$1,156,700
Marketing & Admin	$702,619	$592,348
Total Costs	$1,706,361	$1,749,048

*With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated 2012 budgets within the residential program portfolio. The reallocation is summarized on page 1-7. Shown above is the original filed budget for 2012.

IMPLEMENTATION REVIEW

Implementation Strategy

With a Residential HVAC Rebate Program, it is of great value to have a third party implementation vendor with experience running similar programs that require building a network of HVAC contractors. Therefore, DP&L determined that program implementation would be most effectively managed by a third-party implementation partner.

At the conclusion of a RFP process, Conservation Services Group (CSG) was chosen as DP&L's implementation partner. CSG, based in Westborough, Massachusetts is a non-profit organization with a 25-year history of delivering energy efficiency programs. CSG's track record includes running successful programs for utilities such as Southern California Edison, San Diego Gas and Electric, NSTAR, Columbia Gas of Ohio, and National Grid. In addition, since the Residential HVAC Rebates Program is a logical extension of the HVAC Diagnostic and Tune-Ups Program, the most cost-effective approach is to utilize the same vendor to implement both programs.

Targeted Products

DP&L offered rebates for central HVAC systems in three categories: New Construction; Replacement; and Early Retirement, with tiers for higher efficiency levels. DP&L customers can select the system manufacturer and model of their choice, but are only eligible to receive a rebate if the system meets the Seasonal Energy Efficiency Rating (SEER) requirements, or the Energy Efficiency Ratio (EER) requirements for ground source heat pumps. In 2012, DP&L began offering rebates for the installation of electronically commutated motors (ECM) used in high efficiency, gas furnaces. In 2012, the most popular central system rebate was for early retirement air conditioners at SEER 14/15, followed by early retirement air conditioners at SEER 16+. DP&L also issued more than 1,200 rebates for ECMs.

Rebates Offered

For Central Air Conditioning, Air-Source Heat Pumps, and Ductless Mini-Splits*

SEER Efficiency Rating	New Construction	Replacement	Early Retirement
14-15	$100	$100	$200
16+	$150	$150	$300

*Mini-splits are not eligible for early retirement rebates.

For Air-Source Heat Pumps

SEER Efficiency Ratio	New Construction	Replacement	Early Retirement
14-15	$200	$200	$400
16+	$300	$300	$600

For Ground-Source Heat Pumps

EER Efficiency Ratio	New Construction	Replacement	Early Retirement
16-18	$200	$200	$400
19+	$300	$300	$600

For Electronically Commutated Motors (ECM)

AFUE	New Construction	Replacement	Early Retirement
95%+	$100	$100	$100

New Construction – High-efficiency, new equipment installed in new homes in a home or a home addition where there is no previously existing central air conditioning or heat pump system.
Replacement – High-efficiency, new equipment installed as a replacement for existing equipment not meeting early retirement eligibility requirements.
Early Retirement – High-efficiency, new equipment installed as a replacement for existing equipment that meets the following requirements:

Existing equipment is in working order, regardless of age OR
Existing equipment is less than or equal to 20 years old and is repairable for less than $1000.

Rebates Issued

Product	Rebates Issued 2012
Replacement or New Construction Air Conditioner SEER 14/15	129
Replacement or New Construction Air Conditioner SEER 16+	64

Replacement or New Construction Heat Pump SEER 14/15	582
Replacement or New Construction Air Source Heat Pump SEER 16+	52
Replacement or New Construction Ductless Mini-Split SEER 14/15	3
Replacement or New Construction Ductless Mini-Split SEER 16+	103
Replacement or New Construction Ground Source Heat Pump EER 13-15	12
Replacement or New Construction Ground Source Heat Pump EER 16+	17
Early Retirement Air Conditioner SEER 14/15	1,208
Early Retirement Air Conditioner SEER 16+	627
Early Retirement Air Source Heat Pump SEER 14/15	425
Early Retirement Air Source Heat Pump SEER 16+	322
Early Retirement Ground Source Heat Pump EER 13-15	52
Early Retirement Ground Source Heat Pump EER 16+	51
ECM	1,240

Targeted Contractors

CSG recruited a network of contractors to market, recommend, and install eligible HVAC equipment. Contractors must be certified by DP&L to participate in the program and must sign a partnership agreement. Certification qualifications include: a valid HVAC license; minimum levels of insurance; Environmental Protection Agency-certified technicians; and a Better Business Bureau rating higher than B-. Large contractors were targeted first, which allowed the program to reach the greatest number of DP&L customers as quickly as possible. Continually, smaller, independent contractors were recruited, so that by the end of 2012, the program had 225 participating contractors located throughout the DP&L service territory.

To make the program convenient and accessible for all customers, customers may purchase an eligible HVAC system from any certified contractor of their choice. If a customer's existing contractor is not already a certified contractor, CSG will work to recruit the contractor into the program so that the customer does not have to switch contractors.

When purchasing qualifying equipment, DP&L customers receive the rebate via an instant discount on the invoice total from the certified contractor. Participating contractors are then reimbursed for the total of the rebates issued, with proper support documentation. This approach allows customers to have a lower upfront out-of-pocket expense when making their purchase. Also, it is the most cost-effective method, as establishing a rebate processing service for individual customers (which CSG had not included in their implementation plan) can be a significant, added expense.

Staffing

CSG's local staff members manage the program and serve as DP&L's direct point-of-contact. (This staff also manages the HVAC Tune-Up Program.) The local field staff, consisting of a program manager, account manager, administrative coordinator, and part-time quality control auditor, is responsible for maintaining relationships with HVAC contractors to ensure that the program is mutually beneficial and successful. For contractors to be most successful in the program, they need to have a thorough understanding of program guidelines and buy-in to the DP&L program design and processes. CSG maintains regular contact with contractors to discuss program issues, potential solutions, and opportunities for improvement.

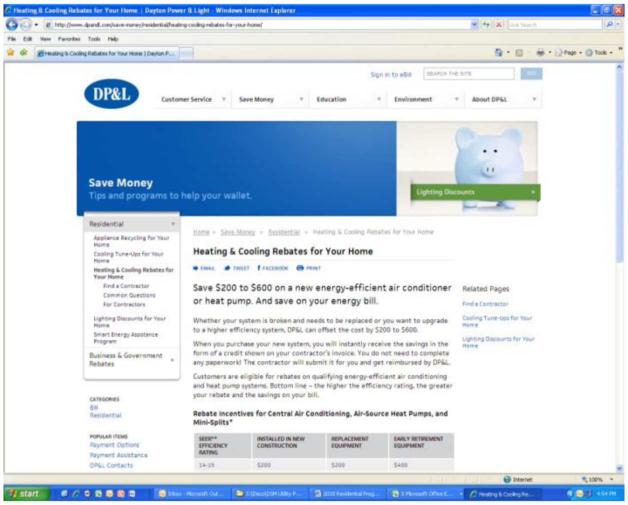
CSG closely monitors rebate applications for accuracy of rebate values and eligibility of equipment. CSG also performs quality control checks on a portion of all system installations and accompanying paperwork to ensure that contractors adhere to the program guidelines. Contractors who exhibit a track record of poor quality work or customer complaints are removed from the program. The local staff is supported by the experienced managers and support team located in the CSG main office.

Marketing

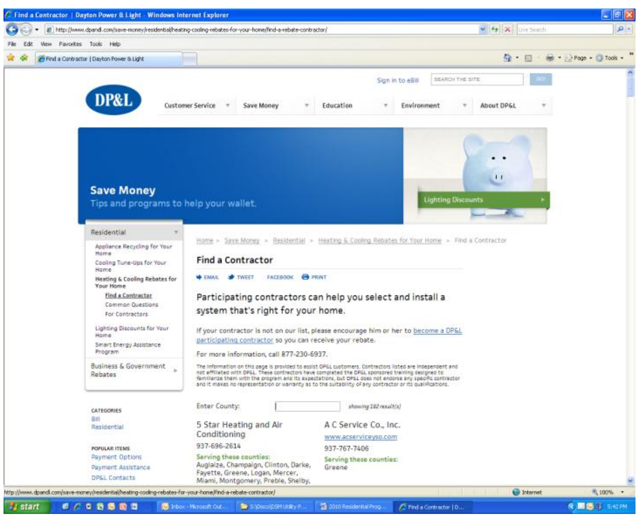
The program is designed to be marketed largely through participating HVAC contractors. Since contractors work directly with DP&L customers, they are able to offer rebates at the point-of-sale. Participating contractors are motivated to offer the rebates as a sales tool, providing a discount that non-participating contractors cannot. To support contractors and help advertise the program, DP&L created a series of marketing pieces including web pages, fliers, and bill inserts.

The HVAC rebate program web pages on the DP&L company web site provide an overview of the program, a list of eligible equipment, and answers to frequently asked questions. One page is dedicated to helping customers find a participating contractor. Customers can search by their home county and see a list of all contractors serving that area. This page also mentions the ability to recruit the customer's present contractor.

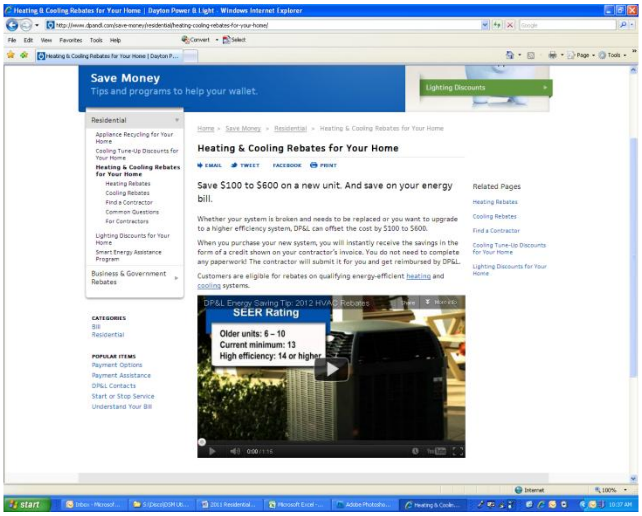
The web portal contains a special log-in section for participating contractors. The portal displays program news and answers to frequently asked questions.



Customer Web Pages
The HVAC program landing page gives a description of the residential HVAC rebates program and allows customers to navigate to other pages for more information.

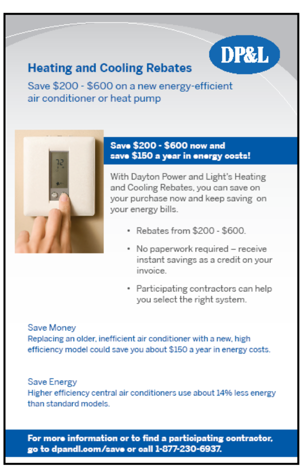


Web Site Contractor Locator
The contractor locator allows customers to search for participating contractors by their home county.



YouTube Video
The YouTube video, produced by DP&L and posted on the HVAC rebates program landing page, educates customers about the benefits of upgrading to a high efficiency HVAC system.

Bill Insert
Bill inserts were mailed to 450,000 customers in May, June, and July.



Flyer
Program fliers were distributed to customers at community outreach events attended by the residential lighting program field staff, creating promotional efficiencies among programs.

Newspaper Advertisements
DP&L ran a series of newspaper advertisements to promote the program in June, July, and August.

Education, General Awareness
DP&L conducted a mass media education and general awareness campaign promoting the value of energy efficiency and the available residential programs, including HVAC rebates. A complete discussion of this campaign can be found in Section 5.

Customer Service
In all programs, customer service is a critical element of program success. As such, DP&L designed a number of customer service elements into its program, some of which have been previously discussed.

The web pages and contractor locator (discussed in the Residential HVAC Rebates Marketing section) allow DP&L to provide a breadth of information for all customers with internet access. The contractor locator allows customers to conveniently access a way to participate in the program.

For those without internet access, or who want to speak to a person, DP&L set up a program hotline number staffed by CSG employees. The staff has been trained to answer detailed questions about the Residential HVAC Rebates Program and help customers locate participating contractors in their area.

DP&L maintains its own customer service center, accepting calls regarding all functions of DP&L. DP&L management staff continues to update customer service center staff regarding program details as needed.

The large number of participating contractors is an important component of DP&L's customer service. The contractors were located throughout DP&L's service territory, making the rebates accessible to all customers. In addition, the ability to recruit a customer's current contractor is a large source of satisfaction for both the customer and the contractor.

The CSG local staff is another significant element of DP&L's customer service, serving both the contractors and the customers. For contractors to be most successful in the program, they need to have a thorough understanding of program guidelines and buy-in to the program design and processes. CSG maintains regular contact with contractors to discuss program issues, potential solutions, and opportunities for improvement.

In addition, CSG's quality control of contractors' work allows DP&L customers to receive their rebates, as promised. CSG performs quality control checks on five percent of all system installations and five percent of pre-installations for early retirement systems. Equipment is reviewed along with the accompanying paperwork to ensure that contractors adhere to the program guidelines. CSG's oversight ensures that the program's integrity is maintained and that customers are treated properly and fairly. Contractors who exhibit a track record of poor quality work or customer complaints are removed from the program.

Participating Contractors

5 Star Heating and Air Conditioning	J & M Heating & Cooling
A C Service Co., Inc.	John Boyd Heating & Cooling
AAA Professional Heating & Cooling	John P. Timmerman Co., LLC
A-Abel Heating & Air Conditioning Inc.	Johnson Mechanical, Inc.
Accurate Heating & Cooling	Joseph's Heating & A/C, Inc.
Advanced Mechanical Services	K C Services, LLC
Aero Mechanical Systems	Kelly Heating and Air
Air Comfort Heating and Cooling	Kenny Adams Heating & Cooling LLC
Air Systems Div. PRD Corp. Inc.	Kirkwood Heating & Cooling
Aireawide Heating & Air Inc.	Kogge Plumbing, Heating & A/C, Inc.
Airtron Heating & Air Conditioning	Kool-Ease, Inc.
AJ Mechanical Services, Inc.	Korrect Plumbing Co.
Allied Services, Inc.	Lake Contracting Company
All-Weather Heating & A/C Inc.	Lefeld Plbg. & Htg. Inc.
Al's Complete Heating & Cooling Inc.	Livingston HVAC
Alternative Heating and Cooling	Lochard Inc.

American Air	Logan Master Appliance
American Residential Systems	Logan Services
Anderson Mechanical Associates, LLC	Lowe's HVACR
Apex Mechanical Systems	Lowman Metal Shop
Applied Mechanical Systems	M. Bruns Plbg. HVAC & Elect
Area Energy & Electric	MAB Mechanical Inc.
Area Heating & Air Conditioning, LLC	Mark Sweitzer Htg. Clg. & Ref. Inc.
Arrow Mechanical Services	Masters Heating & Cooling Inc.
Ayers Service Group DBA CW Service	Mastertech Mechanical Services Inc.
B & B Plumbing and Heating Co.	MC Heating & Cooling
B & K Heating & A/C Inc.	Mike Logan Refrigeration/Appliance
Babb Sheet Metal	Minkner Services Corp
Bach Heating & Air, LLC	Morland Heating & Air Conditioning
Barga Heating, A/C & Refrig., Inc.	Morris Heating Cooling and Electrical Services Inc.
Barker Heating and Air Conditioning Co.	National Heating & A/C Co.
Barnard HVAC, LLC	Nelson Comfort
Beck Heating & Air Conditioning, LLC	New Comfort Heating & Cooling
Bill Ahrens Plumbing & Heating, Inc.	New Knoxville Supply Co.
Blair Heating & Air Conditioning	Noll-Fisher Inc.
Bluestone Solar Engineering	North Star Plbg. Htg. & Clg.
Bolyard Heating & Cooling Inc.	Northtowne Heating
Bowling Contracting Services Ltd.	Osterfeld Champion Service
Brockman Furnace Co.	Outstanding Heating & Air, LLC
Brookville Htg & AC LLC	Peck Heating Air Conditioning
Bunsold Plumbing & Heating Inc.	Perry's Heating & Air Conditioning
Burkett's Heating & Cooling, Inc.	Peters Heating & Clg. Co.
Buschur's Refrigeration Inc.	Peterson Electric & Heating Inc.
Butler Heating and Air Conditioning Co.	Pinnacle Heating & Cooling
Carney's Heating & Cooling	Premier Restoration & Mechanical Services
Central Htg & A/C	Quality Heating & Cooling Inc.
Childers H.V.A.C. Systems Inc.	Quality Mechanical Services, Inc.
ChillTex, LLC	Quality Plumbing & Heating
Choice Comfort Services	R & R Service Plumbing
CHW Mechanical Services, LLC	R & W Heating, Inc.
CJS Heating & Air	R J Brothers Heating & Cooling
Clark's Air Conditioning and Heating	R. E. Becker Builders, Inc.
Climate Control Systems, Inc.	Raiff Heating and Cooling, LLC
Climate Dragon LLC	Ray's Refrigeration, Inc.
Climate Zone Heating & Air LLC	Refrigeration Control
Comfort Control Heating & Cooling, Inc.	Reliant Mechanical Inc.
Comfort Solutions Heating & Air	Riber Heating & Cooling

Conditioning LLC	
Comfort Solutions, Inc.	Richard Sharp Heating & Air Conditioning
Comfort Xpress, LLC	Rick's Heating & Cooling, Inc.
Commercial Refrigeration Specialists	Rieck Services
Community Mechanical	Riesen Plumbing & Heating
Consolidated Hunter Heating & Plumbing, Inc.	Rineair Heating & Air Conditioning, Inc.
Cool Solutions	RK Plumbing and Home Services LLC
Crabtree Heating & Air Conditioning	Robinson Heating & Air, Inc.
Custom Air Conditioning	Roessner Energy Products Inc.
Custom Heating & A/C, Inc.	Rose Heating & Cooling
Damon Whorton	Schmidt's Heating, Cooling & Refrigeration
Dan Smith Heating & Cooling	Schnippel Electric, Plumbing & Heating
Danco Enterprises Inc.	Scott's Heating & Air Conditioning, Inc.
Dave's Services	Seiter Services LLC
Davis Refrigeration Inc.	Service Experts Heating and Air Conditioning
Dawson Services	Shafer Heating & Cooling LLC
Dayton AC & Heating Co., Inc.	Shawnee Heating & Air, LLC
Dayton Mechanical Services, Inc.	Smarda Company
Deer Heating & Cooling Inc.	Snyder's Heating & Cooling
Del-Monde Inc.	South Home Air, Inc.
DeLong Air, Inc.	Southtown Heating, Cooling, Plumbing & Electrical
Del's Heating & Air Conditioning Co.	Southwestern Ohio Heating and Air Conditioning, Inc.
Dependable Heating & Air	Spec Mechanical Inc.
Detmer and Sons, Inc.	Stanley Construction Services, LLC
Drake Heating & Air	Stebbins Plumbing & Heating
E.H. Noonan Inc.	Steve & Ted's Services, Inc.
Edington Heating & Cooling	Steven Brackman Htg & Cooling
Ed's HVAC, Plumbing, Electric	Stuck Heating and Air Conditioning
EES Facility Services	Superior Mechanical Services, Inc.
Eisert Plumbing & Heating, Inc.	Systems C S Services Inc.
Engineering Excellence Regional Services, LLC	Tanner Heating and Air Conditioning
EnviroControl Systems, Inc.	Taylor Heating & A/C LLC
Environmental Doctor	TechnoAir HVAC Inc.
Excel Heating & Cooling LLC	Temp-Co Heating & A/C
Extreme's One Hour Heating & Air Conditioning	The Problem Solvers LLC
Faller Mechanical, LLC	TK Mechanical
Farquhar Heating & Air	Total Service Heating & Cooling
Favret Heating & Cooling	Townsend Heating & Air Conditioning
Fetz Plumbing, Heating & Air	Townsend's Heating & Cooling, Inc.

Conditioning	
Fox Air HVAC LLC	Trenton Heating & Air Conditioning
Franck Plumbing & Heating Co., Inc.	Troy Plumbing, Heating & Air Conditioning Services, Inc.
Frye Mechanical, Inc.	Tucker Heating & Air Conditioning, Inc.
Future Air	Universal Heating & Cooling LLC
Gagel Plumbing & Heating, Inc.	Wallace Heating & Air
Gallion Heating & Cooling Inc.	Wat-Kem Mechanical, Inc.
Gateway Metal Contractors	Watkins Heating & Cooling
Grilliot's Heating & Cooling Inc.	WebbtoWebb Construction Services
H & M Heating & Cooling, Inc.	Wells Brothers
Hauck Bros., Inc.	Wenig's, Inc.
Hauser Air Heating & Air Conditioning	West Jefferson Plumbing & Heating
Housh - The Home Energy Experts	Westfall Plumbing and Heating
Houston's HVACR, Inc.	Wind Bender & Associates
Howard Heating & A/C LLC	Wm. Brockman & Sons
Howdieshell Heating & Cooling LLC	Wyatt's Heating & Cooling
Howell Heating & Cooling	Yutzy Heating & Cooling Inc.
Integrity Comfort Systems	

RESIDENTIAL HVAC DIAGNOSTIC & TUNE-UP

PROGRAM DESCRIPTION

The Residential HVAC Diagnostic & Tune-Up Program offers rebates for tune-ups performed on residential central air conditioners and heat pumps. The customer receives an instant discount as a line item on the invoice from a participating HVAC contractor.

The objective of the program is to reduce energy consumption and peak demand savings by incentivizing customers to purchase a tune-up of their HVAC system, performed by a participating contractor that is trained on tune-up best practices.

The program is designed for residential customers with central air conditioning or heat pump units in owner-occupied, single-family residential dwellings. All targeted customers taking delivery service from DP&L are eligible for the program regardless of their choice of generation supplier.

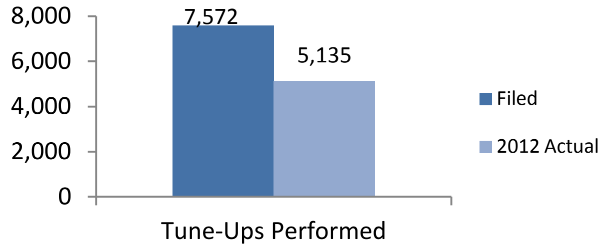
The program started in March 2010 with the training of a core group of 8 participating contractors and has increased to 17. In total, 5,135 HVAC tune-ups were performed in 2012 through this program in DP&L residential customers' homes.

PERFORMANCE SUMMARY

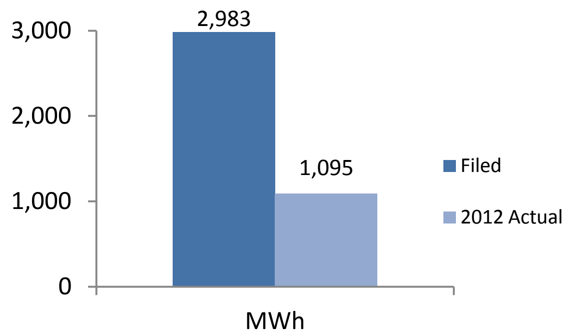
During 2012, 5,135 HVAC tune-ups were performed in residential customers' homes, resulting in gross annualized energy savings of 1,095 MWh and peak demand savings of 0.19 MW. After two years of low program participation, this program was redesigned in 2012 to be more simple and attractive both to contractors and customers. Participation increased over the 2012 program year; however, the performance was still less than the anticipated 7,572 tune-ups. As a result, DP&L will be ramping down and discontinuing the tune-up program in 2013.

2012 Performance

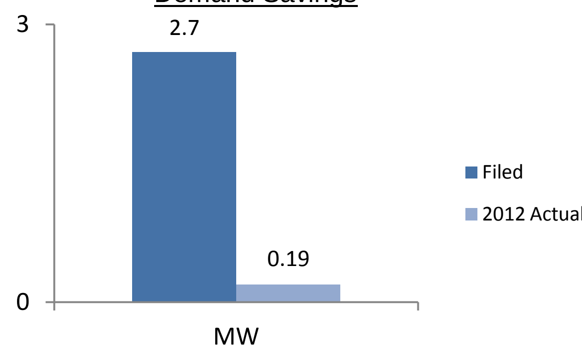
Units



Energy Savings



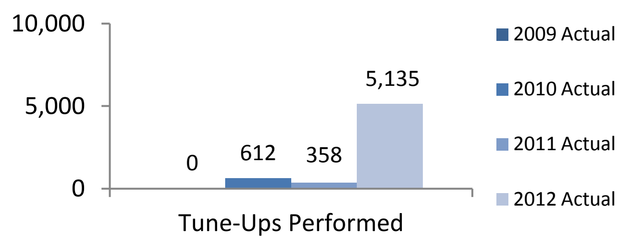
Demand Savings



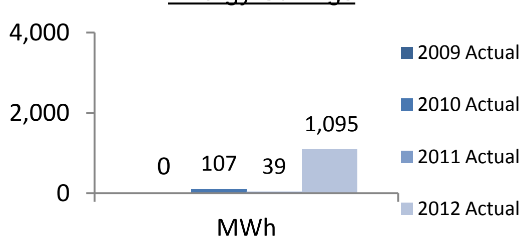
All “filed” numbers are taken from DP&L’s program portfolio filing; Case No. 08-1094-EL-SSO.

Four-Year Trend Analysis

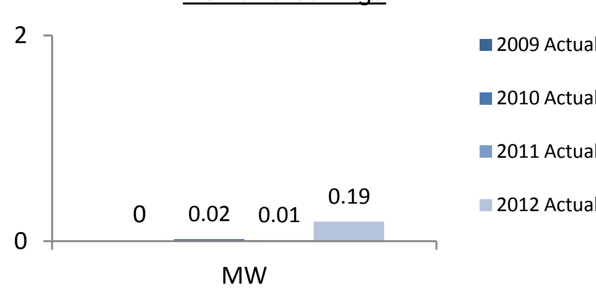
Units



Energy Savings



Demand Savings



Budget, Cost Summary*

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$833,450	$203,840
Marketing & Admin	$416,725	$350,981
Total Costs	$1,250,175	$554,821

*With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated 2012 budgets within the residential program portfolio. The reallocation is summarized on page 1-7. Shown above is the original filed budget for 2012.

IMPLEMENTATION REVIEW

Implementation Strategy

At the conclusion of a RFP process, Conservation Services Group (CSG) was chosen as DP&L's implementation partner. CSG is the vendor selected to also manage the Residential HVAC Rebates Program. Since the Residential HVAC Diagnostic and Tune-Up Program is a logical extension of the HVAC Rebates Program, the most cost-effective approach is to utilize the same vendor to implement both programs.

Targeted Process

As a part of the redesigned tune-up program, the contractor completes a thorough evaluation of the HVAC system, following a 20-point checklist. The checklist focuses on the five major components of an HVAC system including air flow, evaporator coil, blower assembly, condenser coil, and refrigerant charge. The checklist is based on best practice maintenance guidelines, according to the Air Conditioning Contractors of America (ACCA) manual.

Incentives Offered

Participating customers receive a $25 discount from a participating contractor. DP&L also pays participating contractors $15 per tune-up completed. DP&L's payment helps compensate the contractors for their additional time and training, which helps contractors provide customers with a high quality tune-up.

Tune-Ups Performed

System Type	Number of Tune-Ups Performed
Central Air Conditioner	4,258
Heat Pump	877

Targeted Contractors

The 2012 program was redesigned with the help of contractors that are members of the local ACCA chapter. DP&L's implementation vendor worked closely with ACCA to determine the program design that would yield the best tune-up results and facilitate buy-in from participating contractors. The 20-point checklist is based on the ACCA manual for maintenance. All participating tune-up contractors are members of ACCA and are top performers in the DP&L HVAC Equipment Rebates Program. All participants are required to undergo training on program guidelines and processes.

Staffing

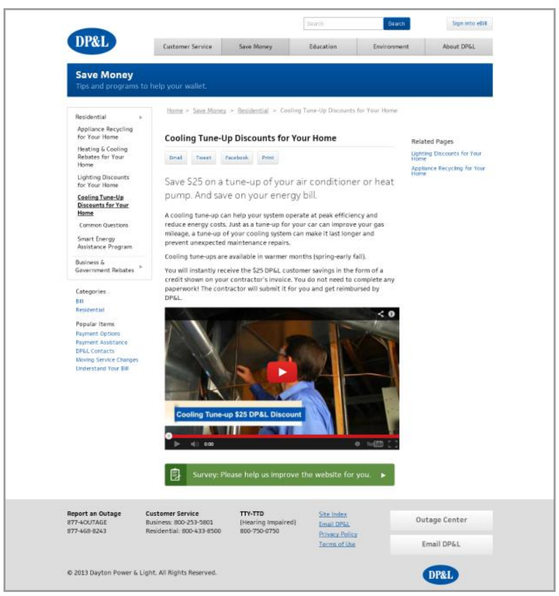
The same local field staff hired by CSG for the HVAC Rebate Program performs the work associated with the tune-up program. The local field staff is responsible for maintaining relationships with HVAC contractors, ensuring that the program is mutually beneficial and successful. For contractors to be most successful in the program, they need to have a thorough understanding of program guidelines and buy-in to the DP&L program design and processes. CSG maintains regular contact with contractors to discuss program issues, potential solutions, and opportunities for improvement. Despite CSG and DP&L's efforts, participating contractors did not all buy-in to the redesigned program. As a result, DP&L will be ramping down and discontinuing the tune-up program in 2013.

Due to the technical nature of this program, CSG works closely with contractors to ensure the technical accuracy and quality of tune-ups performed. At the start of the program, CSG's staff regularly accompanied contractors to customers' homes to work alongside them and continue their training. Throughout the program year, CSG continued to perform quality control checks on a portion of all tune-ups to ensure that contractors adhere to program guidelines. Contractors who exhibit a track record of poor quality work or customer complaints are removed from the program.

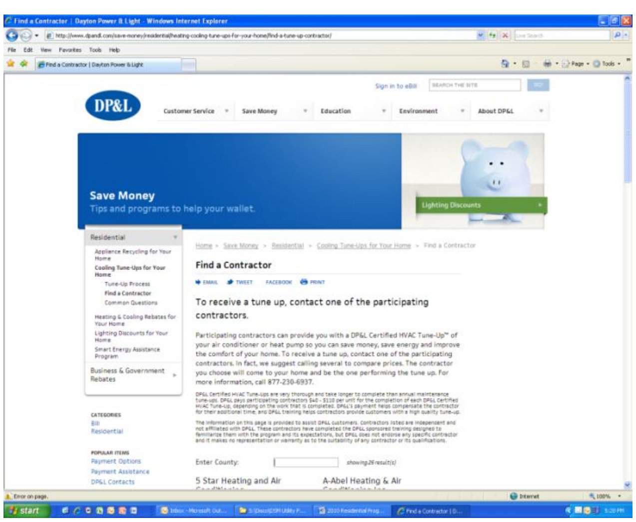
The local staff is supported by the experienced managers and support team located at the CSG main office.

Marketing

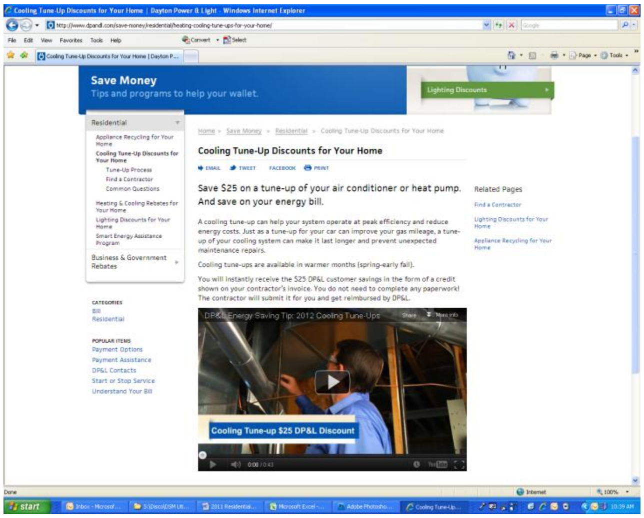
The program is designed to be marketed largely through participating HVAC contractors. Since contractors work directly with DP&L customers, they are able to offer tune-ups at the point-of-sale. Participating contractors are motivated to offer the rebates as a sales tool, providing a discount that a non-participating contractor cannot. To support contractors and help advertise the program, DP&L created a series of marketing pieces including web pages, fliers, bill inserts, and print advertisements. The HVAC tune-up web pages on the DP&L company web site provide an overview of the program, a description of the tune-up process, and answers to frequently asked questions. One page is dedicated to helping customers find a participating contractor. Customers can search by their home county and see a list of all contractors serving that area. In addition, in 2012, CSG completed direct mailing and follow-up phone calls targeted to high energy users to market the program.



Customer Web Pages
The HVAC tune-up program landing page gives a description of the Residential HVAC Tune-up Program and allows customers to navigate to other pages for more information.



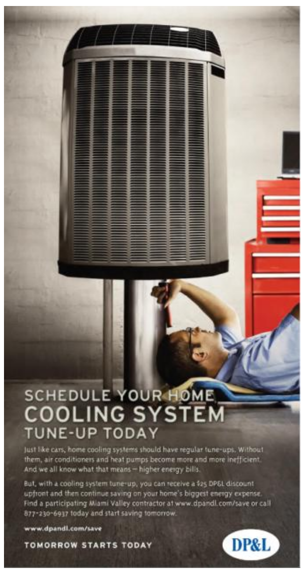
Web Site Contractor Locator
The contractor locator allows customers to search for participating contractors by their home county.



YouTube Video
The YouTube video, produced by DP&L and posted on the HVAC Tune-Up program landing page, educates customers about the benefits of tuning up their A/C.

Bill Insert
Bill inserts were mailed to 450,000 customers in March and April. In addition, contractors were given a supply of the inserts to distribute to their customers.

Flyer
Program fliers were distributed to customers at community outreach events attended by the Residential Lighting Program field staff, creating promotional efficiencies among programs.



Newspaper Advertisements
DP&L ran a series of newspaper advertisements to promote the program in March and April.

Customer Service
In all programs, customer service is a critical element of program success. As such, DP&L designed a number of customer service elements into its program, some of which have been previously discussed.

The web pages and contractor locator (discussed in the Residential HVAC Rebates Marketing section) allow DP&L to provide a breadth of information for all customers with internet access. The contractor locator allows customers to conveniently access a way to participate in the program.

For those without internet access, or who want to speak to a person, DP&L set up a program hotline number staffed by CSG employees. The staff has been trained to answer detailed questions about the Residential HVAC Tune-Up Program and help customers locate participating contractors in their area.

DP&L maintains its own customer service center, accepting calls regarding all functions of DP&L. DP&L management staff continues to update customer service center staff regarding program details as needed.

CSG recruited and trained a group of contractors that were located throughout DP&L's service territory, making the rebates accessible to all customers. However, it has been important to keep the number of participating contractors limited in order to maintain the technical accuracy and quality of the tune-ups performed. There were 17 trained participating contractors in 2012.

The CSG local staff is another significant element of DP&L's customer service, serving both the contractors and the customers. For contractors to be most successful in the program, they needed to have a thorough understanding of program guidelines and buy-in to the program design and processes. CSG maintains regular contact with contractors to discuss program issues, potential solutions, and opportunities for improvement. As mentioned, despite CSG and DP&L's efforts, participating contractors did not all buy-in to the program redesign and processes. As a result, DP&L will be ramping down and discontinuing the program in 2013.

In addition, CSG quality control of contractors' work allows DP&L customers to receive a quality tune-up, as promised. CSG performs quality control checks on five percent of all tune-ups performed. Equipment is reviewed along with the accompanying paperwork to ensure that contractors adhere to the program guidelines. CSG's oversight ensures that the program's integrity is maintained and that customers are treated properly and fairly. Contractors who exhibit a track record of poor quality work or customer complaints are removed from the program.

Participating Contractors

A-Abel Heating & Air Conditioning Inc.	Drake Heating & Air
Airtron Heating & Air Conditioning	Kirkwood Heating & Cooling
Allied Services, Inc.	Korrect Plumbing Co.
Anderson Mechanical Associates, LLC	Logan Services
B & K Heating & A/C Inc.	New Comfort Heating & Cooling
Barker Heating and Air Conditioning Co.	Tanner Heating and Air Conditioning
Butler Heating and Air Conditioning Co.	Watkins Heating & Cooling
Deer Heating & Cooling Inc.	Wm. Brockman & Sons
Detmer and Sons, Inc.	

RESIDENTIAL APPLIANCE RECYCLING

PROGRAM DESCRIPTION

The Residential Appliance Recycling Program allows for the collection of working refrigerators and freezers. The appliances are picked up directly from customers' homes, at no cost, and are transported to a facility in Columbus, Ohio to be deconstructed and recycled according to the Environmental Protection Agency's (EPA) best practices. Customers participating in the program in 2012 received a $25 rebate check for each unit recycled.

The objective of the program is to promote the retirement and recycling of inefficient appliances from households by offering an incentive for working equipment as well as information and education on the cost of keeping an inefficient unit in operation.

The Residential Appliance Recycling Program is designed for any residential customer with working refrigerators or freezers. The appliances must be plugged in and in working condition. All targeted customers taking delivery service from DP&L are eligible for this program regardless of their choice of generation supplier.

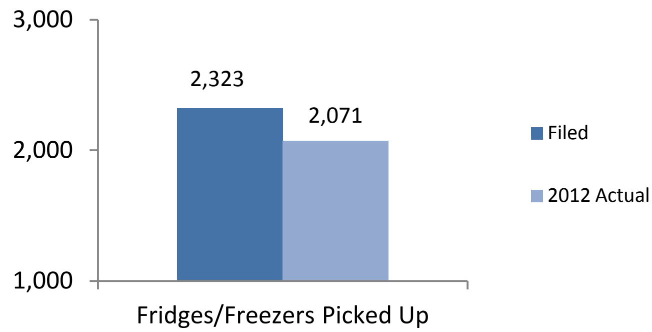
This program started in May 2009 and continued through 2012.

PERFORMANCE SUMMARY

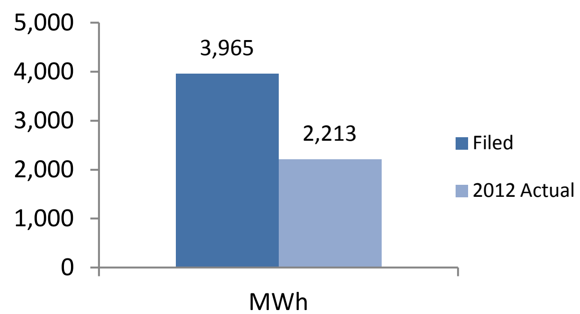
With the approval of the PUCO and notification of the energy efficiency collaborative, the 2012 appliance rebate budget of $218,398 was transferred to the appliance recycling program. During 2012, 2,071 appliances were collected throughout the DP&L service territory, resulting in gross annualized energy savings of 2,213 MWh and peak demand savings of .35 MW.

2012 Performance

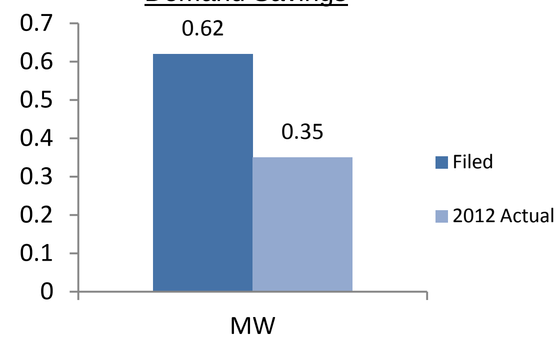
Units



Energy Savings



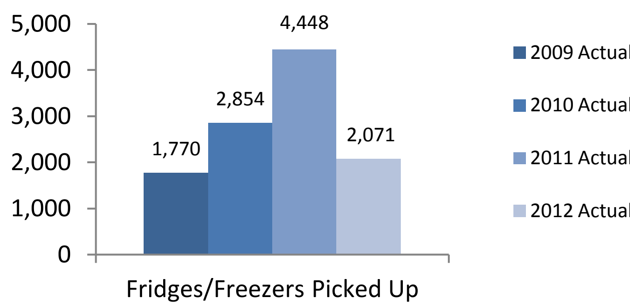
Demand Savings



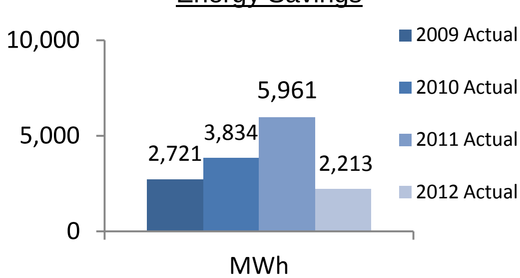
All "filed" numbers are taken from DP&L's program portfolio filing; Case No. 08-1094-EL-SSO.

Four-Year Trend Analysis

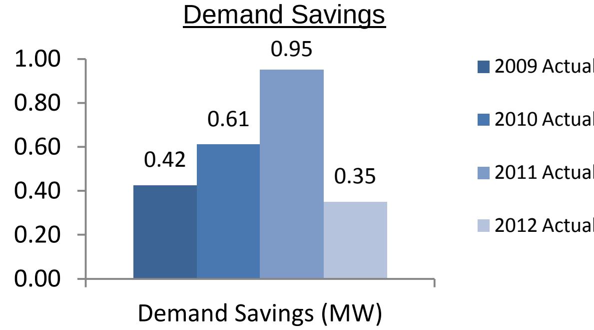
Units



Energy Savings



Demand Savings



Budget, Cost Summary*

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$122,701	$51,825
Marketing & Admin	$269,942	$290,416
Total Costs	$392,643	$342,241

*With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated 2012 budgets within the residential program portfolio. The reallocation is summarized on page 1-7. Shown above is the original filed budget for 2012.

IMPLEMENTATION REVIEW

Implementation Strategy

Appliance recycling and proper disposal of materials require technical expertise, available recycling facilities, and qualified crews in the field. As such, DP&L determined that a third party implementation partner, specializing in this area, provided the best means of effectively managing the program.

At the conclusion of a RFP process, DP&L selected JACO Environmental as its implementation partner. In its proposal, JACO demonstrated a sound process for efficiently and properly collecting and deconstructing appliances, as well as the recycling and disposal of appliance components. JACO has experience running similar programs for more than 40 clients including PG&E, Southern California Edison, SMUD (California), PacifiCorp, and NJ Clean Energy.

In addition, JACO is being utilized by AEP Ohio and First Energy for their appliance recycling programs. Using the same vendor as AEP and First Energy creates efficiencies, lowering costs to DP&L, as well as other benefits. For instance, given the volume of recycling from DP&L and AEP, JACO decided to build a new recycling facility in Ohio rather than use the existing facility in Illinois. Also, by serving multiple companies, JACO has increased flexibility when scheduling crews, improving customer service.

Targeted Products

DP&L offers rebates for working refrigerators and freezers functioning both as secondary units and primary units, which are likely on their way to becoming secondary units in a garage or basement. The unit must be 10 to 30 cubic feet in size, which is the traditional size for units used in a residential setting.

Before an appliance is removed from the home, JACO inspects the appliance to ensure that it is in working condition and is plugged in. Non-working appliances or those that are unplugged are not eligible for removal.

Rebates Issued by Order Date

Month	Refrigerators	Freezers
January	93	21
February	60	13
March	102	31
April	129	40
May	129	43
June	197	66
July	207	68
August	211	66
September	187	49
October	108	33
November	113	37
December	54	14
Total	**1,590**	**481**

Of the 2,071 units collected in 2012, the average year the appliances were made was 1986.

The rebate amount was $25 per unit collected. Customers were paid via check mailed directly to their homes. Checks were processed and mailed an average of 21 days from the time the appliance was collected.

Targeted Locations

To make the Residential Appliance Recycling Program convenient and accessible to all residential customers, JACO crews were available to pick up appliances from every geographic area of the DP&L service territory. JACO scheduled pick-up dates and routes according to geography, targeting one region of the service territory each day. The average wait time for customers was 12 days from the time the appointment was scheduled, to when the JACO crew visited the customer’s home.

Staffing

JACO managed this program with staff located in the Portland, Oregon main office and at the recycling facility in Columbus, Ohio. A senior program manager in the main office served as the DP&L point-of-contact. The JACO program manager regularly communicated with the DP&L program manager to ensure that the program was on track to meet targets. The JACO program manager also coordinated all the project’s tasks and served as the hub of communication to JACO support staff in technical support, customer service, check processing, and operations.

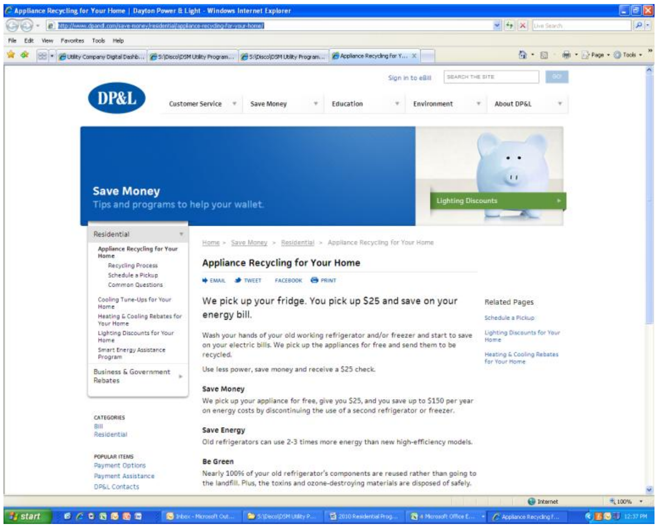
The recycling facility in Columbus, Ohio was managed by an on-site facility manager who planned the crew’s pick-up routes and managed the deconstruction and recycling processes. Crews of two were dispatched each day from the facility to the pick-up routes while additional staff members worked in the facility, deconstructing the appliances. JACO safely disposes of toxins and chlorofluorocarbon (CFC-11) gases from foam insulation. After capturing toxins (oils, mercury, PCBs) and other substances (CFC-11 and other foam insulation blowing agents and CFC-12 and other refrigerants), JACO recycles all the plastic, metals and glass in the appliances. Nearly 100 percent of a refrigerator's components are reused rather than going to the landfill. The facility manager is responsible for ensuring that all material handling processes comply with the best practices of the EPA.

Marketing
DP&L utilized a variety of marketing methods to promote the appliance recycling program to customers, including bill inserts, web pages, truck signs, and print advertisements. The program also significantly benefited from earned media coverage. The marketing collateral emphasized the cost of operating a second refrigerator or freezer and the rebate offered to program participants.

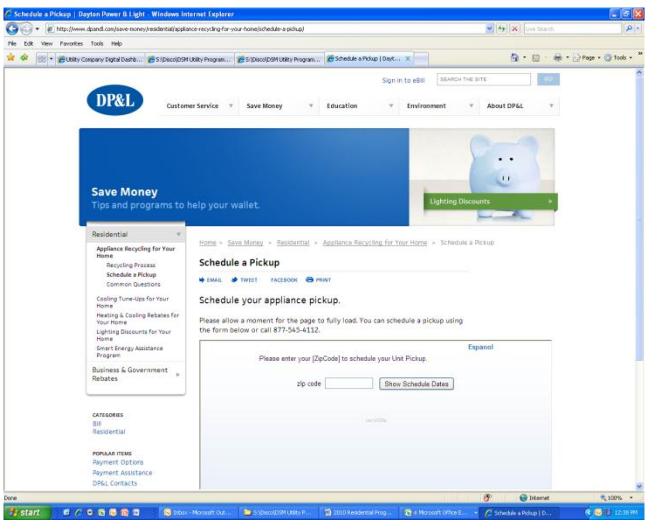
The customer web pages on the DP&L web site informed customers of program eligibility requirements, answers to frequently asked questions, and an overview of the recycling process. In addition, customers were able to register and schedule a pick-up via a web interface.

Sears Partnership
In 2012, DP&L continued its partnership with Sears retailers. Sears is a leading retailer of new refrigerators and freezers, and offers a home delivery service of customer's new appliances. JACO teamed up with Sears outlets across the country to offer a joint delivery of a new appliance along with a pick-up of an old appliance.

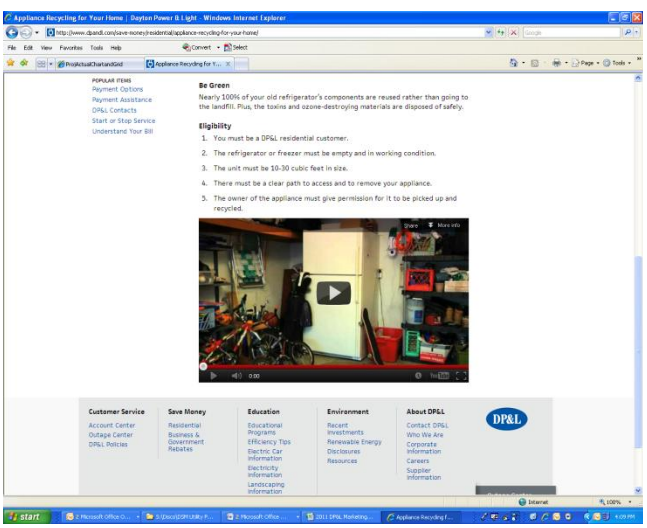
When a customer purchases a new refrigerator or freezer and is looking to get rid of an old appliance, the Sears sales representative will help him/her to register for participation in the DP&L appliance recycling program via an in-store computer kiosk. When the Sears crew member delivers the new appliance, he will confirm that the old appliance is working and meets the requirements of the DP&L program. The appliance will then be transported to a warehouse where it will be stored until JACO can perform a mass collection of appliances from the warehouse. This partnership offers an added convenience for customer participation. This service is marketed through signage on new appliances for sale in the Sears stores and mainly through Sears sales representatives. In 2012, 156 units were picked up through the Sears partnership.



Customer Web Pages
The appliance recycling program landing page gives a description of the program and allows customers to navigate to other pages for more information.



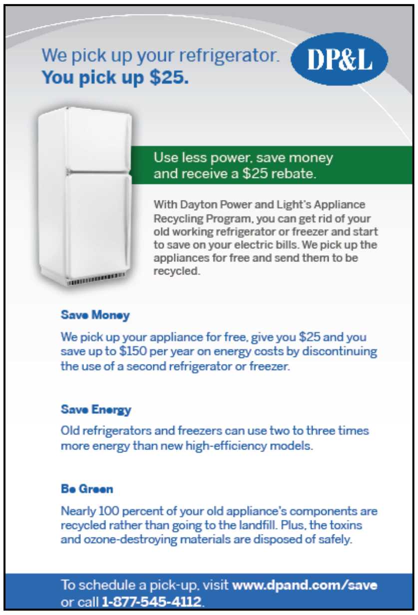
Online Registration
Online registration allows customers to schedule a pick-up at their home.



YouTube Video
The YouTube video, produced by DP&L and posted on the appliance recycling program landing page, educates customers about the savings opportunity from recycling an old fridge.

Bill Insert
Bill inserts were mailed to 450,000 customers each month from March - July.

Newspaper Advertisements
DP&L ran a series of newspaper advertisements to promote the program each month from March through July.



Flyer
Program fliers were distributed to customers at community outreach events attended by the residential lighting program field staff, creating promotional efficiencies among programs.

Truck Sign
This sign, 253' x 90', was displayed on the sides of each JACO truck which performed pick-ups in DP&L neighborhoods.

Education, General Awareness
DP&L conducted a mass media education and general awareness campaign promoting the value of energy efficiency and the available residential programs. A complete discussion of this campaign can be found in Section 5.

Customer Service

In all programs, customer service is a critical element of program success. As such, DP&L designed a number of customer service elements into its program, some of which have been previously discussed.

The web portal and online registration tool serves as a convenient way for customers to learn about the program and schedule a pick-up of their appliance. Customers are able to search for times when a JACO crew will be working in their area and select the date of their choice for a pick-up. In 2012, 26 percent of appointments were scheduled via the online registration tool.

For those without internet access, or for customers who wanted to talk to a representative, DP&L set up a program hotline number staffed by JACO employees. The staff has been trained to answer detailed questions about the Residential Appliance Recycling Program and to assist customers in scheduling appointments. Customers are addressed promptly, as the average period of time a customer waited to speak to a customer service representative was 23 seconds. In 2012, the hotline received approximately 4,316 calls, and 73 percent of appointments were scheduled via the phone.

DP&L maintains its own customer service center, accepting calls regarding all functions of DP&L. DP&L management staff continues to update customer service center staff regarding program details as needed.

Customers' appliances were picked up an average of 12 days from the time the appointment was scheduled. In addition, JACO crews conveniently retrieved the appliances from hard-to-access locations, like basements; the customer needed only to clear a path to the appliance.

For the customer's convenience, JACO crews called 24 to 48 hours before the appointment date to confirm a four-hour window for the pick-up. On the day of the appointment, JACO crews called the customer 30 minutes prior to the expected arrival time.

The timeliness of the rebate check was a priority, with checks processed and mailed an average of 21 days from the appliance collection date. Customers were paid via check mailed directly to their homes. Check processing was managed by JACO.

The continuation of the partnership with Sears was an added customer service in 2012, increasing the convenience of customer participation. The Sears partnership is discussed in detail in the Marketing section.

RESIDENTIAL LOW INCOME AFFORDABILITY

PROGRAM DESCRIPTION

Through the Residential Low Income Affordability Program, home energy audits and inspections are conducted, and cost-effective efficiency measures are installed for qualifying customers. Two categories of eligible measures are available to customers, depending on whether their home is heated or cooled with electricity. A limited number of health and safety measures may also be addressed through the program.

The objective of the Low Income Affordability Program is to identify and implement energy efficiency measures for qualifying homes, reducing the home owners' electric bill and saving energy. The program has the secondary benefit of reducing customer arrearages, which can help save money for all customers.

This program is available to low-income residential electric customers within the DP&L service territory with household incomes equal to or less than 200 percent of the federal poverty level or who are qualified and approved for one of the following: the Ohio Home Weatherization Assistance Program (HWAP), the Percentage of Income Payment Plan (PIPP), or the Home Energy Assistance Program (HEAP). Eligible households include single-family and multi-family homes. This program is available to all qualifying electric customers taking delivery service from DP&L, regardless of their choice of generation supplier.

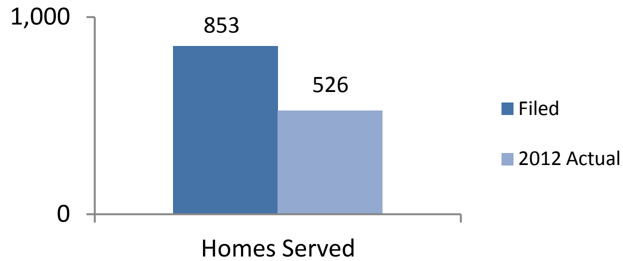
The program is implemented by the Ohio Partners for Affordable Energy (OPAE) through community action agencies located in DP&L's service area.

PERFORMANCE SUMMARY

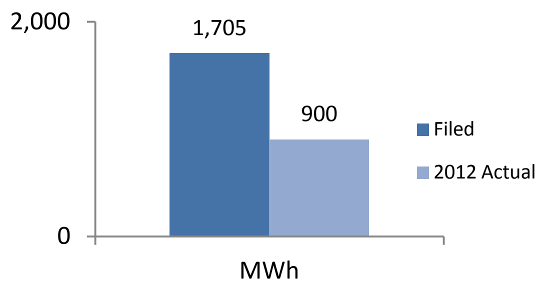
During 2012, 526 customers' homes throughout the DP&L service territory were served through this program, resulting in gross annualized energy savings of 900 MWh and peak demand savings of 0.16 MW.

2012 Performance

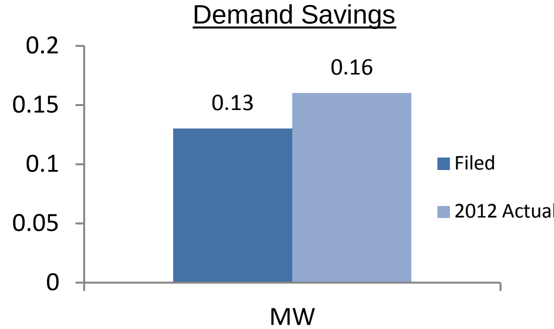
Units



Energy Savings



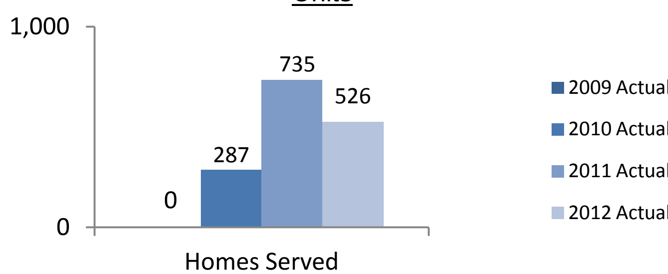
Demand Savings



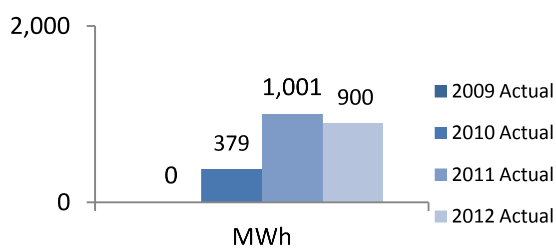
All "filed" numbers are taken from DP&L's program portfolio filing; Case No. 08-1094-EL-SSO.

Four-Year Trend Analysis

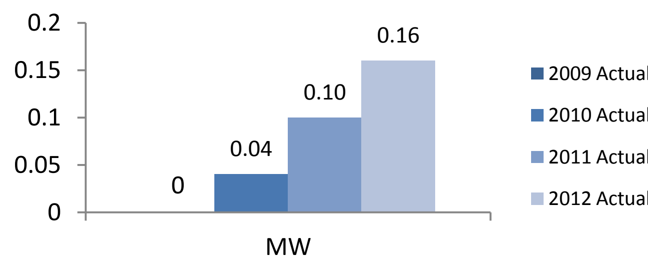
Units



Energy Savings



Demand Savings



Budget, Cost Summary

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$868,482	$804,236
Marketing & Admin	$231,436	$206,772
Total Costs	$1,099,918	$1,011,008

IMPLEMENTATION REVIEW

Implementation Strategy

DP&L has partnered with Ohio Partners for Affordable Energy (OPAE), based in Findlay, Ohio, to bring low-income customers the benefits of this program. OPAE implements this same type of program for FirstEnergy and AEP.

The program is provided to eligible customers at the same time (piggyback) as OPAE and subcontracting agencies deliver other state, utility, and community-based weatherization and energy efficiency services. The piggyback approach is designed to save administrative costs and provide more benefits in a timely, cost-effective manner.

Targeted Products

OPAE or subcontracting agencies may begin their work with a home audit to determine necessary measures. For the customers who heat or cool their homes with electricity, eligible measures may include ceiling and perimeter insulation and duct sealing or insulation. For all other customers, eligible measures may include: installation of energy efficient light fixtures and light bulbs, and metering and replacement of inefficient or inoperable refrigerators and freezers.

DP&L places a high priority on safety. We recognize that certain weatherization and energy efficiency measures cannot be completed or installed because of unsafe conditions like faulty outlets or overloaded circuits. Therefore, electrical safety and health measures are available to eligible customers, regardless of the fuel used as the primary heating source. Health and safety measures cannot exceed 15 percent of total program costs and may include: replacement of outlets, switches, fuse boxes, circuit breaker boxes, and wiring; repair or replacement of roofs, sump pumps, and well pumps; hot water tank replacement; and replacement of inefficient electric stoves and electric dryers.

The total cost of health and safety repairs may not exceed 15 percent of the overall program budget. The cost of the efficiency solutions funded through this program can be a maximum for any single family home of $5,000, and a multi-family home of $50,000.

Targeted Locations
OPAE delivers the program through the community action agencies located in the DP&L service area. These agencies include Community Action Program of the Greater Dayton Area; Clinton County Community Action Program; Community Action Agency of Delaware, Madison, and Union Counties; Community Action Commission of Fayette County; Highland County Community Action Organization; Pickaway County Community Action Organization; SOURCES; Tri-County Community Action Commission of Champaign, Logan, and Shelby Counties. This ensures that customers throughout the DP&L service area will be reached through the program.

Staffing
The program is managed by OPAE through the community action agencies. OPAE is responsible for managing the relationships with the agencies to ensure that eligible work is being performed in eligible customers' homes. Through the agencies, OPAE ensures that the participating contractors are trained and certified to complete work according to the Weatherization Program Standards. The OPAE staff processes the paperwork and documentation from contracted agencies regarding completed jobs and jobs in progress. OPAE is also responsible for monitoring and reporting program performance.

Marketing
This program is marketed and delivered to clients of the community action agencies. In 2012, DP&L performed no additional marketing.

Customer Service
Due to the unique nature of the program, OPAE, through the community action agencies, is responsible for delivering the program in a high quality and cost-effective manner. OPAE is responsible for ensuring that all services, materials, and supplies are of good quality and installed in a professional, workmanlike way, and that all contractors are trained and certified to complete work according to the Weatherization Program Standards.

Using the existing network of community action agencies allows program resources to be effectively administered. DP&L funds are used to piggyback with currently existing programs, creating efficiencies in program delivery.

DP&L maintains its own customer service center, accepting calls regarding all functions of DP&L. DP&L management staff continues to update customer service center staff regarding program details as needed.

NON-RESIDENTIAL PROGRAMS

NON-RESIDENTIAL PRESCRIPTIVE REBATES

PROGRAM DESCRIPTION

The Non-Residential Prescriptive Rebate Program (Rapid Rebates® Program) provides non-residential customers with incentives for new equipment purchases that reduce energy consumption and demand. Technologies that are covered in the program include energy efficient lighting, HVAC, motors, drives and compressed air.

The objective of the program is to help business and government customers overcome the upfront cost hurdle associated with energy efficient technologies.

The Rapid Rebates® Program is designed for all DP&L business and government customers who purchase new energy efficient equipment through a manufacturer, distributor or contractor. All business and government customers taking delivery service from DP&L are eligible for this program regardless of their choice of generation supplier.

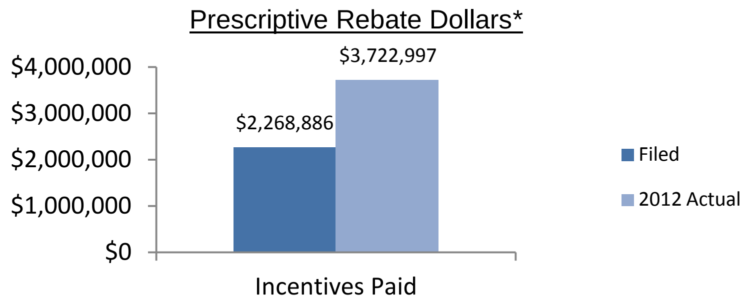
DP&L began accepting online Rapid Rebate® applications on April 1, 2009. In 2012, 116 unique measures were offered through the Rapid Rebates® Program. 100 of these were applied for and utilized by customers. In 2012, DP&L received 1,743 Rapid Rebate® applications, of which 1,269 were paid, 30 were denied approval or cancelled, and 444 applications were pending at the end of 2012.

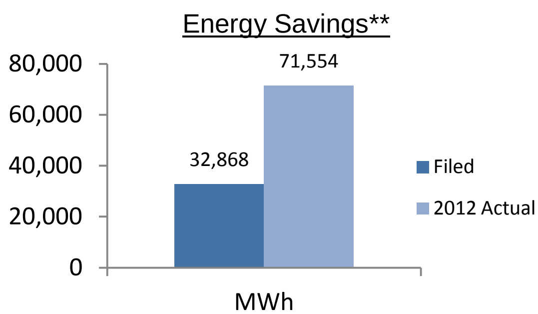
PERFORMANCE SUMMARY

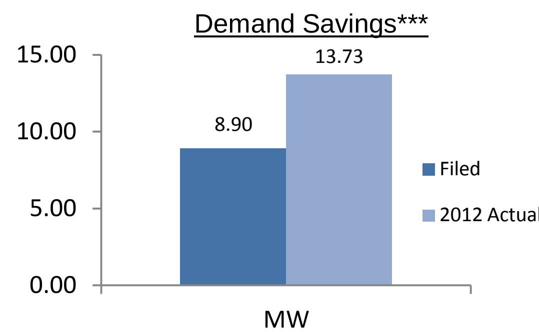
During 2012, DP&L paid $3,591,579 in Rapid Rebates® to business and government customers, resulting in gross annualized energy savings of 71,554 MWh and peak demand savings of 13.73 MW. Keys to the program’s success include continued operation of a customer-friendly online application system, quality customer service and follow through, and strong relationships with Channel Partners.

It should be noted that five percent of savings and costs from the Residential Lighting Program have been reallocated to the Non-Residential Prescriptive Rebates Program. This is due to the fact that program evaluations and national trends suggest that five percent of bulbs in retail locations were purchased by non-residential customers.

2012 Performance

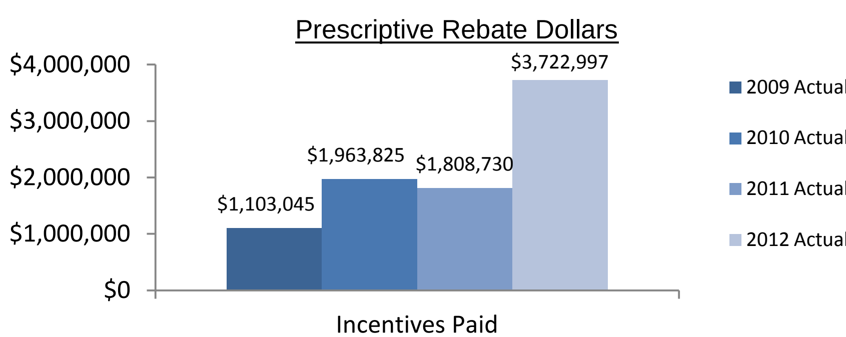


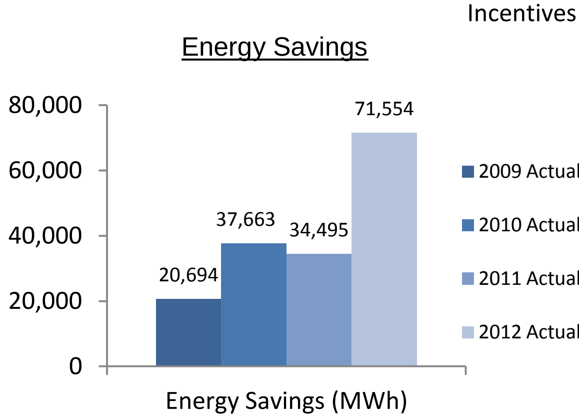


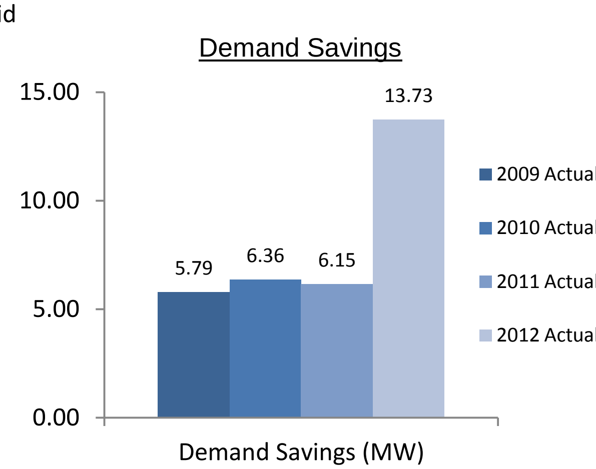


All "filed" numbers are taken from DP&L's program portfolio filing; Case No. 08-1094-EL-SSO.
*Prescriptive Rebate dollars shown here include 5% reallocation for the Residential Lighting Program.
**Energy savings include 5% reallocation from the Residential Lighting Program.
***Demand savings include 5% reallocation to the Residential Lighting Program.

Four-Year Trend Analysis







Budget, Cost Summary

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$2,268,886	$3,722,997*
Marketing & Admin	$998,310	$660,946*
Total Costs	$3,267,196	$4,383,943*

*Includes 5% reallocation of residential CFL program costs

IMPLEMENTATION REVIEW

Implementation Strategy

Since 2009, DP&L has implemented and managed the prescriptive rebate program internally. DP&L chose this course of action, as opposed to hiring an outside implementer, for several reasons. First, implementing the program in-house significantly strengthens DP&L employee knowledge of energy efficiency programs and technologies. Second, it provides DP&L with the opportunity to build relationships with contractor networks and customers, leading to quality customer service. And third, unlike the residential programs, we do not believe that a third party rebate provider adds significant value. Potential rebate volume for business customers is lower than for residential customers, and DP&L continues to be able to process this lower volume of rebates internally.

Targeted Products

DP&L's prescriptive rebate program was designed to provide business and government customers with an extensive choice of energy efficient, retrofit opportunities. In 2012, 116 unique measures were available for Rapid Rebates®. This extensive list broadens the number of customers who can potentially participate in programs. The list of measures was developed based on industry-accepted standards for high efficiency equipment and the associated energy and demand savings. The most popular retrofits are linear fluorescent lighting replacing both T12 and HID (high intensity discharge) lighting. Rebate checks disbursed to customers ranged from $10 to $81,205.

Prescriptive Rebate Allocation

Product Type	Rebate Dollars Paid	Energy Saved (MWh)	Demand Saved (MW)
Lighting*	$3,101,759	61,599	11.88
HVAC	$254,136	2,314	0.84
Motors, Drives & Compressed Air	$323,305	6,153	0.80
Other	$43,797	1,488	0.21

*Lighting savings include 5% reallocation of Residential CFL sales

DP&L does not endorse any equipment manufacturers or suppliers in the prescriptive rebate program. Business and government customers may purchase any brand of equipment from any supplier they choose, as long as the equipment is new and meets the eligibility requirements detailed on the measure lists. Additionally, equipment must use electricity as the fuel source and be replacing existing equipment or be installed as part of a retrofit project.

Application Process

DP&L's prescriptive rebate application process was designed to be customer friendly and comprehensive. The application is completely online which makes it convenient for customers and efficient for program control purposes. The application consists of three pages. The first page asks for basic customer information such as company name, address, installation address, DP&L account number, facility type and hours of operation, tax ID and contractor contact information. On the second page, customers choose from a drop-down list of measures, enter the manufacturer and model numbers, and input the appropriate quantities. The third page allows customers to upload supporting documentation to their application, such as specification sheets, engineering calculations and invoices. When the customer has entered all measures for which they are applying, they "submit rebate" and receive a confirmation number. When customers or contractors have questions, DP&L staff is available to guide them through the process.

The online Rapid Rebate® application is electronically submitted to DP&L for review. Applications must be complete and include the necessary contact information, equipment specification, and equipment costs. DP&L then reviews the application, verifies the information provided, and sends a confirmation email that the application has been approved. If the application has been approved, the funds will be reserved. Program guidelines request the customer or vendor provide DP&L with proof of purchase within 60 days of the approval notification. Proof of purchase may come in the form of an invoice, purchase order or other supporting document. If proof of purchase is not received, DP&L reserves the right to remove the fund reservations. Applicants can reapply for rebates but they will be placed in the back of the queue. The equipment should be installed and ready to operate within 120 days of application approval and DP&L must be notified of the installation. DP&L must be provided with a final invoice reflecting the true costs of purchasing and installing the energy savings measure (including all materials, labor, and equipment discounts) as well as equipment serial numbers. If the installation does not occur within 120 days, the customer may request an extension from DP&L using the Online Extension Request Form. Extension requests are handled on a case by case basis. DP&L releases the rebate funds to the customer or the assigned vendor within approximately 30 days of receiving the verification of installation.

DP&L reserves the right to inspect the installed measure(s) prior to releasing any funds to ensure compliance with the program terms and conditions. A verification audit is performed on every prescriptive rebate greater than $10,000. Additionally, DP&L audits a random sampling of rebates less than $10,000. In 2012, 11.1 percent of Rapid

Rebates less than $10,000 were audited. The breakdown in the number of audits performed is as follows:

Rebate Value	Lighting	HVAC	Motors	Other
>$10,000	55	8	8	1
<$10,000	117	6	9	1
% audits	15.8%	18.9%	20.2%	10.0%

In addition to the internal staff, third party engineers and contractors are utilized to perform pre- and post-installation verification audits for a sampling of projects rebated through the prescriptive rebate program.

Staffing

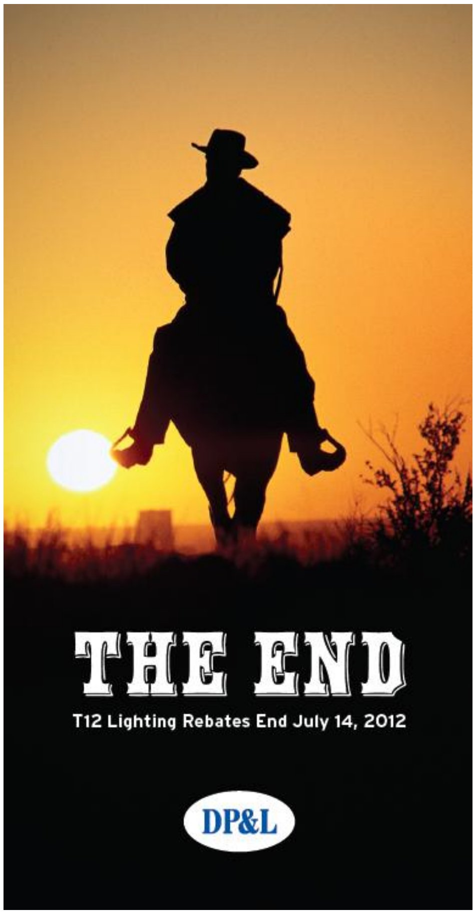
DP&L has four program managers to manage the business rebate programs, including the prescriptive rebate program, and serve as DP&L's direct point-of-contact with customers. The internal staff is responsible for reviewing, approving and processing rebate applications. They track and report all incentive dollars as well as energy and demand savings. The staff is also responsible for promoting the program to customers through a variety of marketing tools and business and community events.

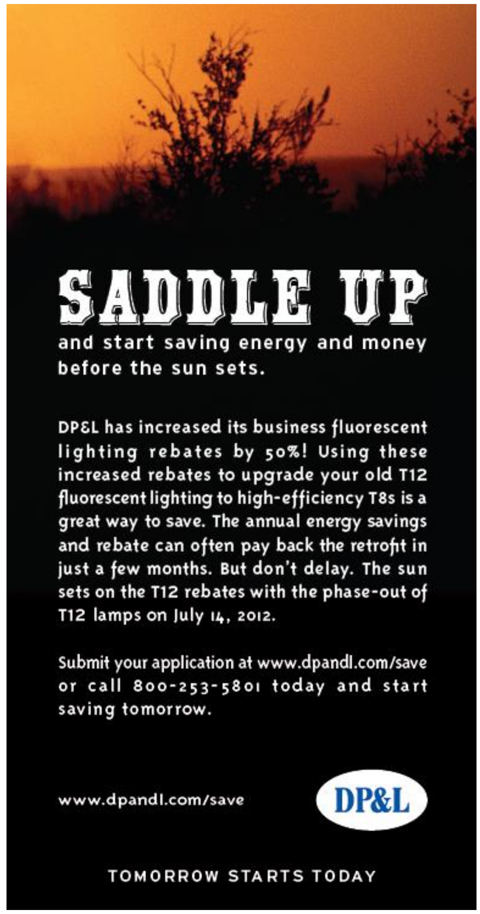
Marketing

In order to promote the prescriptive rebate program to business and government customers, DP&L employed a variety of marketing methods. These methods included publication of program information on the company website, print literature, bill inserts, inserts in local business journals, presentations at community- and vendor-sponsored events, one-on-one marketing by DP&L major account managers, and the continued utilization of a Channel Partner network.

Channel Partners are contractors, engineers and distributors with energy efficiency experience. They have participated in DP&L rebate workshops and are familiar with using DP&L rebate programs to help customers save money. Channel Partners are viewed as an invaluable third party "marketing extension" of DP&L's internal group of program managers. They have direct contact with customers on a daily basis and can influence the customer's purchasing decisions. Of the $3,591,579 in prescriptive incentives paid to customers in 2012, Channel Partners were involved in securing $2,010,849 or 56 percent of those dollars.

In 2012, DP&L also conducted an extensive T12 rebate campaign. July 14, 2012 marked the end of the manufacturing of the majority of T12 lamps, according to Department of Energy (DOE) regulations. DP&L educated customers about the DOE phase-out and gave them one last opportunity to take advantage of the rebate and the energy savings. From January 1 to July 14, 2012 rebates were offered for upgrades from T12s to T8s at 150 percent of the original rebate value. To complement the increased rebate value, DP&L launched a mass media campaign. The campaign consisted of print ads, radio ads, static and animated web ads, bill inserts, banners on the company web site, and two rounds of targeted customer emails. The results of this campaign surpassed DP&L's expectations. From January to July 2012, T12 upgrade rebate applications saw a 163 percent increase over the same period in 2011.



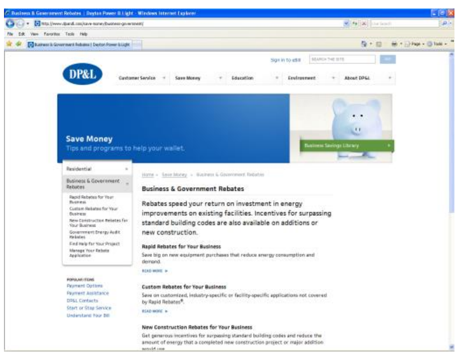


T12 Business Campaign
From January 1 through July 14, 2012, rebates were offered for upgrades from T12 to T8s at 150% of the original rebate value.

Channel Partners
Channel Partners have participated in DP&L rebate workshops and are familiar with using DP&L rebate programs to help customers save money.

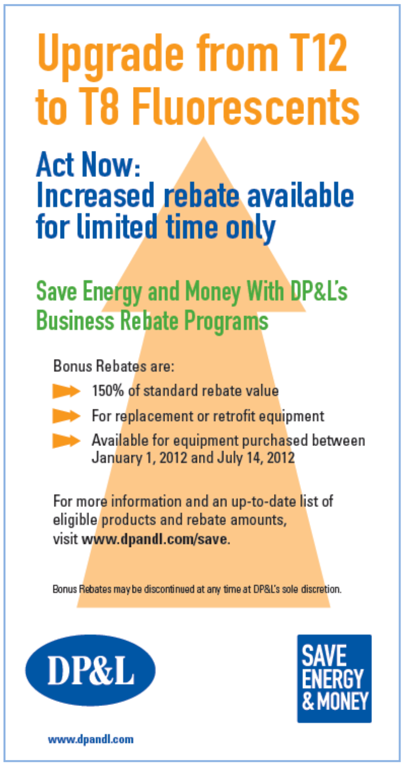
Newsletter

Channel Partners are kept up-to-date on program news and changes through a quarterly Channel Partner newsletter, the "Rapid Review."



Web Portal

The Business Rebates pages on the DP&L website give a description of the prescriptive rebate program and allow customers to navigate to other pages for more information or apply online for a rebate.



Bill Insert
Bill inserts were mailed to 50,000 customers in February, April and June 2012.

Print Ads
The Business Rebate programs were advertised through placement of ads in local and regional magazines and newspapers, including Dayton Daily News, which has a circulation of over 100,000.

Event Sponsorships
DP&L Business Programs frequently sponsor and participate in community- and vendor-sponsored events. Events in 2012 included: DRG3 Sustainability Coordinator Luncheons, Miami and Shelby County Sustainability Forum, Dayton Green Expo and numerous Channel Partner customer appreciation events.

DP&L
TOMORROW STARTS TODAY WITH RAPID REBATES

DP&L's Rapid Rebates® give you cash back on energy efficient products and upgrades.

Control Your Energy Costs

- Controlling energy costs is becoming increasingly important. Not only does it positively affect your bottom line, it's also an important component of any company's green initiative. Thanks to new technologies, there are ample opportunities to decrease energy usage, increase efficiency and save money.

Customers Can Get Cash Back With DP&L's Rapid Rebates

- To help customers save even more, DP&L is offering Rapid Rebates® – cash back on energy-efficient lighting, HVAC systems, motors, drives and compressed air systems. There may also be opportunities to combine Rapid Rebates with federal and state incentives. Funds are allotted to the Rapid Rebate program on a calendar-year basis, and are available on a first-come first-served basis.

Rapid Rebates are Streamlined and Online

- It's easy to get your rebate and you can reserve your funds in advance. That way, you can be sure your rebate funds will be available once you've installed your equipment. Our Rapid Rebate application and an up-to-date listing of eligible products and rebates can be found at dpandl.com/bizrebates.

Apply Online

- Our Rapid Rebates® application and additional details on the Rapid Rebates program can be found at www.dpandl.com/bizrates.

Get Your Rapid Rebates for Energy Efficient:

- Lighting
- Heating Ventilation and Air Conditioning (HVAC)
- Motors and Drives
- Compressed Air
- Additional Technologies

dpandl.com/bizrebates

Print Literature
DP&L used standard print materials for hand outs at meetings with customers and at a variety of speaking events.

Collaborative Partners
DP&L continues to work with its collaborative partners to promote programs. For instance, DP&L is working with the OHA to promote programs to area hospitals.

Customer Service

In all programs, customer service is a critical element for success. As such, DP&L designed a number of customer service elements into the Prescriptive Rebate Program, some of which have been previously discussed.

The Rapid Rebate® section of the DP&L website acts as the main information portal for customers, contractors, distributors and other program participants. It contains a listing of all eligible measures and the rebate amounts, as well as access to the online application. The online application process is akin to online shopping. When the customer has entered all measures for which they are applying, they "submit rebate" and receive a confirmation number. The confirmation number allows the customer access to their application's status, the ability to upload documents to their application, and the ability to assign their rebate to a vendor.

In addition to being an effective means of marketing the program, Channel Partners are also a valuable resource for delivering the program to customers in a quality manner. Channel Partners are trained on both the measures that are rebated through the program and on the application process. Many Channel Partners have taken the rebate programs and used them to offer a "turn-key" experience for the customer, including the approximate rebates in customer quotes and applying for the rebates on behalf of customers. Through this process, customers can have confidence the proposed equipment will be eligible while allowing DP&L to work with the Channel Partner to clarify any issues that may arise. In short, the Channel Partners are an effective "middleman" for the program with proper upfront training and ongoing program communication.

To encourage Channel Partners to continue to provide excellent service to customers, the Channel Partner Rebate Rewards program was launched in 2011. Channel Partners who are listed on the rebate application are automatically enrolled. Once a minimum of $10,000 in DP&L Rapid Rebates® have been attributed to a Channel Partner, they begin to earn a cash bonus equal to 5 percent of the DP&L rebates paid to the customer. This incentivizes the Channel Partner to complete the rebate application for the customer. In 2012, DP&L paid $81,791 in Channel Partner Rebate Rewards.

As a quality control measure, the auditing process ensures that contractors and vendors are not misrepresenting the program. From a customer service perspective, customers appreciate and welcome the audit process, as it gives them unbiased energy savings data. They can use this data in submitting positive post-analysis reports on their capital projects.

To make communication convenient for the customer, the Business Programs staff maintains an Energy Efficiency Inbox, energyefficiency@dplinc.com, a clearinghouse for general program questions that business and government customers may have.

DP&L staffs its own business call center, the Business Solutions Center, catering to DP&L business customers and their billing and other general inquiries. DP&L Business Program management staff conducted training sessions for business solutions center staff regarding energy efficiency program details. This was to ensure that DP&L phone representatives had a basic understanding of the program, could assist customers in navigating the website or point them to the Energy Efficiency Inbox.

NON-RESIDENTIAL CUSTOM REBATES

PROGRAM DESCRIPTION

The Non-Residential Custom Rebate Program provides business and government customers with incentives for equipment purchases and industrial process improvements that reduce energy consumption and demand. Custom Rebates are for equipment that is not covered by DP&L's prescriptive rebate program and is generally best suited for customized industry-specific or facility-specific applications.

The objective of the program is to help business and government customers overcome the upfront cost hurdle associated with energy efficient technologies and to promote innovative and emerging technologies.

The Custom Rebate Program is designed for all DP&L business and government customers who purchase new energy efficient equipment through a manufacturer, distributor or contractor. All business and government customers taking delivery service from DP&L are eligible for this program regardless of their choice of generation supplier.

DP&L began accepting online Custom Rebate applications on April 1, 2009. In 2012, DP&L received 125 Custom Rebate applications, of which 57 were paid, 7 were denied approval, and 61 applications were pending at the end of 2012.

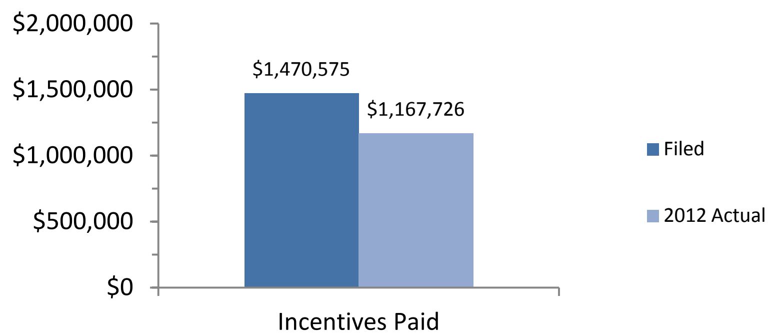
New Construction Rebates are included in the Custom Rebate Program. The New Construction Rebates promote energy efficient design strategies by incenting reductions in the amount of energy that a completed new construction project or major addition would use. In 2012, DP&L received 15 New Construction Rebate applications. These are in addition to the 16 New Construction Rebate applications received but not paid in 2010 and 2011. (New construction projects have lead times spanning multiple months.) Six of the outstanding 31 New Construction Rebates were paid in 2012, accounting for 2,053 MWh and 0.90 MW of annual savings.

The Government Audit Program is also funded through the Custom Rebate budget. All local governments with facilities served by DP&L are eligible to participate, including counties, municipalities, cities, villages, townships and public schools. The objective of the audit program is to help government customers understand how energy is being used, prioritize potential projects, calculate project paybacks and identify rebates for which they are eligible. DP&L reimburses 50 percent of the cost of the audit and will pay the remaining 50 percent if the customer implements electricity-saving projects within 1 year of the audit. DP&L does not supply the auditing services. Rather, customers can choose the third-party audit firm they would like to utilize. In 2012, twelve (12) entities applied for audits of 29 facilities. Since the program’s inception in September 2010, 73 facility audits have been completed.

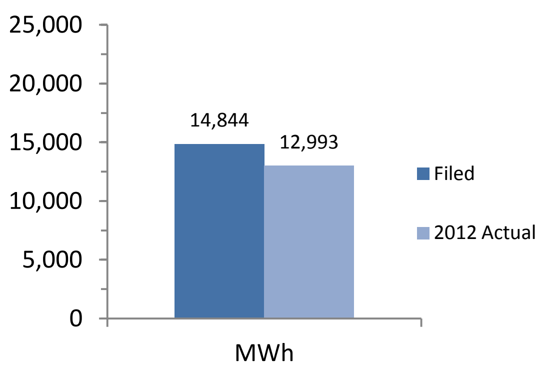
PERFORMANCE SUMMARY
During 2012, DP&L paid $1,167,726 in Custom Rebates to business and government customers, resulting in gross annualized energy savings of 12,993 MWh and peak demand savings of 2.33 MW. Keys to the program's success include continued operation of a customer-friendly online application system, quality customer service and follow through, and strong relationships with Channel Partners.

2012 Performance

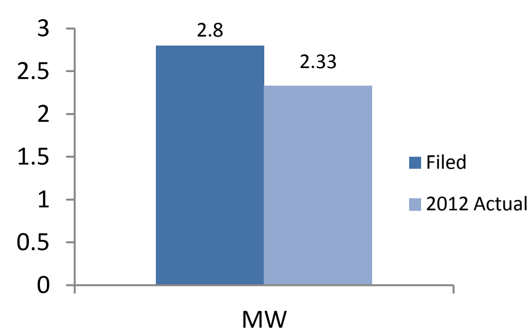
Custom Rebate Dollars



Energy Savings

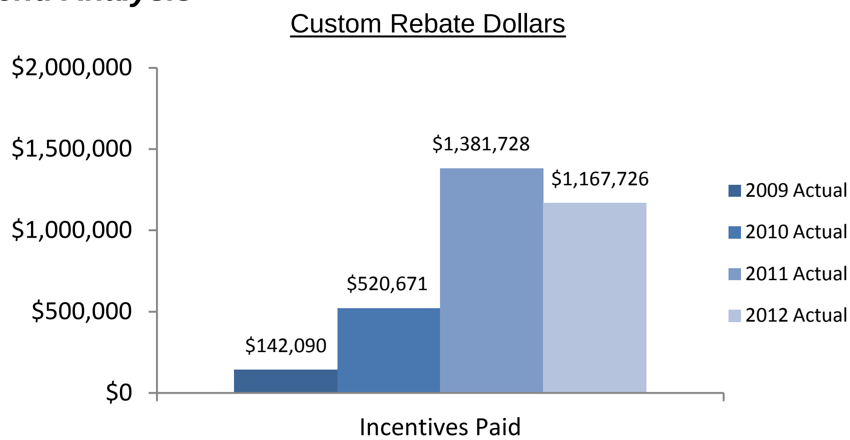


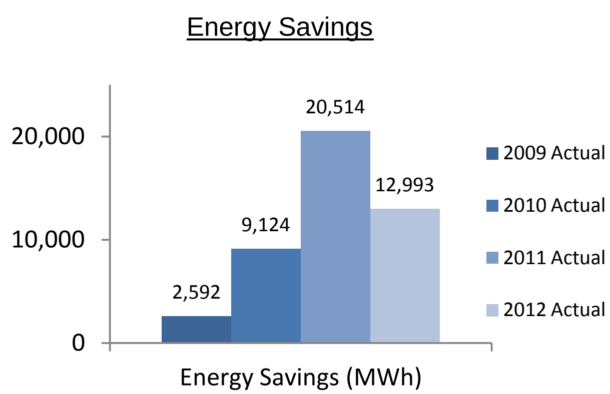
Demand Savings

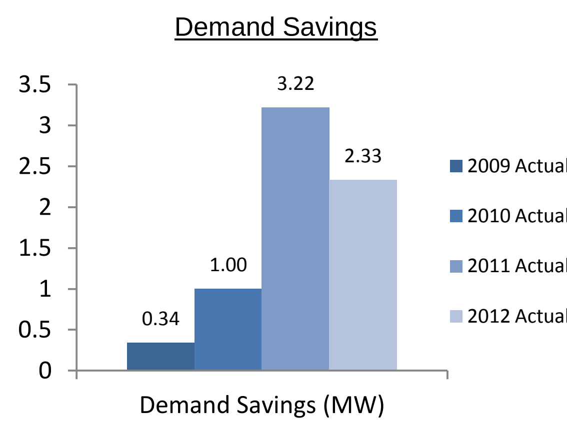


All "filed" numbers are taken from DP&L's program portfolio filing; Case No. 08-1094-EL-SSO.

Four-Year Trend Analysis







Budget, Cost Summary

Budget Category	Filed, 2012	Actual, 2012
Incentive Costs	$1,470,575	$1,167,726
Marketing & Admin	$808,816	$489,640
Total Costs	$2,279,391	$1,657,366

IMPLEMENTATION REVIEW

Implementation Strategy

Since 2009, DP&L has implemented and managed the custom rebate program internally. DP&L chose this course of action, as opposed to hiring an outside implementer, for several reasons. First, implementing the program in-house significantly strengthens DP&L employee knowledge of energy efficiency programs and technologies. Second, it provides DP&L with the opportunity to build relationships with contractor networks and customers, leading to quality customer service. And third, unlike with the residential programs, we do not believe that a third party rebate provider adds significant value at this point in the program. Potential rebate volume for business customers is lower than for residential customers, and DP&L continues to be able to process this lower volume of rebates internally.

Targeted Products

DP&L's custom rebate program was designed to provide business and government customers with an opportunity to receive rebates for implementing innovative energy efficient emerging technologies and process improvements. Rebate checks disbursed to customers ranged from $41.85 to $342,771.

Custom Rebate Allocation

Product Type	Rebate Dollars Paid	Energy Saved (MWh)	Demand Saved (MW)
Lighting	$316,609	5,672	0.70
HVAC	$380,813	3,465	0.49
Other, includes: • Cogged belts • Thin Client applications • Multi-compressor compressed air systems	$225,640	1,803	0.24
New Construction	$244,664	2,053	0.90

In 2012, Custom Rebates were rebated per the following schedule:

Project Type	Rebate Calculation
Lighting	$0.05/kWh + $50/KW
HVAC	$0.10/kWh + $100/KW
Other	$0.08/kWh + $100/KW

DP&L does not endorse any equipment manufacturers or suppliers in the custom rebate program. Business and government customers may purchase any brand of equipment from any supplier they choose, as long as the equipment is new and meets the eligibility requirements. Equipment must use electricity as the fuel source and be replacing existing equipment or be installed as part of a retrofit project. Projects are required to have a payback of less than 7 years before rebates are applied. The 7-year maximum payback helps to promote cost effectiveness.

New Construction Rebates are calculated in one of two ways. The lighting power density (LPD) incentive encourages the inclusion or installation of lighting designs and equipment that provide quality lighting at lower installed wattages. The incentive is calculated on a per square foot basis for LPD performance exceeding ANSI/ASHRAE/IESNA Standard 90.1-2007.

$$Incentive_{LPD} = (LPD_{baseline} – LPD_{actual}) \times area \times \$0.30$$

Alternately, customers can choose to have their new building evaluated using the Whole Building Energy Performance Baseline Improvement method. This method incents customers who design their buildings to be more efficient than a baseline building constructed to ANSI/ASHRAE/IESNA Standard 90.1-2007. To be eligible for a whole building incentive, the customer must provide documentation of an energy model in accordance with ANSI/ASHRAE/IESNA Standard 90.1-2007, Appendix G. Incentives are calculated using the following incentive rate guidelines. To receive an incentive, a project must achieve an annual electric energy and demand savings of 5 percent or better than baseline.

Incentive Rate Guidelines		
First Year Annual Electric Reduction	**Energy Incentive Rate**	**Demand Incentive Rate**
5-10% over baseline	$0.05/kWh	$50/KW
>10% over baseline	$0.08/kWh	$75/KW
>20% over baseline	$0.10/kWh	$100/KW

Application Process

DP&L's custom rebate application process was designed to be customer friendly and comprehensive. The application is completely online which makes it convenient for customers and efficient for program control purposes. Customers must apply for a custom rebate prior to beginning their project. The pre-approval phase allows DP&L the opportunity to perform pre-installation auditing (in some cases, metering) of the affected systems. The application consists of three pages. The first page asks for basic customer information such as company name, address, installation address, DP&L account number, facility type and hours of operation, tax ID and contractor contact information. On the second page, customers enter a detailed project description, their baseline energy and demand usages, and their proposed energy and demand usages. The third page allows customers to upload supporting documentation to their application, such as specification sheets, engineering calculations and invoices. When the customer has input all their data, they "submit rebate" and receive a confirmation number. When customers or contractors have questions, DP&L staff is available to guide them through the process.

The customer or vendor completes the online Custom Rebate application and submits it electronically to DP&L for review. Applications must be complete and include the necessary contact information, equipment specifications, and equipment costs. Additionally, applicants must submit a full description of how the energy and demand savings were calculated. DP&L then reviews the application, verifies the information provided, and sends a confirmation email that the application has been approved. If the application has been approved, the funds will be reserved. Program guidelines suggest the customer or vendor provide DP&L with proof of purchase within 60 days of the approval notification. Proof of purchase may come in the form of an invoice, purchase order or other supporting document. If proof of purchase is not received, DP&L reserves the right to remove the fund reservation. Applicants can reapply for rebates but they will be placed in the back of the queue. The equipment should be installed and ready to operate within 120 days of application approval and DP&L must be notified of the installation. DP&L must be provided with a final invoice reflecting the true costs of purchasing and installing the energy savings measure (including all materials, labor, and equipment discounts) as well as equipment serial numbers. If the installation does not occur within 120 days, the customer may request an extension from DP&L using the Online Extension Request Form. Extension requests are handled on a case by case basis. DP&L releases the rebate funds to the customer or the assigned vendor within approximately 30 days of receiving the verification of installation.

DP&L reserves the right to inspect the installed measure(s) prior to releasing any funds to ensure compliance with the program Terms and Conditions. A verification audit is performed on every custom rebate greater than $10,000. Additionally, DP&L audits a random sampling of rebates less than $10,000. In 2012, 28.2 percent of rebates less than $10,000 were audited. The breakdown in the number of audits performed is as follows:

Rebate Value	Custom
>$10,000	14
<$10,000	20
% audits	40.0%

In addition to the internal staff, third party engineers and contractors are utilized to perform pre- and post-installation verification audits for a sampling of projects rebated through the custom rebate program.

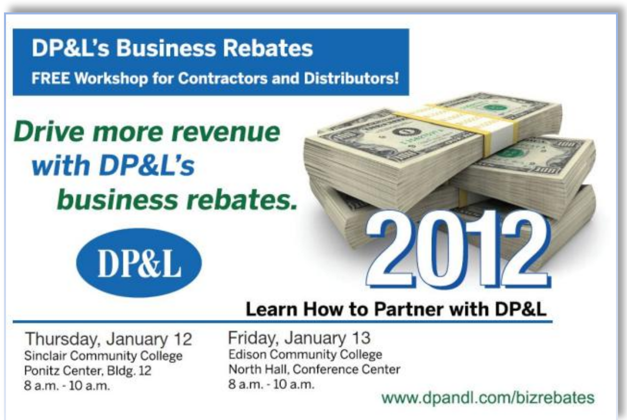
Staffing

DP&L has four program managers to manage the business rebate programs, including the custom rebate program, and serve as DP&L's direct point-of-contact with customers. The internal staff is responsible for reviewing, approving and processing rebate applications. They track and report all incentive dollars as well as energy and demand savings. The staff is also responsible for promoting the program to customers through a variety of marketing tools and business and community events.

Marketing

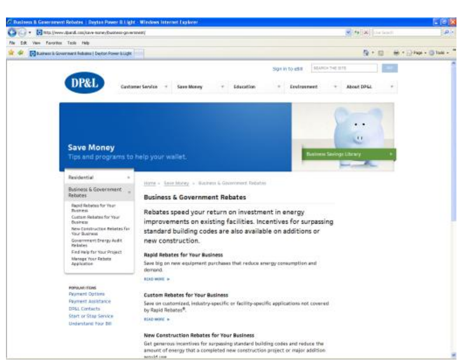
For efficiency and cost-effectiveness purposes, DP&L often promoted the custom rebate program as it promoted its Rapid Rebates. DP&L employed a variety of marketing methods, including publication of program information on the company website, print literature, bill inserts, inserts in local business journals, presentations at community- and vendor-sponsored events, one-on-one marketing through major account managers, and the creation of the Channel Partner network.

Channel Partners are contractors, engineers and distributors with energy efficiency experience. They have participated in DP&L rebate workshops and are familiar with using DP&L rebate programs to help customers save money. Channel Partners are viewed as an invaluable third party “marketing extension” of DP&L’s internal group of program managers. They have direct contact with customers on a daily basis, and can influence the customer’s purchasing decisions. Of the $1,167,726 in custom incentives paid to customers in 2012, Channel Partners were involved in securing $114,536 or 9.8 percent of those dollars.

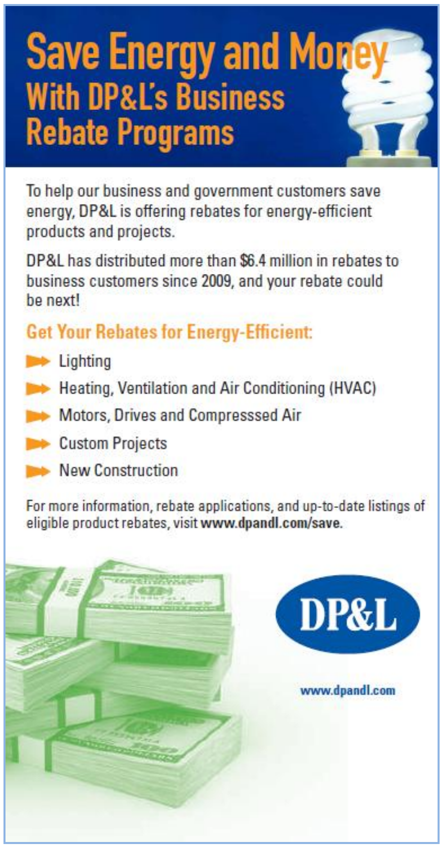


Channel Partners
Channel Partners have participated in DP&L rebate workshops and are familiar with using DP&L rebate programs to help customers save money.

Newsletter
Channel Partners are kept up-to-date on program news and changes through a quarterly Channel Partner newsletter, the “Rapid Review.”



Web Portal
The Business Rebates pages on the DP&L website give a description of the custom rebate program and allow customers to navigate to other pages for more information or apply online for a rebate.



Bill Insert

Bill inserts were mailed to 50,000 customers in February, April and June 2012.

Print Ads

The Business Rebate programs were advertised through placement of ads in local and regional magazines and newspapers, including Dayton Daily News, which has a circulation of over 100,000.

Event Sponsorships

DP&L Business Programs frequently sponsor and participate in community- and vendor-sponsored events. Events in 2012 included: DRG3 Sustainability Coordinator Luncheons, Miami and Shelby County Sustainability Forum, Dayton Green Expo and numerous Channel Partner customer appreciation events.

Print Literature
DP&L used standard print materials for hand outs at meetings with customers and at a variety of speaking events.

OHIO HOSPITAL ASSOCIATION

Collaborative Partners
DP&L continues to work with its collaborative partners to promote programs. For instance, DP&L is working with the OHA to promote programs to area hospitals.

Customer Service

In all programs, customer service is a critical element to success. As such, DP&L designed a number of customer service elements into the custom rebate program, some of which have been previously discussed.

The Custom Rebate section of the DP&L website acts as the main information portal for customers, contractors, distributors and other program participants. The website contains all Custom Rebate eligibility requirements, as well as access to the online application. Customers receive a confirmation number when they submit an online custom rebate application. The confirmation number allows the customer access to their application's status, the ability to upload documents to their application, and the ability to assign their rebate to a vendor.

In addition to being an effective means of marketing the program, Channel Partners are also a valuable resource for delivering the program to customers in a quality manner. Channel Partners are trained on the custom rebate application process. Many Channel Partners have taken the rebate programs and used them to offer a "turn-key" experience for the customer, including the approximate rebates in customer quotes and applying for the rebates on behalf of customers. Through this process, customers can have confidence the proposed project will be eligible for a rebate while allowing DP&L to work with the Channel Partner to clarify any issues that may arise. In short, the

Channel Partners are an effective “middleman” for the program with proper upfront training and ongoing program communication.

As a quality control measure, the auditing process ensures that contractors and vendors are not misrepresenting the program. From a customer service perspective, customers appreciate and welcome the audit process, as it gives them unbiased energy savings data. They can use this data in submitting positive post-analysis reports on their capital projects.

To make communication convenient for the customer, the Business Programs staff maintains an Energy Efficiency Inbox, energyefficiency@dplinc.com, a clearinghouse for general program questions that business and government customers may have.

Lastly, DP&L maintains its own customer service center, accepting calls regarding all functions of DP&L. DP&L Business Program management staff conducted training sessions for customer service center staff regarding program details. This was to ensure that DP&L phone representatives had a basic understanding of the energy efficiency programs, and could assist customers in navigating the website or point them to the Energy Efficiency Inbox.

MERCANTILE SELF-DIRECT PROGRAM

PROGRAM DESCRIPTION

Pursuant to O.R.C §4928.66, mercantile customers may commit their peak demand reduction, demand response and energy efficiency projects for integration with an electric utility's programs. DP&L's Self-Direct Program consists of the company allowing mercantile customers to commit their resources for integration in DP&L's programs in exchange for a one-time payment, a commitment payment or exemption from the Energy Efficiency Rider (EER). This Self-Direct Program is available to customers who consume 700,000 kWh or more per year or are part of a regional or national account and who commit their demand and energy savings to be integrated into DP&L's energy efficiency programs.

In 2012, consistent with the Commission's pilot program for mercantile customers to commit energy efficient/peak demand reduction adopted in Case No. 10-834-EL-EEC, DP&L's Self-Direct Program allows mercantile customers who have successfully identified and documented savings from energy efficiency projects since January 1, 2009 to apply for a one-time incentive payment or an exemption from the EER. If a customer provides all the necessary project documentation, DP&L will file a joint application with the customer, requesting PUCO approval of an incentive payment or exemption from the EER for a period of time. Rules also permit a customer to file directly with the PUCO.

The one-time payments are reduced to 75 percent of the incentive amount the customer could have received for the same project under the 2012 prescriptive or custom rebate programs. EER exemption requests are based on the percentage of demand and energy saved versus the overall customer demand and energy consumed. The EER exemption is proposed to last as long as the percentage of savings achieved by the customer exceeds the legislated demand and/or energy targets on an individual basis. Customers may participate as an individual facility or have the option to aggregate all facilities into a single application. All applications are filed at the PUCO individually and reviewed on a case-by-case basis.

All mercantile applications must be approved by the PUCO prior to taking effect.

PERFORMANCE SUMMARY

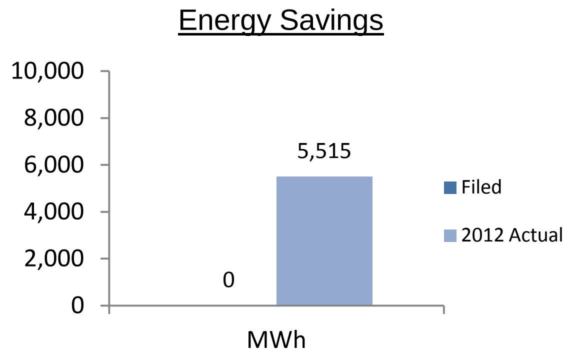
During 2012, DP&L jointly filed ten applications with customers requesting a one-time incentive payment for historical energy efficiency projects. These applications were filed using the PUCO-issued mercantile template format and resulted in demand savings of 3.27 MW and energy savings of 4,523 MWh.

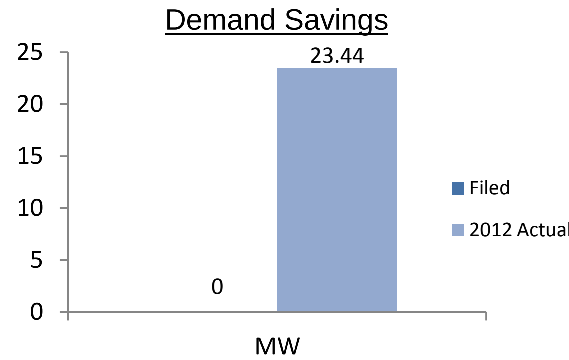
Savings continue to be claimed on a single energy efficiency rider exemption (10-2205-EL-EEC), which was filed in 2010 and approved by the Commission on December 7, 2011.

Additionally, in 2012, DP&L issued a request for proposal seeking demand reduction "commitments" from curtailment service providers (CSP's) on behalf of their DP&L mercantile customers. Four suppliers submitted proposals. The lowest bidder was selected. DP&L purchased 20 MW of demand response attributes in 2012.

2012 Mercantile Program Summary		Approved by PUCO	Energy Savings (kWh)	Demand Savings (kW)	Incentive Payment
One-Time Incentive Payments for Energy Efficiency					
City of Dayton	12-1266-EL-EEC	✓	43,804	0.0	$1,642.65
CityWide Development Corp.	12-2534-EL-EEC	✓	300,316	365.0	$49,898.70
Dayton Board of Education	12-1598-EL-EEC	✓	209,352	162.1	$21,679.25
Dayton Board of Education	12-1597-EL-EEC	✓	201,505	312.8	$25,151.44
Dayton Board of Education	12-1418-EL-EEC	✓	123,863	144.4	$18,261.78
Mancor	12-1412-EL-EEC	✓	86,204	8.2	$9,375.00
Montgomery County	12-0871-EL-EEC	✓	38,516	31.7	$2,700.00
Ohta Press U.S., Inc.	12-2943-EL-EEC	✓	129,307	8.2	$9,375.00
Washington CH City Schools	12-1265-EL-EEC	✓	1,120,905	1,719.8	$213,052.88
Wright Patterson Air Force Base	12-1267-EL-EEC	✓	2,269,477	517.3	$121,892.25
Subtotal Energy Efficiency Incentive Payments			**4,523,249**	**3,269.5**	**$473,028.95**
Energy Efficiency Rider Exemptions					
	10-2205-EL-EEC	✓	991,981	171.6	
Demand Response Commitment Contract					
Subtotal Demand Response Commitments			**-**	20,000.0	$171,842.00
TOTAL 2012 Mercantile Savings			**5,515,230**	**23,441.1**	**$644,870.95**

2012 Performance





All "filed" numbers are taken from DP&L's program portfolio filing; Case No. 08-1094-EL-SSO. At the time of the filing, DP&L did not include a self-direct program.

Budget, Cost Summary

DP&L did not file a self-direct plan or budget with its program portfolio plan. Below are actual costs for 2012.

Budget Category	Actual, 2012
Incentive Costs	$644,871
Marketing & Admin	$155,877
Total Costs	$800,748

IMPLEMENTATION REVIEW

Implementation Strategy

The Mercantile Self-Direct Program can require a significant investment of time on the part of the customer and can be somewhat complex to understand. As such, DP&L is implementing this program in-house, utilizing business program managers. This provides a dedicated point of contact at DP&L to assist the customer through the process. It is the program manager's responsibility to understand program details, communicate the program to customers, and help customers manage their way through the process.

Targeted Customers

DP&L has determined that approximately 1,200 customers qualify for the Self-Direct Program based on the law's minimum usage criteria of 700,000 kWh per year, set forth in O.A.C. §4901:1-39(P).

Staffing
DP&L utilizes business program managers to manage the Self-Direct Program. These managers focus on managing all stages of the Self-Direct Program including program design, PUCO rule review, marketing and customer service.

Marketing
To promote the Self-Direct Program, DP&L worked with its major account managers to identify large customers who participate in PJM Demand Response as well as those who may have implemented past efficiency projects. Additionally, DP&L educated industry contractors and distributors about the availability of the program. Their knowledge about local efficiency projects was used to establish leads for potential customers that may have implemented projects in the 2009 to 2012 timeframe.

Customer Service
Given the complexities of the program and filing requirements, the Mercantile Self-Direct Program requires extensive customer interaction throughout the planning, filing and reporting process. As such, DP&L utilizes its business program managers to provide customers with assistance and a single point of contact. DP&L's program managers are knowledgeable about program rules, requirements and procedures and can help customers with their initial analysis related to program savings and expected energy efficiency rider costs. Further, DP&L can provide the regulatory and legal support required to make initial filings and assist throughout the regulatory approval and reporting process.

EDUCATION, AWARENESS BUILDING, & MARKET TRANSFORMATION ACTIVITIES

In 2012, DP&L's education, awareness building and market transformation activities included school education through Ohio Energy Project (OEP) and customer education and awareness building through both mass media and DP&L's website.

Budget, Cost Summary*

Budget Category	Filed, 2012	Actual, 2012
School Education	--	$191,845
General Education, Awareness Building	--	$621,916
Total Costs	$1,671,553	$813,761

*With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L reallocated 2012 budgets within the residential program portfolio. The reallocation is summarized on page 1-7. Shown above is the original filed budget for 2012.

SCHOOL EDUCATION (OHIO ENERGY PROJECT)

PROGRAM DESCRIPTION

The School Education Program provides take-home energy savings kits for students as well as accompanying classroom energy efficiency curriculum and training for teachers. The objectives of the program are to: 1) reduce electricity use of program participants in selected schools; 2) educate students and their families about energy, energy efficiency, and the effects of their energy usage decisions; and 3) create energy awareness among students that will promote energy efficient habits throughout their lives.

The program is implemented by Ohio Energy Project (OEP). OEP is uniquely qualified to provide energy efficiency education based on its existing relationships with school districts and experience delivering similar programs throughout Ohio. OEP is currently operating the same type of program for AEP Ohio.

New for the 2011-12 school year, DP&L has partnered with Vectren and OEP to deliver a school program which addresses both electric and natural gas savings. The joint effort with Vectren was pursued with the encouragement of DP&L's energy efficiency collaborative. The goal of the partnership is to increase the effectiveness of the program while eliminating duplication caused by separate gas and electric programs. This portfolio status report discusses and reports savings for the 2011-12 school year only. Results for the 2012-13 school year will be presented in the 2013 annual portfolio status report.

Training and Curriculum

The program was offered to school districts across DP&L's service territory, grades 5-12. Teachers who volunteered to participate were required to attend professional development workshops to undergo training about program guidelines and curriculum. Once teachers completed the training, they were given one energy efficient kit for each of their students.

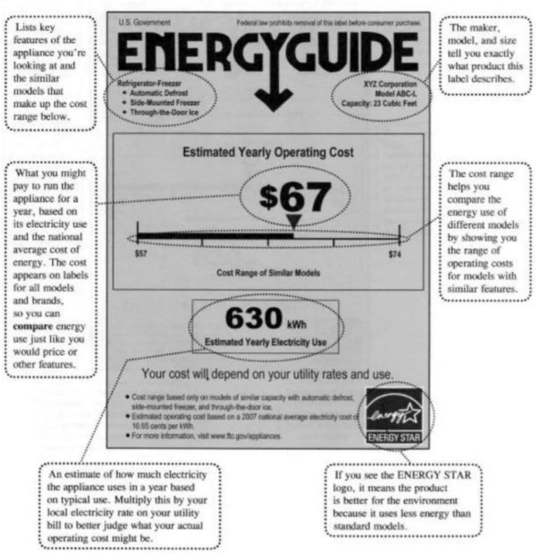
Each teacher was provided with a complete curriculum designed to accompany and educate students about the items contained in the take-home energy savings kit. The curriculum included classroom activities, experiments, and games, all meeting state of Ohio education standards. The curriculum also covered subjects like properties of energy, electric generation fuel sources, home energy audit suggestions, appliance energy usage comparisons, CFL versus incandescent cost comparisons, home temperature measurement exercises, and weatherization information.

In addition, teachers were given materials needed to complete experiments and activities, such as six Kill-A-Watt Meters, two radiometers, one canister of coal, two glow sticks, one pair of "Blaster Balls," one circuit ball, and one flashlight.

The program included a youth energy summit and energy fair. At the youth energy summit, high school students were trained so they could facilitate daylong workshops and hands-on activities for students, grades 5-9, at the energy fair.

Sample Classroom Activities

How to Use the EnergyGuide Label



LET'S COMPARE !
10,000 Hours of Light

CFL (Compact Fluorescent Lightbulb)  23w	Incandescent Bulb  100w
Amount of light = 1700 lumens	Amount of light = 1585 lumens
Power in watts = 23 watts	Power in watts = 100 watts
Lifespan = 10,000 hours	Lifespan = 750 hours
Bulbs needed for 10,000 hours? 1	Bulbs needed for 10,000 hours? 13
Cost per bulb = $ 2.50	Cost per bulb = $ .26
Total bulb cost for 10,000 hrs? **$ 2.50**	Total bulb cost for 10,000 hrs? **$ 3.38**
23 watts X 10,000 hours = 230,000 watthours	100 watts X 10,000 hours = 1,000,000 watthours
Kilowatthours (kWh)? 230 kWh	Kilowatthours (kWh)? 1000 kWh
Cost per kWh = $ .10	Cost per kWh = $ .10
230 kwh x $ .10 /kwh = $ 23.00	1000 kwh x $ .10 /kwh = $ 100.00
Cost of electricity for 10,000 hours **$ 23.00**	Cost of electricity for 10,000 hours **$ 100.00**
Total cost for 10,000 hours = $ 2.50 + $ 23.00 = **$ 25.50**	Total cost for 10,000 hours = $ 3.38 + $ 100.00 = **$ 103.38**

SAVINGS = $103.38 - $ 25.50 = $77.88 !

Take-Home Energy-Saving Kits
Participating teachers were provided energy savings kits to be sent home with each participating student. Each component of the take-home kit was discussed in the classroom, informing students how to properly install and use the item, as well as the way it helps save energy. As a result of our partnership with Vectren, this year's kits now include new gas and water savings measures.

Take-Home Kit Contents

Item	*Description*
2 14W Bright White CFL	Long-life light bulb with up to 75% energy savings. Lasts 10 times longer than an incandescent bulb. White color tone.
2 13W Soft White CFL	Long-life light bulb with up to 75% energy savings. Lasts 10 times longer than an incandescent bulb. Yellowish color tone.
Furnace Filter Whistle	Snap this product onto furnace filters to hear a whistle when the filter is full and needs replaced.
Foam Weather-Strip	Adhesive backed weather stripping, good for sealing out drafts in doors and windows.
Self-Stick Door Sweep	Adhesive-backed PVC door sweep. Seals door gaps and prevents drafts.
Flow Meter Bag	Test your water faucets to see how much water they use.
Earth Massage Showerhead	This product saves water and the energy required to heat the water.
2 Bathroom Sink Aerators	Consistent water pressure from a bathroom sink aerator. This product saves water and the energy required to heat the water.
Kitchen Sink Aerator	Consistent water pressure from a kitchen sink aerator. This product saves water and the energy required to heat the water.
Refrigerator Thermometer Card	Credit card-sized measuring device to determine whether refrigerator is at an efficient temperature.
LED Night Light	Light Emitting Diode (LED) technology creates suitable yet energy efficient light.
Self-Stick Energy Use Gauge Thermometer	Helps measure savings for heating and cooling costs.
Hot Water Temperature Card	Credit card-sized device measures the temperature of hot tap water. Card provides suggested range for setting water heater temperature to optimize efficiency.
DP&L Residential Energy Efficiency Programs Flier	Handout describing DP&L's energy efficiency programs which can help save energy and money.
CFL Recycling Brochure	Brochure explaining the small amount of mercury in CFLs and proper disposal methods.

PERFORMANCE SUMMARY

Through OEP, DP&L recruited and trained 123 teachers in 48 school districts throughout its service territory. In addition, 9,226 energy savings kits were distributed to teachers, to be taken home by students once the classroom lessons were complete. Savings garnered via the installation of compact fluorescent bulbs, LED night lights, faucet aerators and energy efficient showerheads provided in students' take-home kits were gross annualized energy savings of 4,544 MWh and peak demand savings of .32 MW.

Since the core of this program is educational, it is difficult to measure on an absolute basis the long-term impact. To that end though, OEP conducted surveys to provide data to confirm the success of the program. Survey results are as follows:

- Students' energy knowledge before and after the training showed a 29 percent average improvement in test scores.
- Teachers rated the overall quality of the program a 6.5 out of 7.
- Students rated the overall quality of the program a 6 out of 7.
- Teachers reporting that the unit changed student and family attitudes about energy conservation and efficiency: 95 percent

OEP also distributed surveys to participating teachers. These are a few comments from participating teachers regarding the program:

- I thank you for providing this program to so many families. It is so useful, valuable, and it does make a difference in energy consumption in most households who participate in this program.
- I just really appreciate the supportive helpful staff at OEP who have gone out of their way to make this cooperative education possible between classrooms, parents, and energy partners at DP&L and Vectren.
- I think this is an excellent program!
- Most of my students said it made them more aware of their own energy use. Many are turning off lights and TVs that they used to leave on. (Yes, I asked for a show of hands...informal poll.)
- The students are amazed at how much energy and water they use and it makes them think more about their future.
- Before the unit, most of them did not know what conservation or efficiency means. The earlier and the more times they hear the concepts the more likely they are to care about conservation and efficiency.

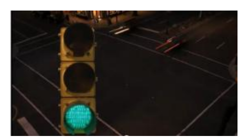
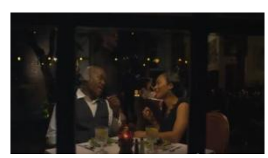
GENERAL EDUCATION, AWARENESS BUILDING, MARKET TRANSFORMATION

DP&L's 2012 education, awareness building and market transformation activities included a mass media campaign targeted to all customers, a CFL education campaign and a web-based resource library designed for business customers.

MASS MEDIA CAMPAIGN

During the course of 2012, DP&L aired a television and print campaign targeted to all of its customers. The goals of the campaign were to communicate the value of energy efficiency and increase the awareness of available energy efficiency programs. In addition, the campaign provided a general level of program marketing support, helping to promote the continued expansion of customer participation in energy efficiency programs. The campaign ran from the week of November 5 through the end of the year.

Television Script

Announcer Voice Over	Visuals	
DP&L knows the Miami Valley. That's why you can count on us to help you save both money… and energy. From energy efficient lighting upgrades for a business. To LED traffic light rebates for a local government. To HVAC upgrades in your own backyard. We'll work with you to save your hard earned money. Because it's the right thing to do. For all of us. DP&L – Tomorrow starts today.	Various scenes of the Dayton area. Scenes of people using energy in everyday settings. Visual of an LED application in a grocery store. Visual of LED traffic lights. Visual of a residential HVAC unit. Scenes of people in everyday settings as a business turns lights off. DP&L system operating area. Logo and website address for customers to find more information about programs.	       TOMORROW STARTS TODAY www.dpandl.com DP&L

Print


ENERGY SAVINGS
AT EVERY CORNER. FOR YOU.
FOR THE WHOLE COMMUNITY.
DP&L knows the Miami Valley. So you can count on us to help you save both money and energy. Like working with Dorothy Lane Market to help them install energy efficient lighting upgrades. And partnering with a local government to install LED traffic lights. And providing rebates on HVAC upgrades in your own backyard. We'll work with you to save your hard earned money. Because it's the right thing to do.
www.dpandl.com
TOMORROW STARTS TODAY
DP&L

COMPACT FLUORSCENT EDUCATION
During 2012, DP&L also ran a customer education campaign regarding the value of compact fluorescent lights. In addition to education, the campaign had the dual benefit of promoting the purchase of discounted compact fluorescents bulbs at area retailers through the DP&L Residential Lighting Program.

The CFL education campaign consisted of newspaper, radio, and web-based advertising. The campaign began the week of March 5 and ran through the week of June 11.

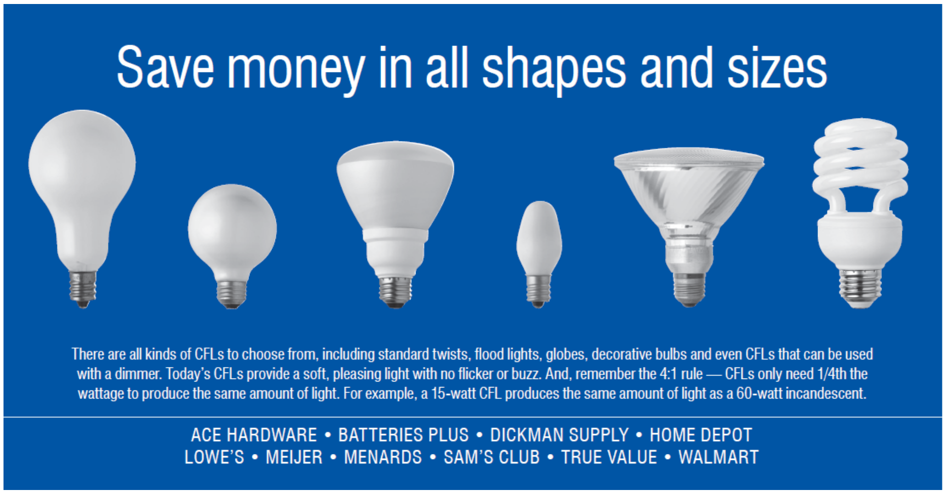
The goal of the campaign was to inform customers about the financial benefits of CFLs. To accomplish this, DP&L "did the math" for customers. It was assumed that the average home has 40 light sockets, and that a single CFL could save an average of $30 over its lifetime. When the DP&L discount is then factored into the initial price of the bulb, the potential total savings for each customer is $1,256. This message was emphasized to overcome a potential misperception that, while CFLs save energy, the savings might not be worth the effort.

Additional messages of the campaign included:

- CFLs use 75 percent less energy than incandescent bulbs and last 10 times longer.
- CFLs now come in a number of shapes, sizes, and applications.
- Discounted bulbs are available at area retailers.

As a part of the campaign, DP&L held two promotional events at area Lowe's stores. At the Saturday morning events, a radio station broadcast live from the store to promote the campaign, conducted interviews with the DP&L program manager, and a display was set up at the store staffed by program employees to personally explain the benefits of CFLs to customers. As an added educational tool, a bicycle used to light incandescent, fluorescent and LED bulbs demonstrated the efficiency of CFLs and LEDs. Customers who tried the bike experienced first-hand that more energy has to be generated to power incandescents, as opposed to CFLs and LEDs.

Sample Campaign Communications




LEARN: HOW TO TURN A SAVINGS OF $1.40 INTO $1,256.
With nearly 100 retail locations, it's easy to save instantly on specially marked DP&L compact fluorescent bulbs and save even more down the road.
Visit www.dpandl.com/save to find a participating retailer near you.
TOMORROW STARTS TODAY
DP&L
Savings of $1,256 was calculated over the lifetime of 40 CFL bulbs—the number of bulb sockets in the average home. Replacing 40 incandescents with CFLs would save $1,200 over the life of the CFLs. The savings with DP&L's offer, an average of $1.40 per bulb, to purchase each of those CFLs is $56.

Radio Ad Script 1

ANNCR VO:
Think using compact fluorescent bulbs doesn't make a difference on your wallet? Dayton Power and Light wants you to think again. That's because DP&L has teamed up with area retailers to save you an average of a dollar 40 on each CFL you buy.

So let's do the math.

SFX: Typing on calculator with print out.
DIRECTION: Announcer is talking out loud to himself

If the average home has 40 sockets for bulbs… let's see… that's a dollar forty times 40, which is $56. And if each bulb saves $30 over its lifetime… that's 40 bulbs times $30 equals $1,200 plus the $56 in savings I got for buying those bulbs… $1,200 plus $56 equals… wow, that's $1,256 in savings, not too shabby.

And just think, CFLs use 75% less energy than regular bulbs and last 10 times as long. So visit dpandl.com, that's d-p-a-n-d-l.com, find a participating retailer near you and look for DP&L's specially marked bulbs.

We're DP&L. Lighting the way to savings.

Radio Ad Script 2

ANNCR VO:
Did you know Dayton Power and Light is offering instant savings when you purchase compact fluorescent bulbs?

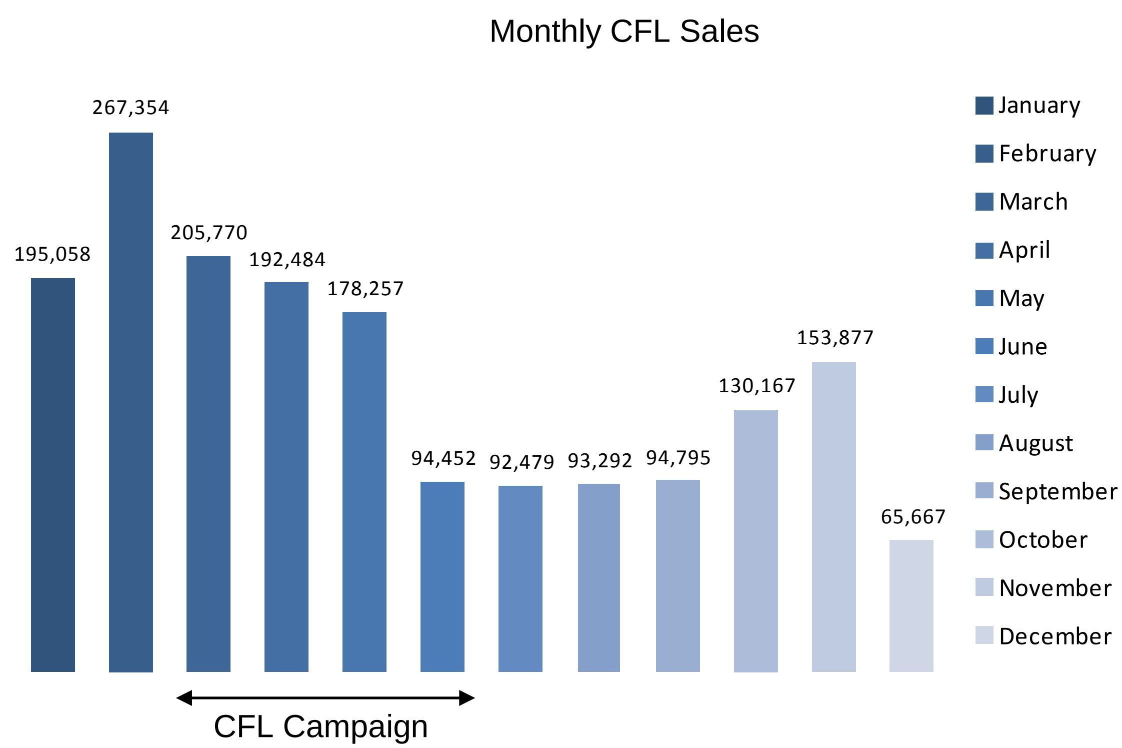
That means the simple CLICK of a switch saves you CASH REGISTER. Just purchase specially marked "HELLO, DAYTON POWER AND LIGHT" CFLs when you visit area retailers such as, "Welcome to Sam's Club, Walmart, Ace Hardware, Lowe's, Home Depot, Dickman Supply, True Value, Menard's, Meijer, Batteries Plus." Not only will you save CASH REGISTER now… an average of $1.40 per CFL to be exact… you'll also save CASH REGISTER on your energy bill.

So let's go over that one more time. Visit any participating DING, and purchase specially marked compact fluorescents. You'll save CASH REGISTER instantly. Take them home and TWIST, TWIST, TWIST and then CLICK, AAAHHHHH *(angelic)*. And since CFLs use 75% less energy and last 10 times as long you'll save even more CASH REGISTER on your energy bill.

Visit dpandl.com, that's d-p-a-n-d-l.com, find a participating retailer near you and look for DP&L's specially marked bulbs.

We're DP&L. Lighting the way to CASH REGISTER.

PERFORMANCE SUMMARY
Market transformation and customer education is a long- term process and can be difficult to measure in the short-term. One measurement of the success of the CFL campaign is the monthly sales volume as measured before, during, and after the campaign. It should be noted that there are other factors that contribute to changes in monthly sales volume other than the education campaign, such as incentive amount adjustments which occurred in January and June of 2012. However, it is reasonable to conclude that the education campaign had a positive impact, capitalizing on the momentum created by changes in incentives and driving sales higher.



WEB-BASED RESOURCE LIBRARY

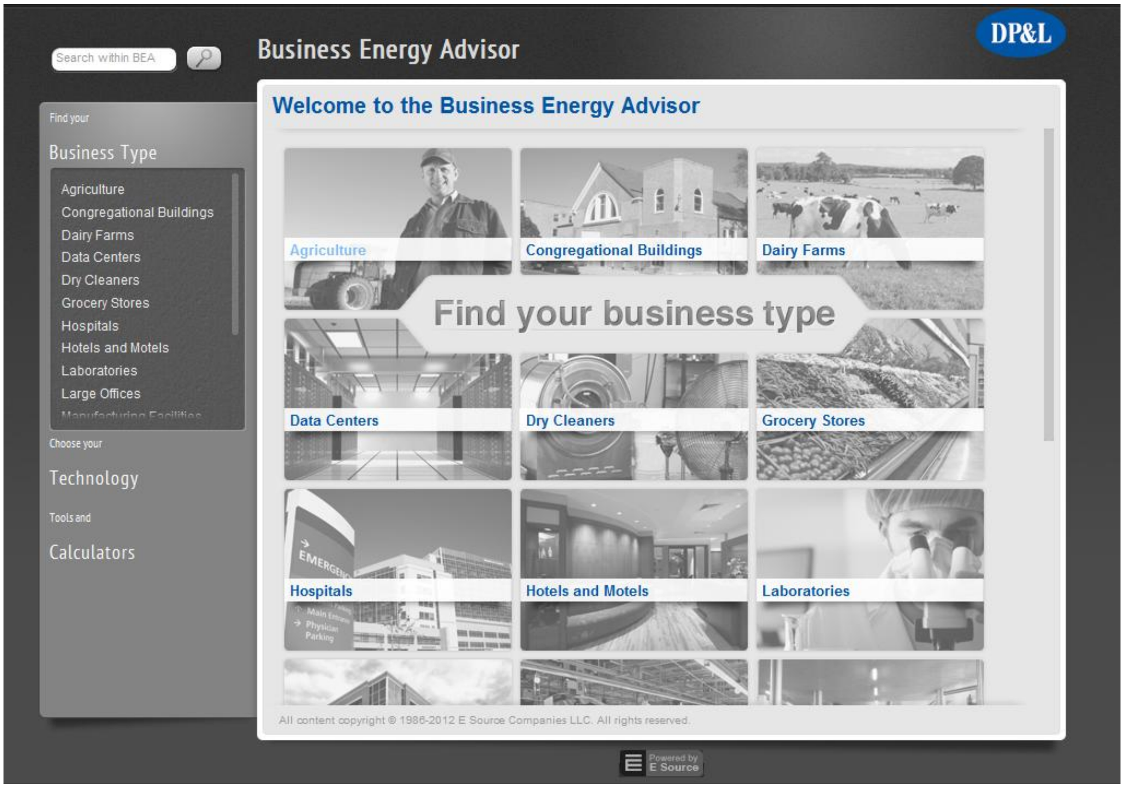
In 2012, DP&L continued to provide a resource library on its website for business customers which included a variety of energy efficiency information.

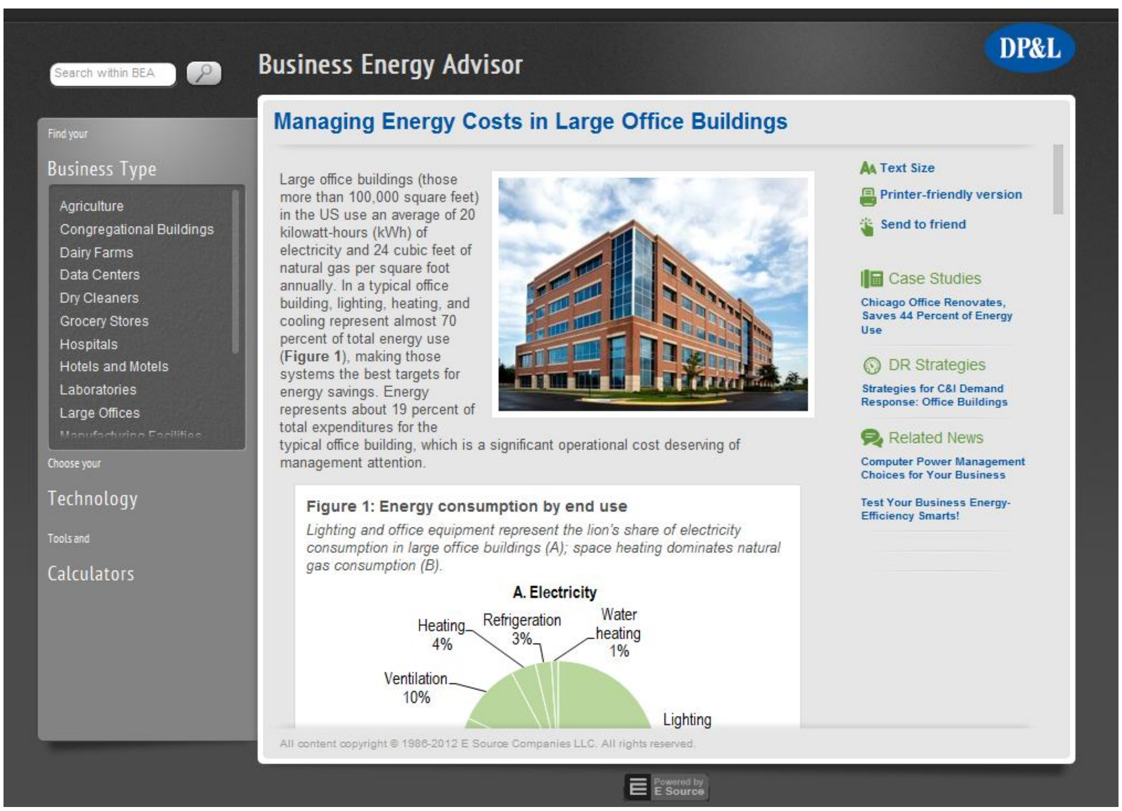
Topics in the library are divided into three main categories: Business Type, Technology, and Calculators. Each category is further broken down into specific topics to allow customers to research their area of interest. The site also includes an O&M Checklist, which provides more detail and guidance for a variety of retrofit projects.

Topics by Category

BUSINESS TYPE	TECHNOLOGY	SAVINGS CALCULATORS
Agriculture	Building Automation Systems	Duct Sealing
Congregations	Building Envelope	Track Lighting
Dairy Farms	C&I Equipment	High-Bay Lighting
Data Centers	Commissioning	Gas Cooling
Dry Cleaners	Compressed Air	Gas Fired Water Heating
Groceries	Cooking	Harmonic Mitigation
Hospitals	Cooling	Dimming Controls
Hotels & Motels	Distributed Energy	Indirect Lighting
Laboratories	Drivepower	Water Heater Comparison
Large Offices	Elevators & Escalators	Water Heater Fuel Cost
Manufacturing	Heating	
Microbreweries	Lighting	
Multifamily Residences	Office Equipment	
Restaurants	Power Quality & Reliability	
Retail	Refrigeration	
Schools	Ventilation & Air Handling	
Warehouses	Water Heating	

Sample Web Pages





OTHER ACTIVITIES

Over the course of 2012, DP&L performed other education and awareness activities, some at the request of organizations and customers. These included:

- Sponsorship of and participation in various events and conferences including the Ohio Weatherization Conference, an energy fair at Wright-Patterson Air Force Base, a conference for the Ohio Section of the American Water Works Association, and the Miami and Shelby County Sustainability Workshop.
- Energy efficiency presentations to community groups, using a presentation created by DP&L called "Top Ten Ways to Save Energy in the Home."
- Participation in Earth Day events hosted by some of our largest customers.
- Sponsoring an Energy Bike program. Teachers participating in our school education program can pick up the energy bike from a DP&L facility and use it for teaching and demonstrations in their classrooms.
- Various interviews with the news media, cable access television and the Dayton Dragons' during baseball telecasts.

RECOMMENDATIONS

The previous pages of this report contain a thorough description of each energy efficiency program, how it is being implemented and marketed, and the results produced to date. These recommendations are based on this program review, and as such, DP&L finds it unnecessary to duplicate that review in this section.

Overall, DP&L is pleased with the progress of its energy efficiency initiatives. The program spending in 2012 was 4 percent below filed budgets while program savings performance was 168 percent of 2012 filed targets.

As with any type of implementation, there is always opportunity to improve, including recommendations outlined in the Cadmus report (Exhibit 1). Over the course of the coming year, DP&L will continue to work with its implementation vendors, its collaborative members and its evaluations provider to make adjustments and improvements to its programs.

In 2011, DP&L evaluated the feasibility and effectiveness of the Appliance Rebate Program and presented its findings to its collaborative. As a result of this review, there was general agreement to transfer the appliance rebate budget to the appliance recycling program. Given the recent review in 2011, in 2012 DP&L once again transferred the budget from the appliance rebate program to the appliance recycling program.

Consistent with DP&L's 2013-2015 Portfolio Plan filed April 15, 2013 (13-0833-EL-POR), DP&L recommends continuing all of the programs that have been implemented with the exception of the Appliance Rebate Program and the Residential HVAC Tune Up Program. The tune up program was redesigned in 2012 to make the program more attractive to customers and participating contractors. Despite increased production in 2012, performance still fell short of expectations. 2013 phase-out of the tune up program was discussed with the collaborative and was met with general agreement.

Filed Program	Recommendation
Residential Lighting (CFL)	Continue
Residential HVAC Rebates	Continue
Residential HVAC Diagnostic & Tune Up	Discontinue
Residential Appliance Recycling	Continue
Residential Appliance Rebates	Discontinue
Residential Low Income Affordability	Continue
Non-Residential Prescriptive Rebates	Continue
Non-Residential Custom Rebates	Continue
Education, Awareness Building, Market Transformation	Continue

APPENDIX A

COMPLIANCE DEMONSTRATION USING PRO-RATED SAVINGS

This appendix provides the results of DP&L's 2012 energy efficiency programs calculated on a pro-rated basis. The table below summarizes the monthly "units" of each residential program, which is the basis for the pro-rated calculations.

- For CFLs, "units" represents the number of bulbs sold in that month.
- For HVAC Rebates, "units" represents the number of systems the contractors installed that month.
- For HVAC Diagnostic and Tune Up, "units" represents the number of tune-ups contractors completed during that month.
- For Appliance Recycling, "units" represents the number of units that were picked up from the customer during the month.
- For Low Income, "units" represents the number of home audits and measure installations completed that month.
- For School Education, "units" represents the number of kits distributed to students after the electric unit was taught in the classroom. Since this program runs throughout the school year, all bulbs installed during the fall of 2011 are counted as installed in January on the table below.

The business programs are not conducive to reporting by units installed due to the varying types of measures involved in these programs. For the business rebate programs, pro-rated savings are based on the date the measures were installed.

Pro-rated demand savings are calculated by excluding the coincident peak demand impacts for all program activity after September 1.

2012 UNITS BY MONTH BY PROGRAM (AS APPLICABLE)

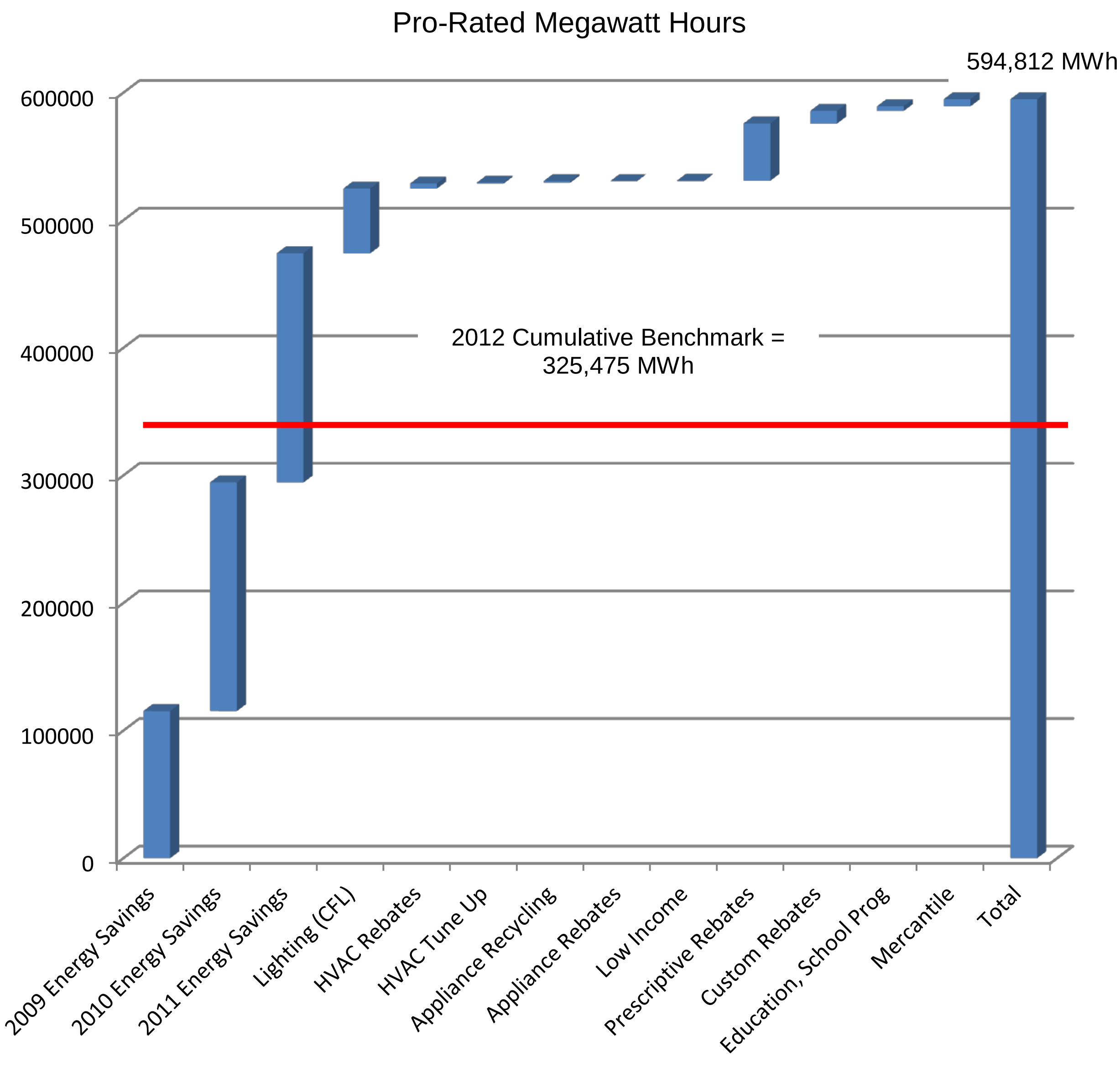
Program (units installed/sold)	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	2012 Total
Residential Lighting (CFL) (000)	195	267	206	192	178	94	93	93	95	130	154	66	1,763
Residential HVAC Rebates	328	239	311	411	815	635	564	439	315	415	280	135	4,887
Residential HVAC Diagnostic & Tune Up	0	23	348	1,024	1,898	1,053	432	224	69	47	14	3	5,135
Residential Appliance Recycling	114	73	133	169	172	263	275	277	236	141	150	68	2,071
Residential Appliance Rebates	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential Low Income Affordability	20	58	33	6	29	26	49	48	47	88	113	9	526
Education, School Programs	1,862	1,173	1,046	1,491	2,382	1,272	0	0	0	0	0	0	9,226

2012 FILED VERSUS ACTUAL ENERGY SAVINGS (PRO-RATED)

Program	Filed, 2012 (MWh)	Actual, 2012 (MWh)	Variance (MWh)
Residential Lighting (CFL)	28,603	50,755	22,152
Residential HVAC Rebates	1,691	3,928	2,237
Residential HVAC Diagnostic & Tune Up	2,983	693	-2,290
Residential Appliance Recycling	3,965	1,159	-2,806
Residential Appliance Rebates(1)	962	0	-962
Residential Low Income Affordability	1,705	398	-1,307
Non-Residential Prescriptive Rebates	32,868	44,819	11,951
Non-Residential Custom Rebates	14,844	9,868	-4,976
Education, School Programs	0	3,606	3,606
Mercantile Customer Commitments	0	5,515	5,515
Total	**87,621**	**120,741**	**33,120**

(1) With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L transferred the 2012 appliance rebate budget to the appliance recycling program, see page 1-7.

2012 ENERGY ACTUALS (PRO-RATED) COMPARED TO CUMULATIVE BENCHMARKS



	MWh
2009 Actuals	115,279
2010 Actuals	174,249
2010 Mercantile Commitments	4,957
2011 Actuals	164,039
2011 Mercantile Commitments	15,547
2012 Pro-Rated Actuals	115,226
2012 Mercantile Commitments	5,515
Cumulative 2009-2012 Total Savings	594,812
Cumulative 2012 Benchmarks	325,475

2012 ACTUAL ENERGY SAVINGS BY MONTH (PRO-RATED)

Program (in MWh)	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	2012 Total
Residential Lighting (CFL)	8,365	11,407	7,780	6,653	5,862	2,489	2,068	1,774	1,447	1,525	1,143	242	50,755
Residential HVAC Rebates	447	347	383	431	729	530	397	251	176	144	75	18	3,928
Residential HVAC Diagnostic & Tune Up	0	5	55	156	261	135	50	20	6	4	1	0	693
Residential Appliance Recycling	123	73	118	135	122	163	146	123	85	38	27	6	1,159
Residential Appliance Rebates	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential Low Income Affordability	30	52	61	5	42	25	49	41	25	31	36	1	398
Non-Residential Prescriptive Rebates	13,401	5,075	7,195	2,479	4,247	2,980	2,309	2,714	1,682	2,179	398	160	44,819
Residential Custom Rebates	5,685	389	163	82	2,149	756	159	88	279	8	110	0	9,868
Education, School Programs	972	576	479	438	795	346	0	0	0	0	0	0	3,606
Mercantile[(1)] Customer Commitments	--	--	--	--	--	--	--	--	--	--	--	--	5,515
Total	**29,023**	**17,924**	**16,234**	**10,379**	**14,207**	**7,424**	**5,178**	**5,011**	**3,700**	**3,929**	**1,790**	**427**	**120,741**

[(1)] Mercantile commitments from historical energy efficiency projects are not impacted by pro-rated calculations.

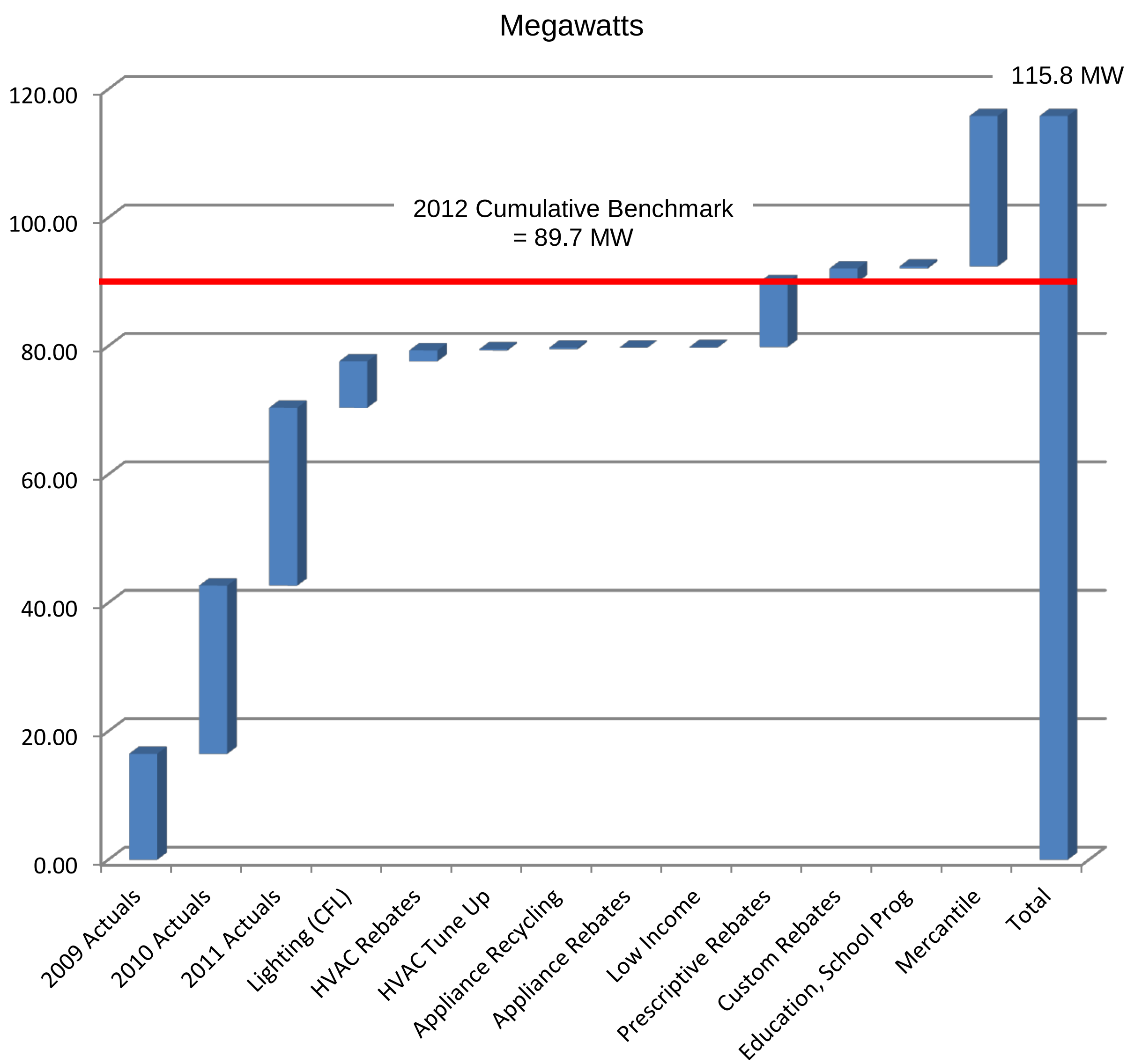
2012 FILED VERSUS ACTUAL DEMAND SAVINGS (PRO-RATED)

Program	Filed, 2012 (MW)	Actual, 2012 (MW)	Variance (MW)
Residential Lighting (CFL)	2.43	7.23	4.80
Residential HVAC Rebates	1.50	1.70	0.20
Residential HVAC Diagnostic & Tune Up	2.65	0.18	-2.47
Residential Appliance Recycling	0.62	0.25	-0.37
Residential Appliance Rebates(1)	0.12	0.00	-0.12
Residential Low Income Affordability	0.13	0.09	-0.04
Non-Residential Prescriptive Rebates	8.90	10.12	1.22
Non-Residential Custom Rebates	2.76	2.12	-0.64
Education, School Programs	0.00	0.32	0.32
Mercantile Customer Commitments(2)	0.00	23.44	23.44
Total	**19.11**	**45.45**	**26.34**

(1) With the approval of PUCO Staff and notification of DP&L's energy efficiency collaborative, DP&L transferred the 2012 appliance rebate budget to the appliance recycling program, see page 1-7.

(2) Mercantile Customer Commitments include 20.0 MW of PJM Demand Response committed to DP&L by mercantile customers.

2012 DEMAND ACTUALS (PRO-RATED) COMPARED TO BENCHMARKS



	MW
2009 Actuals	16.5
2010 Actuals	24.7
2010 Mercantile Commitments*	1.5
2011 Actuals	24.2
2011 Mercantile Commitments*	3.5
2012 Pro-Rated Actuals	22.0
2012 Mercantile Commitments	23.4
Cumulative 2009-2012 Total Savings	115.8
Cumulative 2012 Benchmarks	89.7

*Mercantile commitments for PJM Demand Response do not carry over from year to year. Therefore, PJM Demand Response commitments for 2010 and 2011 have been removed from the cumulative total.

2012 ACTUAL DEMAND SAVINGS BY MONTH (PRO-RATED)

Program (in MW)	Jan	Feb	Mar	April	May	June	July	Aug	2012 Total
Residential Lighting (CFL)	1.00	1.49	1.12	1.06	1.05	0.51	0.49	0.51	7.23
Residential HVAC Rebates	0.13	0.11	0.14	0.18	0.35	0.31	0.28	0.20	1.70
Residential HVAC Diagnostic & Tune Up	0.00	0.00	0.01	0.04	0.07	0.04	0.02	0.00	0.18
Residential Appliance Recycling	0.02	0.01	0.02	0.03	0.03	0.04	0.05	0.05	0.25
Residential Appliance Rebates	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Low Income Affordability	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.02	0.09
Non-Residential Prescriptive Rebates	2.59	0.96	1.44	0.75	1.16	1.09	0.92	1.21	10.12
Non-Residential Custom Rebates	1.36	0.07	0.05	0.03	0.25	0.29	0.02	0.05	2.12
Education, School Programs	0.07	0.05	0.04	0.04	0.08	0.04	0.00	0.00	0.32
Mercantile Customer Commitments [(1)]									23.44
Total	**5.18**	**2.70**	**2.83**	**2.13**	**3.00**	**2.33**	**1.80**	**2.04**	**45.45**

(1) Mercantile demand commitments from historical energy efficiency projects and PJM Demand Response programs are not impacted by pro-rated calculations.

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report

The Dayton Power and Light Company ("DP&L" or "the Company") herewith submits its updated Benchmark Report ("Benchmark Report") pursuant to section 4901:1-39-05(C)(1)(a) of the Ohio Administrative Code ("O.A.C"). In this report, DP&L identifies the energy and demand baselines for kilowatt-hour sales and kilowatt demand for reporting year 2012 based on the preceding three calendar years (2009, 2010 and 2011) as specified in section 4928.66(A)(2)(a) of the Ohio Revised Code ("O.R.C."), along with DP&L's energy saving and peak demand reduction statutory benchmarks. In this report, DP&L also makes adjustments pursuant to O.R.C. §4928.66(A)(2)(c) and O.A.C §4901:1-39-05(B) to adjust its sales and demand baselines to normalize for weather and changes to DP&L's customer base related to mercantile opt-out applications, lost load and, in some cases, load growth. DP&L's benchmarks and adjustments are supported by the descriptions shown below, including the method of calculating the baselines, supporting data, assumptions, rationales and calculations as required by O.A.C. §4901:1-39-05(B).

DP&L 2012 Energy Efficiency Baseline Calculation

Consistent with the definition of "Energy baseline" pursuant to O.A.C. §4901:1-39-01(J), DP&L's Total Retail sales for the three preceding calendar years (2009, 2010, and 2011), which are shown below, were taken from DP&L's most recent long-term forecast report found on the Electric Utility Ohio Service Area Energy Consumption Forecast (PUCO FORM FE-D1) and included as Workpaper A.

2009: 13,727,277 MWh
2010: 14,282,324 MWh
2011: 14,127,719 MWh

DP&L 2012 Peak Demand Baseline Calculation

Consistent with the definition of "Peak-demand baseline" pursuant to O.A.C. §4901:1-39-01(S), DP&L's Peak Demands for the three preceding calendar years (2009, 2010, and 2011), which are shown below, were taken from DP&L's most recent long-term forecast report found on the Electric Utility Ohio Seasonal Peak Load Demand Forecast (PUCO FORM FE-D3) and included as Workpaper B.

2009: 2,912 MW
2010: 2,956 MW
2011: 3,146 MW

Normalizing Adjustments

Significant Loss/Growth of Customer Loads

O.A.C. §4901:1-39-05(B) permits an electric distribution utility to adjust its baselines for changes in the number of customers, sales and peak demand that are outside of the electric distribution utility's control. DP&L adjusted its 2012 baselines to account for customers with significant load who reduced, ceased or expanded their operations during the reporting period. Because there will always be some customers lost over the course of time, which can be balanced against DP&L's natural load growth, the customers identified in this adjustment are only large customer loads that grew or were lost and which, due to size, are not expected to be replaced under ordinary growth and contraction business cycles. Specifically, DP&L's adjustments include only customers with load changes of 2 MW or greater.

Adjustments for lost customer loads are necessary and will continue to be necessary as the lost loads represent customers that will not be available to take advantage of DP&L's Energy Efficiency programs. These eliminated or soon to be eliminated loads should be excluded from the baseline calculation in order to more accurately reflect the potential energy savings, which can be reasonably expected from DP&L's customers in current and future years. In other words, lost customer loads will have the impact of decreasing both the Energy Efficiency and Peak Demand Reduction baselines.

For the sake of balance, when accounting for changes in number of customers, sales and peak demand, DP&L likewise adjusted its baselines to account for atypical growth in customer load. DP&L believes it is appropriate to adjust for extraordinary customer load growth, as these customers will be able to take advantage of DP&L's Energy Efficiency programs now and going forward. Customer load growth will have the effect of increasing both the Energy Efficiency and Peak Demand Reduction baselines. Adjustments for customer load changes are reported in Workpaper C.

Adjustment for Mercantile Customers

Pursuant to O.R.C §4928.66(A)(c), an electric distribution utility must adjust its baseline to exclude the effects of all energy efficiency or peak demand reduction programs that may have existed during the period used to establish the baseline. Therefore, in addition to the adjustment for customer load change, DP&L also adjusted its baseline to account for the energy efficiency and peak demand reduction that was realized in connection with the approval of mercantile opt-out applications. With the exception of two applications, such mercantile applications, which included energy efficiency projects for the 2009-2011 timeframe, were approved by the Commission under the 60 day automatic approval in 2010, 2011, and 2012, pursuant to the Commission's pilot program for Mercantile Customers as established in Case No. 10-834-EL-EEC. Two of the mercantile applications were approved by the Commission for exemption from DP&L's Energy Efficiency Rider as a result of implementation of energy efficiency projects. The adjustment for Mercantile Customers is shown in more detail in Workpaper D.

Weather normalization

Weather-normalization adjusts actual weather-sensitive retail sales by class (Residential, Commercial, and Public Authority) to account for the difference between actual and normal heating and cooling degree days based on historical use per customer per day per cooling degree day and heating degree day relationships for these classes.

Workpapers E1–E3 calculate the weather normalized retail sales and peak demands for the period. The weather normalization factor is the ratio of weather normalized values to actual values (sales or peak demands) and is calculated on Workpaper F.

The annual MWh sales adjusted for loss/growth in customer loads and mercantile opt out applications are multiplied by the Weather Normalization Factor to yield the Normalized Retail Energy Sales (MWh). The same process is applied to calculate Weather Normalized Peak Demands (MW).

DP&L 2012 Normalized Energy Efficiency Baseline Calculation

DP&L's 2012 Normalized Energy Efficiency baseline calculation is shown on Schedule 1. The methodology is consistent with O.A.C. §4901:1-39-01(J) and includes the adjustments described above. The normalized retail energy sales for 2009, 2010, and 2011 are averaged over the three years, to produce DP&L's 2012 Normalized Energy Efficiency Baseline of 13,892,400 MWh.

DP&L 2012 Energy Efficiency Reduction Benchmark Calculation

As described in O.R.C. §4928.66(A)(1)(a), beginning in 2009, an electric distribution utility shall:

> "Implement energy efficiency programs that achieve energy savings equivalent to at least three-tenths of one per cent of the total, annual average, and normalized kilowatt-hour sales of the electric distribution utility during the preceding three calendar years to customers in this state. The savings requirement, using such a three-year average, shall increase to….. an additional eight-tenths of one per cent in 2012."

DP&L's 2012 Normalized Energy Efficiency Baseline of 13,892,400 MWh is multiplied by the 2012 Energy Efficiency Reduction Benchmark percentage of 0.80% pursuant to O.R.C. §4928.66(A)(1)(a). The result is DP&L's 2012 Incremental Energy Efficiency Reduction Benchmark of 111,139 MWh. DP&Ls 2012 cumulative Energy Efficiency Reduction Benchmark is 325,475 MWh. The calculations are shown on Schedule 1.

DP&L 2012 Normalized Peak Demand Baseline Calculation

DP&L's 2012 Normalized Peak Demand Reduction baseline calculation is shown on Schedule 2. The methodology is consistent with O.A.C. §4901:1-39-01(S) and includes the adjustments described above. DP&L's Normalized Peak Demands for 2009, 2010, and 2011 are averaged over the three years, to produce DP&L's 2012 Normalized Peak Demand Baseline of 2,759 MW.

DP&L 2012 Peak Demand Reduction Benchmark Calculation

As described in O.R.C. §4928.66 (A)(1)(b), beginning in 2009, an electric distribution utility shall:

> "Implement peak demand reduction programs designed to achieve a one per cent reduction in peak demand in 2009 and an additional seventy-five hundredths of one per cent reduction each year through 2018."

DP&L's 2012 Normalized Peak Demand Reduction Baseline of 2,759 MW is multiplied by the 2012 Peak Demand Reduction Benchmark percentage of 3.25% pursuant to O.R.C. §4928.66 (A)(1)(b). The result is DP&L's 2012 Peak Demand Reduction Benchmark of 89.7 MW. The calculation is shown on Schedule 2.

Schedule 1

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
Energy Efficiency Baseline and Benchmark Calculation

		2009	2010	2011	2012
1	**Baseline Calculation Components**				
2	Retail MWh Sales [1]	13,727,277	14,282,324	14,127,719	
3					
4	**Normalizing Adjustments**				
5	Significantly Reduced Customer Sales [2]	(191,485)	(119,143)	(76,409)	
6	Significantly Expanded Customer Sales [3]	157,551	103,999	6,513	
7	Total Customer Sales Adjustment (5)+(6)	(33,934)	(15,144)	(69,896)	
8	Mercantile Customer Adjustment [4]	17,690	21,112	24,538	
9	Total Adjusted Retail Sales (2)+(7)+(8)	13,711,033	14,288,292	14,082,361	
10	Weather Normalization Factor [5]	1.01859	0.96700	0.98666	
11	Normalized Retail Energy Sales (9)*(10)	13,965,921	13,816,778	13,894,502	
12					
13	**2012 Normalized Energy Efficiency Baseline**				
14	3 Year Normalized Average (MWh)				13,892,400
15					
16	**Calculation of 2012 Energy Efficiency Reduction Benchmark**				
17	Normalized Preceding 3 Year Average Sales (14)				13,892,400
18	2012 Incremental Energy Efficiency Reduction Benchmark % [6]				0.80%
19	2012 Incremental Energy Efficiency Reduction Benchmark (17)*(18)				111,139
20	2010-2011 Energy Efficiency Reduction Benchmark [7]				214,336
21	**2012 Cumulative Energy Efficiency Reduction Benchmark (19)+(20)**				**325,475**

[1] Retail sales for the period 2009-2011 are reported in PUCO Form FE-D1 (Case No. 13-1810-EL-FOR). See Workpaper A, Column (6).

[2] Significantly reduced customer sales include those who ceased or reduced their operations during the period. See Workpaper C for details on load reductions.

[3] Significantly expanded customer sales include those who started or expanded their operations during the period. See Workpaper C for details on load expansions.

[4] See Workpaper D for calculation of Mercantile Customer Adjustment.

[5] See Workpaper F for calculation of the weather normalization factor.

[6] Energy Efficiency benchmark as established in O.R.C. §4928.66(A)(1)(a).

[7] 2011 Cumulative Energy Efficiency Reduction Benchmark as established in Case No. 12-1420-EL-POR, Schedule 1, line 21.

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
Peak Demand Baseline and Benchmark Calculation

		2009	2010	2011	2012
1	**Baseline Calculation Components**				
2	Peak MW Demand [1]	2,912	2,956	3,146	
3					
4	**Normalizing Adjustments**				
5	Significantly Reduced Customer Load [2]	(36)	(31)	(18)	
6	Significantly Expanded Customer Load [3]	47	21	9	
7	Total Customer Load Adjustment (5)+(6)	11	(10)	(9)	
8	Mercantile Customer Adjustment [4]	5	7	8	
9	Total Adjusted Peak Demand (2)+(7)+(8)	2,928	2,953	3,145	
10	Weather Normalization Factor [5]	0.97527	0.91610	0.86364	
11	Normalized Peak Demand (9)*(10)	2,856	2,705	2,716	
12					
13	**2012 Normalized Peak Demand Reduction Baseline**				
14	3 Year Normalized Average (MW)				2,759
15					
16	**Calculation of Normalized 2012 Peak Demand Reduction Benchmark**				
17	Normalized Preceding 3 Year Average Peak Demand (14)				2,759
18	2012 Peak Demand Reduction Benchmark % [6]				3.25%
19	**2012 Peak Demand Reduction Benchmark (17)*(18)**				**89.7**

[1] Peak demand for the period 2009-2011 is reported in PUCO Form FE-D3 (Case No. 13-1810-EL-FOR). See Workpaper B.

[2] Significantly reduced customer load include those who ceased or reduced their operations during the period. See Workpaper C for a complete list of customers.

[3] Significantly expanded customer load include those customers who started or expanded their operations during the period. See Workpaper C for a complete list of customers.

[4] See Workpaper D for calculation of Mercantile Customer Adjustment.

[5] See Workpaper F for calculation of weather normalization factor.

[6] Peak Demand Reduction benchmark as established in O.R.C § 4928.66(A)(1)(b).

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report

PUCO FORM FE-D1: ELECTRIC UTILITY OHIO SERVICE AREA ENERGY CONSUMPTION FORECAST
(Megawatt-Hours Per Year)

		(1)	(2)	(3)	(4)	(5)	(5a)	(6)	(7)	(8)
	YEAR	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	TRANSPORTATION (a)	OTHER (b)	ENERGY EFFICIENCY & DEMAND RESPONSE	TOTAL END USER CONSUMPTION 1+2+3+4+5-5a	LOSSES AND UNACCOUNTED FOR	NET ENERGY FOR LOAD 6+7
-5	2008	5,425,661	3,920,511	4,007,203	4,835	1,436,917		14,795,127	790,093	15,585,220
-4	2009	5,227,724	3,727,122	3,372,617	3,153	1,396,661		13,727,277	797,678	14,524,955
-3	2010	5,516,004	3,767,233	3,571,504	1,467	1,426,116		14,282,324	419,500	14,701,824
-2	2011	5,424,545	3,713,941	3,560,411	817	1,428,005		14,127,719	400,646	14,528,365
-1	2012	5,181,338	3,698,607	3,650,639	1,625	1,404,461		13,936,670	455,260	14,391,930
0	2013	5,149,645	3,722,309	3,676,273	1,625	1,412,469	(149,529)	13,812,792	533,650	14,346,443
1	2014	5,183,733	3,747,767	3,679,846	1,625	1,422,395	(311,194)	13,724,171	530,309	14,254,481
2	2015	5,218,616	3,773,457	3,679,321	1,625	1,433,386	(469,728)	13,636,677	527,011	14,163,687
3	2016	5,268,734	3,798,822	3,677,217	1,625	1,446,792	(629,812)	13,563,378	524,247	14,087,626
4	2017	5,298,863	3,822,565	3,675,735	1,625	1,461,593	(791,740)	13,468,641	520,676	13,989,317
5	2018	5,345,828	3,843,303	3,671,467	1,625	1,478,103	(955,534)	13,384,792	517,515	13,902,307
6	2019	5,396,839	3,863,819	3,669,077	1,625	1,493,753	(1,121,217)	13,303,897	514,465	13,818,362
7	2020	5,448,261	3,884,752	3,670,819	1,625	1,507,651	(1,288,338)	13,224,770	511,482	13,736,252
8	2021	5,500,172	3,905,799	3,672,562	1,625	1,521,677	(1,456,358)	13,145,477	508,492	13,653,970
9	2022	5,552,578	3,926,960	3,674,305	1,625	1,535,834	(1,625,288)	13,066,015	505,497	13,571,512
10	2023	5,593,516	3,950,557	3,676,680	1,625	1,549,629	(1,795,135)	12,976,873	502,136	13,479,009

(a) Transportation includes railroads & railways.
(b) Other includes Street & Highway Lighting, Public Authorities and Interdepartmental Sales.

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report

PUCO FORM FE-D3: ELECTRIC UTILITY OHIO SEASONAL PEAK LOAD DEMAND FORECAST
(Megawatts)

	Native Load					Internal Load			
	Year	Summer	Demand Response	Net Summer	Winter (a)	Summer	Demand Response	Net Summer	Winter (a)
-5	2008	3027			2709	3027			2709
-4	2009	2912			2436	2912			2436
-3	2010	2956			2474	2956			2474
-2	2011	3146			2329	3146			2329
-1	2012	3046			2424	3046			2424
0	2013	3050	25	3025	2427	3050	25	3025	2427
1	2014	3071	51	3020	2443	3071	51	3020	2443
2	2015	3091	79	3012	2459	3091	79	3012	2459
3	2016	3112	106	3006	2476	3112	106	3006	2476
4	2017	3131	133	2998	2491	3131	133	2998	2491
5	2018	3151	161	2990	2507	3151	161	2990	2507
6	2019	3172	189	2983	2524	3172	189	2983	2524
7	2020	3194	217	2977	2541	3194	217	2977	2541
8	2021	3215	245	2970	2558	3215	245	2970	2558
9	2022	3237	273	2964	2576	3237	273	2964	2576
10	2023	3259	301	2958	2593	3259	301	2958	2593

(a) Winter load reference is to peak loads which follow the summer peak load.

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
Significant Change in Customer Loads

		Consumption (MWh)			Coincident Peak (MW)		
Ln	Customer	2009	2010	2011	2009	2010	2011
1	**REDUCTIONS/ELIMINATIONS**						
2	Customer 1	(15,889)	(674)	-	(2)	-	-
3	Customer 2	(36,944)	(18,259)	-	(5)	(3)	-
4	Customer 3	(6,830)	(6,298)	378	(3)	(3)	(1)
5	Customer 4	(18,170)	-	-	(1)	-	-
6	Customer 5	(17,893)	(7,454)	-	(3)	-	-
7	Customer 6	(7,969)	(5,615)	(948)	(1)	(1)	-
8	Customer 7	(62,430)	(82,026)	(73,924)	(17)	(23)	(16)
9	Customer 8	(7,447)	(357)	-	(1)	-	-
10	Customer 9	(9,401)	(1,130)	-	(1)	-	-
11	Customer 10	(10,965)	-	-	(2)	-	-
12	Customer 11	2,453	2,670	(1,915)	-	(1)	(1)
13	**TOTAL**	**(191,485)**	**(119,143)**	**(76,409)**	**(36)**	**(31)**	**(18)**
14							
15	**EXPANSIONS**						
16	Customer 12	21,171	11,883	(43,568)	9	5	1
17	Customer 13	21,077	16,524	1,884	3	3	-
18	Customer 14	30,581	18,325	20,200	10	5	4
19	Customer 15	11,943	4,263	1,865	2	1	-
20	Customer 16	(4,135)	(371)	225	-	-	-
21	Customer 17	8,257	2,027	583	1	-	-
22	Customer 18	2,160	1,177	(303)	-	(1)	-
23	Customer 19	6,524	(1,019)	(442)	-	(1)	-
24	Customer 20	28,734	28,734	13,697	4	4	-
25	Customer 21	11,708	11,597	10,634	4	4	4
26	Customer 22	11,593	6,193	499	12	1	-
27	Customer 23	7,142	4,316	1,224	2	-	-
28	Customer 24	796	350	15	-	-	-
29	**TOTAL**	**157,551**	**103,999**	**6,513**	**47**	**21**	**9**
30							
31	**TOTAL CHANGE**	**(33,934)**	**(15,144)**	**(69,896)**	**11**	**(10)**	**(9)**

THE DAYTON POWER AND LIGHT COMPANY
2012 Benchmark Report
Adjustment for Mercantile Customers

Ln	Customer	Demand Savings (kW)			Energy Savings (kWh)		
		2009	2010	2011	2009	2010	2011
1	**2010 Mercantile Customer Adjustment ***						
2	Customer A	499.4	499.4	499.4	1,914,690	1,914,690	1,914,690
3	Customer B	13.2	13.2	13.2	202,161	202,161	202,161
4	Customer C	294.5	294.5	294.5	959,998	959,998	959,998
5	Customer D	91.5	91.5	91.5	91,554	91,554	91,554
6	Customer E	261.5	261.5	261.5	261,565	261,565	261,565
7	Customer F	237.0	237.0	237.0	1,000,430	1,000,430	1,000,430
8	Customer G	97.1	97.1	97.1	526,864	526,864	526,864
9	**Total 2010 Adjustment**	**1,494.2**	**1,494.2**	**1,494.2**	**4,957,262**	**4,957,262**	**4,957,262**
10							
11	**2011 Mercantile Customer Adjustment ***						
12	Customer H	28.9	108.7	108.7	241,494	952,131	952,131
13	Customer I	120.5	120.5	120.5	620,513	620,513	620,513
14	Customer J	192.5	192.5	192.5	958,979	958,979	958,979
15	Customer K	-	-	8.1	-	1,310	40,600
16	Customer L	129.4	137.9	137.9	969,324	980,601	996,566
17	Customer M	-	-	275.2	-	4,410	229,417
18	Customer N	-	-	39.6	-	42,768	141,247
19	EER Exemption Applications	1,615.9	1,746.0	1,879.5	8,074,276	8,690,166	9,561,649
20	**Total 2011 Adjustment**	**2,087.2**	**2,305.6**	**2,762.0**	**10,864,586**	**12,250,878**	**13,501,102**
21							
22	**2012 Mercantile Customer Adjustment ***						
23	Customer O	-	-	57.1	-	83,276	499,656
24	Customer P	-	-	406.3	-	22,596	210,142
25	Customer Q	-	-	13.7	-	64,572	171,581
26	Customer R	2.3	2.3	2.3	26,769	44,856	44,855
27	Customer S	32.6	32.6	44.4	253,764	260,098	329,770
28	Customer T	158.0	158.0	158.0	785,861	785,861	785,861
29	Customer U	-	-	31.7	-	414	38,516
30	Customer V	1,125.0	1,719.8	1,719.8	636,882	1,120,905	1,120,905
31	Customer W	-	-	-	-	-	44,618
32	Customer X	-	517.3	517.3	-	982,219	2,269,477
33	Customer Y	-	-	-	-	-	19,191
34	Customer Z	-	312.8	312.8	60,451	201,505	201,505
35	Customer AA	-	-	-	3,043	37,727	43,277
36	Customer AB	-	365.0	365.0	100,911	300,316	300,316
37	**Total 2012 Adjustment**	**1,317.9**	**3,107.8**	**3,628.4**	**1,867,681**	**3,904,345**	**6,079,670**
38							
39	**Total 2010, 2011 & 2012 Adjustment**	**4,899.3**	**6,907.6**	**7,884.6**	**17,689,529**	**21,112,485**	**24,538,034**

* These Mercantile Applications (except the EER exemption applications) were approved by the Commission in 2010, 2011, and 2012 respectively under the 60 day automatic approval, pursuant to the Commission's pilot program for Mercantile Customers as established in Case No. 10-834-EL-EEC. These adjustments are prorated and based on the timeframe that the energy efficiency was achieved. The EER exemption applications were approved by the Commission in 2011 for exemption from DP&L's Energy Efficiency Rider.

DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
2009 Weather Normalization

2009 Actual Calendar Retail Sales

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	Peak
Residential Non-Heating	384,529	252,915	245,025	214,560	231,900	306,235	343,465	354,076	232,226	227,612	227,607	331,800	3,351,950	MW
Residential Heating	315,366	242,564	160,892	99,287	81,566	90,453	108,155	116,978	82,263	110,954	131,367	228,252	1,768,097	June
Total Residential	**699,895**	**495,479**	**405,917**	**313,847**	**313,466**	**396,688**	**451,620**	**471,054**	**314,489**	**338,566**	**358,974**	**560,052**	**5,120,047**	Actual
														2912
Commercial	351,924	270,376	293,797	279,006	302,385	339,903	318,490	367,430	275,842	294,467	272,587	311,673	3,677,880	
Industrial	230,837	284,671	244,371	275,283	279,417	298,594	294,016	301,349	313,307	278,746	289,032	263,124	3,352,747	Load Factor[1]
Public Authorities	113,449	102,284	104,136	105,638	114,496	120,700	102,837	124,719	108,674	110,250	99,132	109,230	1,315,545	55.39%
Street Railway	554	426	375	352	268	14	92	168	85	117	153	418	3,022	
Street Lighting	5,874	5,729	5,347	5,542	5,457	5,392	5,381	5,550	5,625	5,697	5,722	5,869	67,185	
Total Non-Residential	**702,638**	**663,486**	**648,026**	**665,821**	**702,023**	**764,603**	**720,816**	**799,216**	**703,533**	**689,277**	**666,626**	**690,314**	**8,416,379**	
Total Retail	**1,402,533**	**1,158,965**	**1,053,943**	**979,668**	**1,015,489**	**1,161,291**	**1,172,436**	**1,270,270**	**1,018,022**	**1,027,843**	**1,025,600**	**1,250,366**	**13,536,426**	

2009 Weather Normalized Retail Sales

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	
Residential Non-Heating	367,768	259,103	261,284	196,496	233,625	285,861	457,204	373,390	269,274	225,627	241,596	330,527	3,501,755	WN Peak[2]
Residential Heating	286,156	256,306	196,073	99,240	81,673	86,318	132,794	121,470	90,226	98,362	162,460	225,386	1,836,464	MW
Total Residential	**653,924**	**515,409**	**457,357**	**295,736**	**315,298**	**372,179**	**589,998**	**494,860**	**359,500**	**323,989**	**404,056**	**555,913**	**5,338,219**	June
														WN
Commercial	333,903	274,875	297,213	273,144	303,422	336,132	348,896	374,603	287,930	298,126	274,308	310,735	3,713,287	**2840**
Industrial	230,837	284,671	244,371	275,283	279,417	298,594	294,016	301,349	313,307	278,746	289,032	263,124	3,352,747	
Public Authorities	107,907	102,866	104,136	104,761	114,600	120,237	105,670	125,258	109,717	110,250	99,132	109,104	1,313,638	
Street Railway	554	426	375	352	268	14	92	168	85	117	153	418	3,022	
Street Lighting	5,874	5,729	5,347	5,542	5,457	5,392	5,381	5,550	5,625	5,697	5,722	5,869	67,185	
Total Non-Residential	**679,075**	**668,567**	**651,442**	**659,082**	**703,164**	**760,369**	**754,055**	**806,928**	**716,664**	**692,936**	**668,347**	**689,250**	**8,449,879**	
Total WN Retail Sales	**1,332,999**	**1,183,976**	**1,108,799**	**954,818**	**1,018,462**	**1,132,548**	**1,344,053**	**1,301,788**	**1,076,164**	**1,016,925**	**1,072,403**	**1,245,163**	**13,788,098**	

All sales in MWh

[1] **Peak Load Factor is calculated by dividing peak month sales by the number of hours in the month then dividing the result by the peak demand [peak month sales/hours in month)/peak demand]**

[2] **Weather normalized peak is calculated by applying the peak load factor to the normalized peak month sales [(peak month sales/hours in month)/peak month load factor]**

DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
2010 Weather Normalization

2010 Actual Calendar Retail Sales

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	
Residential Non-Heating	354,522	258,858	263,664	203,306	245,866	353,434	428,783	479,014	243,507	199,042	246,067	340,943	3,617,006	
Residential Heating	314,486	234,210	169,658	97,379	97,539	116,261	140,235	129,590	93,722	98,488	142,356	270,668	1,904,592	**Peak**
Total Residential	**669,008**	**493,068**	**433,322**	**300,685**	**343,405**	**469,695**	**569,018**	**608,604**	**337,229**	**297,530**	**388,423**	**611,611**	**5,521,598**	MW
														August
Commercial	302,665	277,871	302,608	269,824	318,672	317,820	378,028	385,363	322,214	284,653	269,686	312,026	3,741,430	Actual
Industrial	254,217	271,670	274,023	299,991	319,337	352,685	305,353	306,694	317,996	309,254	302,290	268,483	3,581,993	**2956**
Public Authorities	94,835	116,238	107,316	104,585	124,228	112,401	131,524	130,471	118,374	109,601	99,925	112,041	1,361,539	
Street Railway	202	90	243	135	102	111	75	66	52	47	75	88	1,286	Load Factor[1]
Street Lighting	6,021	6,433	5,640	5,564	5,685	5,409	5,535	5,556	5,632	5,804	5,831	6,115	69,225	65.33%
Total Non-Residential	**657,940**	**672,302**	**689,830**	**680,099**	**768,024**	**788,426**	**820,515**	**828,150**	**764,268**	**709,359**	**677,807**	**698,753**	**8,755,473**	
Total Retail	**1,326,948**	**1,165,370**	**1,123,152**	**980,784**	**1,111,429**	**1,258,121**	**1,389,533**	**1,436,754**	**1,101,497**	**1,006,889**	**1,066,230**	**1,310,364**	**14,277,071**	

2010 Weather Normalized Retail Sales

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	
Residential Non-Heating	347,836	242,522	273,403	206,303	225,285	298,401	377,019	399,263	206,555	199,921	248,281	320,566	3,345,355	
Residential Heating	301,603	200,335	189,078	122,271	93,516	104,210	128,870	112,021	85,562	108,390	147,494	227,097	1,820,447	
Total Residential	**649,439**	**442,857**	**462,481**	**328,574**	**318,801**	**402,611**	**505,889**	**511,284**	**292,117**	**308,311**	**395,775**	**547,663**	**5,165,802**	**WN Peak[2]**
														MW
Commercial	295,985	263,138	305,036	269,824	311,921	303,429	364,381	364,137	314,243	284,653	270,124	294,344	3,641,215	August
Industrial	254,217	271,670	274,023	299,991	319,337	352,685	305,353	306,694	317,996	309,254	302,290	268,483	3,581,993	WN
Public Authorities	93,023	112,924	107,316	104,585	123,580	111,007	130,209	128,436	117,525	109,601	99,925	108,285	1,346,416	**2708**
Street Railway	202	90	243	135	102	111	75	66	52	47	75	88	1,286	
Street Lighting	6,021	6,433	5,640	5,564	5,685	5,409	5,535	5,556	5,632	5,804	5,831	6,115	69,225	
Total Non-Residential	**649,448**	**654,255**	**692,258**	**680,099**	**760,625**	**772,641**	**805,553**	**804,889**	**755,448**	**709,359**	**678,245**	**677,315**	**8,640,135**	
Total WN Retail Sales	**1,298,887**	**1,097,112**	**1,154,739**	**1,008,673**	**1,079,426**	**1,175,252**	**1,311,442**	**1,316,173**	**1,047,565**	**1,017,670**	**1,074,020**	**1,224,978**	**13,805,937**	

All sales in MWh

[1]**Peak Load Factor is calculated by dividing peak month sales by the number of hours in the month then dividing the result by the peak demand [peak month sales/hours in month)/peak demand]**

[2]**Weather normalized peak is calculated by applying the peak load factor to the normalized peak month sales [(peak month sales/hours in month)/peak month load factor]**

DAYTON POWER & LIGHT COMPANY

2012 Benchmark Report

2011 Weather Normalization

2011 Actual Calendar Retail Sales

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	
Residential Non-Heating	342,572	267,668	249,345	223,379	251,958	339,836	421,111	478,748	208,472	199,094	257,055	293,932	3,533,170	
Residential Heating	286,415	213,815	185,285	111,503	113,411	106,336	149,644	114,875	92,473	108,333	138,250	200,327	1,820,667	**Peak**
Total Residential	**628,987**	**481,483**	**434,630**	**334,882**	**365,369**	**446,172**	**570,755**	**593,623**	**300,945**	**307,427**	**395,305**	**494,259**	**5,353,837**	MW
														July
Commercial	319,462	282,583	288,681	263,869	294,243	329,869	388,778	356,272	308,971	292,237	274,516	290,478	3,689,959	Actual
Industrial	281,405	261,150	307,024	276,393	296,195	299,049	346,201	292,962	319,441	325,811	293,661	243,346	3,542,638	**3146**
Public Authorities	113,041	102,788	111,241	104,094	114,554	113,860	143,090	122,346	114,240	111,106	101,279	102,051	1,353,690	
Street Railway	78	58	90	33	64	49	61	63	69	69	72	81	787	Load Factor[1]
Street Lighting	5,958	5,773	5,777	5,582	5,650	5,524	5,571	5,417	5,584	5,915	5,683	5,985	68,419	62.14%
Total Non-Residential	**719,944**	**652,352**	**712,813**	**649,971**	**710,706**	**748,351**	**883,701**	**777,060**	**748,305**	**735,138**	**675,211**	**641,941**	**8,655,493**	
Total Retail	**1,348,931**	**1,133,835**	**1,147,443**	**984,853**	**1,076,075**	**1,194,523**	**1,454,456**	**1,370,683**	**1,049,250**	**1,042,565**	**1,070,516**	**1,136,200**	**14,009,330**	

2011 Weather Normalized Retail Sales

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	
Residential Non-Heating	331,580	271,788	252,598	238,405	208,642	324,720	290,344	441,405	211,254	205,773	272,590	310,217	3,359,316	
Residential Heating	265,531	223,239	189,671	130,286	100,125	103,038	120,522	106,551	91,030	109,390	173,308	239,357	1,852,048	
Total Residential	**597,111**	**495,027**	**442,269**	**368,691**	**308,767**	**427,758**	**410,866**	**547,956**	**302,284**	**315,163**	**445,898**	**549,574**	**5,211,364**	**WN Peak[2]**
														MW
Commercial	308,106	285,646	289,592	263,869	288,549	326,185	353,863	346,299	319,240	294,204	276,059	300,383	3,651,995	July
Industrial	281,405	261,150	307,024	276,393	296,195	299,049	346,201	292,962	319,441	325,811	293,661	243,346	3,542,638	WN
Public Authorities	109,706	103,216	111,241	104,094	114,178	113,477	139,686	121,372	115,059	111,338	101,279	102,546	1,347,192	**2717**
Street Railway	78	58	90	33	64	49	61	63	69	69	72	81	787	
Street Lighting	5,958	5,773	5,777	5,582	5,650	5,524	5,571	5,417	5,584	5,915	5,683	5,985	68,419	
Total Non-Residential	**705,253**	**655,843**	**713,724**	**649,971**	**704,636**	**744,284**	**845,382**	**766,113**	**759,393**	**737,337**	**676,754**	**652,341**	**8,611,031**	
Total WN Retail Sales	**1,302,364**	**1,150,870**	**1,155,993**	**1,018,662**	**1,013,403**	**1,172,042**	**1,256,248**	**1,314,069**	**1,061,677**	**1,052,500**	**1,122,652**	**1,201,915**	**13,822,395**	

All sales in MWh

[1]Peak Load Factor is calculated by dividing peak month sales by the number of hours in the month then dividing the result by the peak demand [peak month sales/hours in month)/peak demand]

[2]Weather normalized peak is calculated by applying the peak load factor to the normalized peak month sales [(peak month sales/hours in month)/peak month load factor]

THE DAYTON POWER & LIGHT COMPANY
2012 Benchmark Report
Weather Normalization Factors

Year	Actual Calendar Retail Sales[1]	Weather Normalized Retail Sales[2]	Energy Weather Normalization Factor[3]
	(a)	(b)	(c)
2009	13,536,426	13,788,098	1.01859
2010	14,277,071	13,805,937	0.96700
2011	14,009,330	13,822,395	0.98666

	Actual System Peak Demands[1]	Weather Normalized Peak Demands[2]	Demand Weather Normalization Factor[3]
2009	2,912	2,840	0.97527
2010	2,956	2,708	0.91610
2011	3,146	2,717	0.86364

[1] Workpaper E1-E3.

[2] Weather normalization sales and peaks are based on normal heating and cooling degree day adjustments (Workpaper E1-E3).

[3] Weather normalization factor (c)= (b)/(a).

EXHIBIT 1

2012 Evaluation, Measurement, and Verification Report

May 15, 2013

Dayton Power and Light
1900 Dryden Rd,
Dayton, OH 45439

The Cadmus Group, Inc.
An Employee-Owned Company • www.cadmusgroup.com

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Executive Summary

In 2008, Dayton Power and Light (DP&L) filed a seven-year Energy Efficiency and Demand Response Plan for residential and business programs, in response to Senate Bill 221 (S.B. 221). S.B. 221 called for a 2.3% cumulative reduction in total electricity sales, and a 3.25% reduction in peak demand in 2012, with requirements for continued energy savings, extending through 2025. Additionally, DP&L's portfolio of energy-efficiency programs had to operate cost-effectively.

In 2009, DP&L hired Cadmus to perform impact and process evaluations for all its programs; this is Cadmus' fourth annual evaluation report.

The impact evaluation sought to achieve the following objectives:

- Determine program and portfolio cost-effectiveness;
- Assess the appropriateness of the program's gross *ex ante* claimed savings; and
- Verify measure installations and calculate adjusted gross saving estimates.

For the past two years, Cadmus has conducted telephone surveys with program participants to assess measure verification, satisfaction, how they first learned about the program, and other key process metrics. We found very similar results from year to year and programs have not been significantly changed in 2012. We therefore limited our process evaluation to a few programs (Low-Income, Appliance Recycling, and the BE E^3 Smart).

Table 1 provides DP&L's saving goals by program, both as claimed and as evaluated. DP&L exceeded its 2012 kWh and kW goals. DP&L's adoption of Cadmus' preliminary evaluation findings resulted in similar *ex ante* and *ex post* (adjusted gross) measure-level savings. For instance, Cadmus conducted its impact evaluation for the Be E^3 Smart program in December 2012, allowing DP&L to incorporate these findings into its reporting. In many instances, this resulted in measure-level realization rates close to 100%.

Three of the seven programs achieved their filed 2012 kWh energy-savings and kW demand reduction goals (the exceptions being: residential Appliance Recycling, residential Low-Income, residential HVAC Diagnostic & Tune-Up and nonresidential Custom Rebate). These programs realized less-than-expected energy savings due to lower-than-anticipated participation rates, per-unit realized energy savings or a combination of the two.

Table 1, below, provides a summary of program goals and *ex ante* claimed, verified gross, and adjusted gross savings. The sources of these savings estimates are provided below.

Table 1. Overall Evaluation Results

Program	Program Goals*		*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings	
	kWh	kW	kWh	kW	kWh	kW	kWh	kW
Residential								
Lighting	28,602,790	2,434	80,676,682	9,650	80,865,678	9,672	80,442,456	8,508
Appliance Recycling	3,965,361	620	2,212,725	354	2,212,725	354	2,132,918	338
Low-Income	1,705,147	129	900,475	155	852,303	104	982,318	122
HVAC Rebate	1,690,920	1,510	7,034,692	2,211	7,034,692	2,211	6,605,094	1,972
HVAC Tune-Up	2,983,368	2,650	1,095,080	188	1,096,662	188	983,335	156
Be E3 Smart**	N/A	N/A	4,544,834	323	4,386,130	316	4,527,447	312
Nonresidential								
Prescriptive	32,868,215	8,902	71,553,838	13,731	70,748,539	14,076	67,301,629	14,620
Custom	14,843,797	2,766	12,992,791	2,328	12,426,519	1,948	12,289,185	1,847
Total	**86,659,598**	**19,011**	**181,011,117**	**28,939**	**179,623,248**	**28,869**	**175,264,383**	**27,875**

* DP&L filed values.

** There are no goals filed with the Public Utilities Commission of Ohio (PUCO) for the Be E3 Smart Program.

The overall portfolio was found cost-effective, with a total resource cost (TRC) benefit/cost ratio of approximately 1.54. Few individual residential programs fell short of the 1.0 TRC benefit/cost ratio. Nonresidential programs were cost-effective.

A main reason for conducting an evaluation is to provide program planners with the data necessary to successfully design or plan for future programs. Evaluations tend to either show that a program is working as intended or needs course corrections to achieve a desired outcome. Over the past four years, DP&L has conducted evaluations for all their programs and has consistently used Cadmus evaluated saving estimates in their program planning and reports. This indicates DP&L's desire to optimize the use of evaluation as a course correction mechanism.

General findings from the 2012 evaluation include:

- Similar to 2011 evaluation findings, 2012 programs exhibited high realization rates, with some nearing 100%.
- For most programs, participation levels continue to increase or remain about the same from previous years. While DP&L plans to discontinue the residential HVAC Diagnostic & Tune-Up program in 2013, it's noteworthy that the program made significant strides in participation uptake from 358 HVAC units receiving a tune-up in 2011 to more than 5,000 in 2012. However, due to the program consistently missing expected uptake and evaluated energy-savings and demand reductions, DP&L plans to ramp down and discontinue the residential HVAC Diagnostic & Tune-Up program, directing funds to other, cost-effective programs.
- DP&L improved data tracking for three key programs: residential Low-Income, School Education, and nonresidential Prescriptive. All three programs have moved to tracking data via an online database. Cadmus reviewed the Low-Income database and Energy Education (Be E^3 Smart). Few

areas for improvement were identified in the Low-Income program data tracking which were discussed with DP&L and other stakeholders.

- Participants across all programs surveyed show high levels of satisfaction for most delivery elements, i.e., rebate amount, energy savings, incented equipment, and overall program experience. Comparing these results with similar evaluations across the country, DP&L customers generally rank their experience higher or in line with benchmarked averages.

Introduction and Study Purpose

For the impact evaluations, Cadmus assessed and documented program savings. For the process evaluations, we sought to document satisfaction and feedback from the perspectives of program and implementation staff, and of participant and market actors. Table 2 provides general researchable questions and supporting activities.

Table 2. Overall Researchable Questions and Supporting Activities

Researchable Question	Activity Used to Address Question
What changes to design and delivery would improve program performance?	• Program and implementation staff interviews • Participant surveys • Program database review
What gross energy savings and demand reductions do the programs experience?	• Program database review • Data verification • Engineering analysis • Customer billing analysis
How satisfied are customer and market actors with the program?	• Customer and market actor surveys
Are the programs cost-effective? Is the portfolio cost-effective?	• Cost-effectiveness tests

Overall Evaluation Methodology

Though verification and evaluation activities varied uniquely for each program, the primary evaluation activities included the following:

- Using engineering calculations to verify program *ex ante* claimed savings, and to determine verified and adjusted program gross kilowatt hour (kWh) and kilowatt (kW) reductions.
- Performing site visits to verify measure installation. For the residential Be E3 Smart and Low-Income programs, verification was conducted via telephone survey.
- Developing statistical regression models to determine adjusted gross program savings with customer billing data.
- Conducting a detailed review of project documentation, calculations, audit reports, and assumptions.
- Conducting telephone surveys with participants, seeking to evaluate program processes.
- Benchmarking important metrics from each program evaluation against recent comparable programs to provide additional context when interpreting the results.

The energy saving and demand reduction tables in this report present the following:

1. ***Ex Ante* Claimed Savings:** These are savings based on *ex ante* participation and calculation assumptions. DP&L used multiple sources to determine claimed savings—primarily: the draft State of Ohio Energy Efficiency Technical Reference Manual (TRM), filed August 6, 2010, under Case No. 09-0512-GE-UNC (draft Ohio TRM); and results from previous Cadmus evaluation work.

Therefore, *ex ante* savings and adjusted gross savings may prove similar when DP&L applies preliminary evaluation results. Table 3 summarizes sources used to calculate *ex ante* savings.

Table 3. *Ex Ante* Claimed Savings: Summary of Sources

Program	*Ex Ante* Savings Source
Lighting	Draft Ohio TRM CFL calculation
Appliance Recycling	Cadmus regression analysis
Low-Income	Draft Ohio TRM and Cadmus preliminary measure calculations
HVAC Rebate	Cadmus billing analysis, draft Ohio TRM saving calculations, and secondary sources
HVAC Tune-Up	Draft Ohio TRM Tune-Up calculations
Be E3 Smart	Draft Ohio TRM, and preliminary results from Cadmus regarding installation rates
Prescriptive	Draft Ohio TRM where applicable, and Cadmus deemed saving estimates provided in 2010 and 2011
Custom	Custom calculations and data from DP&L hired third-party consultants

2. **Verified Gross Savings:** These savings are based on *ex ante* savings values, with adjustments to *ex ante* participation, based on phone or on-site verification, or database review.
3. **Adjusted Gross Savings:** These savings result from adjustments to *ex ante* participation, based on phone or on-site verification, and adjustments to UES, based on engineering reviews of savings, statistical models, or other approaches.[1]

Each program-specific section below provides a detailed explanation of adjustments made to calculate verified and adjusted gross savings.

Threats to Validity

- The following list provides known threats to this evaluation's validity, possible bias sources, and the method we used to address these issues: For the residential Appliance Recycling program , Cadmus assessed sources of uncertainty and bias resulting from differences in the implementer's assessment of appliance characteristics, specifically the age and usage of units. Implementer staff may have been trained differently regarding ways to recognize qualifying units (e.g., age, working conditions), all of which would be uploaded into the tracking database. This potentially could have biased DP&L's tracking database.
- To address telephone survey nonresponse bias, Cadmus utilized survey best practices, including: calling at different times of day; calling on weekends; and scheduling call-backs.
- When using regression models Cadmus made every attempt to guard against errors associated with omitted variables, improper functional forms, and inclusion of erroneous data.

[1] In several cases using draft Ohio TRM calculations or assumptions, Cadmus incorporated feedback from the *Joint Objections and Comments to the August 6, 2010 Draft Technical Resource Manual from Ohio Edison Company, The Cleveland Electric Illuminating Company, The Toledo Edison Company, Columbus Southern Power Company, Ohio Power Company, Duke Energy Ohio, Inc., The Dayton Power And Light Company and Industrial Energy Users-Ohio*, filed November 3, 2010, in PUCO Case No. 09-512-GE-UNC (draft Ohio TRM Joint Objections and Comments). The text notes areas where this proves appropriate.

Telephone Survey Best Practices and Reporting

Telephone surveys informed the impact and process evaluations of the residential Appliance Recycling, residential Low-Income, and residential Energy Education programs. For general population surveys (e.g., participant customers), special care addressed potential issues in the following areas:

- Sample selection (which customers to include in the survey sample frames).
- Response (whether, as a group, customers answering the survey proved representative of the sample frame).
- Data analysis and reporting (whether analysis was conducted that considered sample selection and limitations of survey data collection).

We conducted all surveys using RDD Field Services (RDD),[2] a survey research and telephone data collection provider. The program-specific sections report survey disposition rates, calculated for general population surveys. Survey disposition calculations adhered to American Association for Public Opinion Research (AAPOR) minimum definitions.[3]

Response, cooperation, refusal, and contact rate calculations used the following equations:

$$RR1 = \frac{I}{(I+P) + (R+NC+O) + (UH+UO)}$$

$$COOP1 = \frac{I}{(I+P) + R+O}$$

$$REF1 = \frac{R}{(I+P) + (R+NC+ +O) + (UH+UO)}$$

$$CON1 = \frac{(I+P)+R+O}{(I+P)+R+O+NC+(UH+UO)}$$

Where:

I	= Complete interview
P	= Partial interview
R	= Refusal and break-off

[2] See: http://www.rdd.info/

[3] See: http://www.aapor.org/AM/Template.cfm?Section=Standard_Definitions2&Template=/CM/ContentDisplay.cfm&ontentID=3156

NC = Noncontact

O = Other

UH = Unknown if household occupied

UO = Unknown other

Appendix H: Distribution of General Population Telephone Survey Call Results summarizes the final disposition results for each general population survey effort.

Overall Study Scope

Program Descriptions

In 2012, DP&L offered six residential and two commercial and industrial programs (mercantile customer participation and associated savings were not evaluated, except for cost-effectiveness). Table 4 provides reported participation by program.

Table 4. Claimed Program Participants

Program	Reported Quantity	Unit Type
Lighting[*]	1,675,469	CFLs sold
Appliance Recycling	2,071	Recycled appliances
Low-Income	526	Homes
HVAC Rebate	4,887	Equipment rebated
HVAC Tune-Up	5,135	Equipment tuned-up
Be E^3 Smart	9,226	Student kits distributed
Prescriptive	1,268	Projects
Custom	86	Projects

[*]Quantity reflects 95% of the bulbs sold in the residential Lighting program (1,763,652) to account for the 5% installed in commercial applications. These 5% are shifted to the nonresidential Prescriptive Rebate program. Additional detail is provided in the residential Lighting section below.

Detailed program overviews can be found in Sections 3, 4, and 5 of DP&L's Annual Report.

Types of Evaluation Activities Conducted for Each Program

Since 2009, Cadmus has continuously evaluated the following programs:

- Residential Lighting;
- Residential Appliance Recycling;
- Residential Heating and Cooling Rebate;
- Nonresidential Prescriptive Rebate; and
- Nonresidential Custom Rebate.

And, since 2010, the following programs:

- Residential Low-Income; and
- Residential Energy Education (Be E^3 Smart) program.

For the current evaluation, Cadmus performed an impact evaluation and cost-effectiveness assessment for all programs, and full (including participant customer surveys) or limited (program staff interviews and/or database review only) process evaluations for several programs. Table 5 summarizes evaluation activities.

Table 5. Summary of Process Evaluation Activities by Program

Program	Impact Evaluation	Process Evaluation Activities		
		Full	Limited	None
Residential				
Lighting	√			√
Appliance Recycling	√	√		
Low-Income	√	√		
HVAC Rebate	√			√
HVAC Tune-Up	√			√
Be E3 Smart	√	√		
Nonresidential				
Prescriptive	√		√	
Custom	√		√	

In 2012, Cadmus suspended process evaluation activities for the residential Lighting and Heating and Cooling Discount Rebate programs as evaluations for the previous three years identified very consistent findings, and no significant program changes occurred for either program between 2011 and 2012. Due to consistently lower-than-expected program uptake and evaluated energy-savings and demand reductions, DP&L plans to ramp down and discontinue the residential HVAC Diagnostic & Tune-Up program in 2013, directing funds to other, cost-effective programs. Therefore, findings from a process evaluation would provide little perceived benefit.

Residential Lighting Program

Evaluation Overview

Cadmus' evaluation of the 2012 residential Lighting program followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 6 identifies key researchable evaluation questions.

Table 6. Key Researchable Questions

Researchable Question	Activity Used to Address Question
What are the gross savings?	• Review of secondary sources and draft Ohio TRM.
Is this program cost-effective?	• Cost-effectiveness analysis.

Detailed Evaluation Findings

The following key findings relate to the impact evaluation. Cadmus conducted process evaluations for program years 2010 and 2011, and therefore did not conduct one for this program year.

- The program achieved 80,442,456 kwh in energy savings and 8,508 kW in demand reduction. Compared against claimed *ex ante* savings, the program produced realization rates of: 99.7% for energy savings; and 88.2% for demand savings. The difference between *ex ante* claimed and verified gross savings resulted from a minor database input error. The difference between verified gross and adjusted gross demand reflected an update to several inputs as specified in the draft Ohio TRM Joint Objections and Comments document. These findings also show that the lighting program energy and demand goals for 2012 were exceeded by 281% and 350% respectively.

Table 7. Residential Lighting Program Claimed and Achieved Energy Savings

Measure	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	kWh	kW	kWh	kW	kWh	kW	Precision*
CFL	80,676,682	9,650	80,865,678	9,672	80,442,456	8,508	±6.1%

*Precision at 90% confidence.

- Cadmus analyzed yearly CFL bulb sales for DP&L's residential lighting program starting from program year inception, and found, given the size of electric territory and the maturity of the program, DP&L sells significantly more bulbs per customer than similar programs in other utilities (3.5 versus an average of 1.4 for other programs per year). Assuming even distribution across all customers, every DP&L household has purchased approximately 15 CFLs over the past four years.

  Their success of promoting more bulbs per customer than other utilities we reviewed may be in part due to two things: promoting larger CFL quantity packs and higher incentives for those larger packs. While other utilities drop the incentive level for the larger packages of bulbs, DP&L maintains similar discounts across all sizes of bulb packages.

The last on-site verification study that addressed energy efficient lighting saturation and penetration levels was in 2010. This work found DP&L CFL saturation levels to be 15%, which was on the lower end of other utilities but within the range of utilities just starting to implement residential lighting programs. Multiple years have passed and DP&L's success with promoting CFLs may warrant another round of on-site visits to gauge current efficient lighting saturation and CFL storage rates.

- Primary and secondary data show approximately 40% of DP&L participating retailers still carried 100W incandescent bulbs as late as the end of the first quarter of 2013 (based on data collected by Cadmus, program implementer (Ecova), and secondary literature). This indicates customers continued to have the 100W incandescent as a bulb choice throughout 2012. Based on these data, Cadmus kept the baseline of 100W incandescents for equivilant lumen rated CFLs. Cadmus is continuing to monitor the incandescent inventory in Ohio and other states for 100W and now 75W incandescents, which were impacted by the Energy Independence and Security Act of 2007 (EISA 2007) in 2013. It would seem plausible that the 100W incandescent inventory will be sufficiently depleted in 2013 and would indicate the need to lower the delta watt mulitiplier to the suggested draft Ohio TRM of 2.06 for 21+ watt CFLs.
- Primary data collected in 2011 by Cadmus in DP&L's territory found that approximately 5% of CFLs purchased from retailers were installed in commercial applications. Therefore, 5% of the residential lighting program sales were shifted to the nonresidential Prescriptive program.

Impact Evaluation Methodology and Findings

Cadmus used the approaches detailed below and the following algorithms to evaluate the 2012 residential Lighting program:

$$\Delta kWh = \frac{W_{CFL} * \Delta WM}{1{,}000} * ISR * HOU * 365 * WHF_e$$

$$\Delta kW = \frac{W_{CFL} * \Delta WM}{1{,}000} * ISR * WHF_d * \mathrm{CF}$$

Where:

W_{CFL}	= CFL wattage [W]
ΔWM	= Delta Watts Multiplier
ISR	= In Service Rate
HOU	= Hours of Use [hours/day]
WHF_e	= Waste Heat Factor for Energy
WHFd	= Waste Heat Factor for Demand
CF	=Summer Peak Coincidence Factor

Table 8 shows the values used to calculate energy and demand savings, as explained in detail below.

Table 8. 2012 Lighting Evaluation Inputs

Savings Algorithm Input	Residential Lighting	
	Draft Ohio TRM	Draft Ohio TRM Comments and Objections Document
HOU	2.85	-
WHF_e	1.07	-
WHF_d	1.21	1.07
ISR*	0.86	-
ΔWM	3.25	-
ΔWM (21W+)	2.06	-
CF	0.11	0.16

*Residential ISR used to calculate commercial savings.

Installation Rate

Site visits conducted for the 2010 program evaluation identified a 76% installation rate. The draft Ohio TRM recommends a 77% annual installation rate (86% after accounting for bulbs moving from storage into sockets). In the 2011 end-use customer phone survey, customers reported a 68.3% installation rate. No statistical difference could be detected between the 2010 site visit-derived value and the 2011 survey-based values. Cadmus also conducted a literature review regarding other utility installation rates (Table 9).

Table 9. CFL Installation Rate Literature Review Findings

Source	Data Collection Method	Reported Year	ISR	Notes
West Coast utility	Self-reporting: CFL user survey	2010	0.67	Cumulative 3 years (2006–2008)
Western utility	Self-reporting: 254 lighting surveys	2011	0.67	Does not include bulbs in storage
West Coast utility	Self-reporting: CFL user survey	2010	0.67	Cumulative 3 years (2006–2008)
Midwest utility	Self-reporting: 301 customer surveys	2012	0.68	N/A
Northwest utility	Self-reporting: 252 in-territory lighting surveys	2012	0.69	Does not include bulbs in storage
West Coast utilities	Self-reporting: CFL user survey	2010	0.71	Cumulative 3 years (2006–2008)
West Coast utility	Self-reporting: 251 in-territory lighting surveys	2012	0.71	Does not include bulbs in storage
Mid-Atlantic utilities	Primary: site visits	2011	0.81	N/A
Western utility	Primary: site visits	2009	0.82	Does not include bulbs in storage
Pennsylvania TRM	Nexus Market Research, "Impact Evaluation of the Massachusetts, Rhode Island and Vermont 2003 Residential Lighting Programs", Final Report, October 1, 2004, (Table 4-7)	2011	0.84	Accounts for bulbs leaving storage within 1 year

Source	Data Collection Method	Reported Year	ISR	Notes
Ohio	Draft Ohio TRM recommended calculation	2010	0.77 adjusted upward to 0.86 to address storage factor	Adjustment for bulbs leaving storage
Mid-Atlantic TRM	EmPOWER Maryland DRAFT 2010 Interim Evaluation Report	2011	0.88	Accounts for bulbs leaving storage

As seen in Table 9, the draft Ohio TRM installation rate of 86% is one of the higher installation rates we found in our literature review. However, it is in line with other technical reference manuals that take into account bulbs moving from storage to sockets, as well as those installed in that program year. This “storage” factor is the percent of incented bulbs initially put into storage that are ultimately installed and drives up installation rates. Other evaluations with lower installation rates did not account for this storage factor.

Hours of Use

In 2012, HOU was estimated using a statistical model using a light logger pooled data set from various states (Maryland, Missouri, Maine and Michigan) as well as from logger data from the DP&L 2009 evaluation. HOU were modeled as a function of room type, existing CFL saturations, and the presence of children in a home. That model produced an estimate of 2.26 hours per day. In 2011, we used the same model containing fewer pooled meters to estimate 2.39 hours.

Cadmus also conducted a literature review of other utility evaluated HOU (Table 10).

Table 10. Hours of Use Literature Review Findings

Source	Data Collection Method	Reported Year	HOU
West coast utilities	Primary: metering of 1,200 homes	2010	1.8
Midwest utility	Primary: metering of 51 homes	2012	1.97
Northeast utility	Primary: metering of 41 homes	2012	1.99
Western utility	Secondary research: meter data collected in 4 states	2012	2.48
Midwest utility	Primary: metering of 101 homes	2012	2.6
New England utilities	Primary: metering of 157 homes	2009	2.8
Ohio	Draft Ohio TRM recommended calculation	2010	2.85
Ameren Missouri	Primary: metering of 44 homes	2011	2.91
Mid-Atlantic utilities	Primary: metering of 59 homes	2011	2.98
Mid-Atlantic utilities	Primary: metering of 131 homes	2012	3.15

This literature review shows the draft Ohio TRM HOU estimate is on the higher end, but within the bounds of other meter studies. The current draft Ohio TRM estimate is based on metering of one utility in Ohio conducted in 2010.

As Ohio CFL saturation levels increase in the state due to the success of utility programs, CFL HOU estimates may need to be revisited. The preferred approach for revising Ohio TRM HOU is through a state-wide study, perhaps coordinated by the public utilities commission at the state level. This is likely to provide highest levels of precision and confidence through utilization of larger sample sizes than any one utility could (or should) afford.

Delta Watt Multiplier

Cadmus used the 3.25 delta watt multiplier value, as stipulated in the draft Ohio TRM, to calculate savings after reviewing various technical reference manuals, and our own calculations, as shown in Table 11. Cadmus calculated a delta watt multiplier based on DP&L tracking data from 2012. Our analysis assumes a replacement bulb would have the equivalent lumens as a baseline incandescent.[4] This analysis resulted in a delta watt value of 3.40. Based on all of these sources, we found the value given by the draft Ohio TRM reasonable.

Table 11. CFL Delta Wattage Multiplier Source Comparison

Savings Algorithm Input	NY TRM 2010	Regional Technical Forum 2011	Mid-Atlantic TRM 2012	CT TRM 2011	Draft Ohio TRM 2010	Cadmus Review (2012 Data)
Delta Watts Multiplier	2.53	2.60	2.95	3.00	3.25	3.40

The EISA 2007 law tightens efficiency standards for light bulbs starting January 1, 2012—effectively banning the manufacture of 100W incandescent bulbs. Cadmus analyzed data provided by ECOVA that tracked 100W incandescent bulb inventories in stores within DP&L's territory. The data found 100W incandescent bulbs widely available throughout 2012. Similar results to the ECOVA study were found in 2013 by phone surveys done in Indiana and in DP&L's territory. All the study results are summarized in Table 12. The 2013 findings suggest that 100W bulbs were available even into 2013; more than 12 months after the ban on their manufacture was implemented.

Table 12. Percent of Stores Selling 100W Incandescent Bulbs

Survey (Territory)	2012, Q2	2012, Q3	2012, Q4	2013, Q1	Notes
ECOVA (DP&L)	100%	100%	40%	-	N = 5 stores, inventories performed each quarter
TecMarket (Indiana)	-	-	-	45%	N = 101 stores, survey implemented January 2012
Cadmus (DP&L)	-	-	-	43%	N = 53 stores, survey implemented March 2012, covers stores that sold 94% of bulbs in DP&L's territory

4 The Uniform Method Project stipulates this method.

Waste Heat Factor for Demand

The draft Ohio TRM provides a value of 1.21 for waste heat factor for demand. For the 2011 evaluation, in response to comments provided in the draft Ohio TRM Joint Objections and Comments document following the 2010 evaluation, Cadmus performed a high-level review of waste heat factors for demand from other, comparable TRMs. While we did not perform primary data collection or analysis, we found the comments in the draft Ohio TRM Joint Objections and Comments document reasonable and more appropriate for the 2011 evaluation. This conclusion also applies to the 2012 evaluation, and serves as a factor driving the difference between *ex ante* gross kW claimed savings and the adjusted gross kW savings, as presented in Table 7. In addition to updating the waste heat factors to reflect the TRM comments, we adjusted both the energy and demand waste heat factors to account for bulbs purchased through the program and installed outside. Since these bulbs do not interact with the homes' heating and cooling systems, they have a waste heat factor of 1.0. Through our light metering work performed for the 2009 evaluation, we determined that 8% of bulbs are installed outside. A revised waste heat factor of 1.06 was calculated by weighting 1.0 by 8% and 1.07 by 92%. A review of the calculation that produced the waste heat factor value of 1.07 showed that it did not consider bulbs installed outside.

Coincidence Factor

The draft Ohio TRM uses a coincidence factor of 0.11, and the draft Ohio TRM Joint Objections and Comments document suggests a coincidence factor of 0.16. Cadmus performed a high-level review of coincidence factors from other comparable TRMs. The value of 0.11 falls in line with other TRM values. Given these comparisons we found it reasonable to keep the value of 0.11.

Savings Shift to Nonresidential Lighting Program

In the 2011 evaluation report,[5] Cadmus recommended shifting 11% of bulbs sold from the residential upstream lighting program to the Nonresidential Prescriptive Rebate program. This recommendation was based on the 2011 residential Lighting program participant survey that asked where the program CFLs were installed. For the 2012 evaluation, Cadmus revisited the 2011 survey results and found one survey response to be a significant outlier in the data[6]. Removing this outlier response changed the percentage of bulbs installed in commercial applications from 11% to 5%. The value of 5% is similar to results from other upstream lighting surveys: The EmPOWER 2012 lighting evaluation found a value of 4% and a Midwest utility study found a value of 5%.

The different savings calculation inputs for residential and commercial lighting drove the difference between the residential and commercial energy savings and demand reductions. The delta watt multiplier (ΔWM) decreased from 3.25 to 2.79 and HOU increased from 2.85 to 9.66[7]. The updated inputs resulted in higher per-UES for the commercial share of savings. The commercial per-unit demand

[5] Cofer, Albee, et al. (2012). *2011 Evaluation, Measurement, and Verification Report*

[6] A student t-test determined that the response was a statistical outlier

[7] 2010 Draft OH TRM, ΔWM for commercial lighting systems and HOU for commercial office

reduction estimate also proved higher than the residential reductions, primarily due to the higher coincidence factor.

In future customer surveys, Cadmus will include questions to ascertain more information about bulbs purchased for commercial applications. Specifically, questions should determine the types of commercial buildings in which the bulbs will be installed, the type of space within the commercial building in which the bulbs will be used (e.g., closet, bathroom, desk, hallways, food prep etc.). Understanding precisely where these bulbs have been installed will inform the commercial inputs to be used in the evaluation.

Residential Lighting Bulb Sales

We analyzed DP&L bulb sales over the last four years, and calculated the average number of bulbs sold per customer.[8] Table 13 summarizes this analysis.

Table 13. DP&L Bulb Sales

Year	Residential Lighting Bulb Sales*	Bulbs Per Customer	Accumulated Bulbs Per Customer
2009	1,437,144	3.3	3.3
2010	2,026,574	4.6	7.8
2011	1,751,523	4.0	11.8
2012	1,675,469	3.8	15.6

*Original bulb sale quantities for all years have been reduced 5% to account for bulbs installed in commercial applications

Comparing DP&L's sales to other utilities in Table 14 shows that DP&L consistently sells more bulbs per customer than other upstream lighting programs where we were able to obtain detailed sales data to make the comparison.

[8] Based on 441,880 residential electric customers per US EIA Electric Sales, Revenue, and Average Price data: http://www.eia.gov/electricity/sales_revenue_price/pdf/table6.pdf

Table 14. DP&L Bulb Sales Comparison

Program Sponsor	Program Year	Evaluation Year	Bulbs Per Customer*	Weighted Average Size of Bulb Package Sold**
Western Utility***	PY4	2009	0.9	-
Midwest Utility 1	PY2	2010	1.0	3.3
Midwest Utility 2	PY2	2010	1.5	-
Northwest Utility 1	PY3	2009	1.8	3.2
Northwest Utility 2	PY4	2010	2.1	3.9
Midwest Utility	20+yrs	2012	2.1	-
Northwest Utility 1	PY4	2010	2.4	2.5
Northwest Utility 2	PY3	2009	3.1	5.5
DP&L	PY1	2009	3.3	3.2
Northeast Utility	PY9	2011	3.5	-
DP&L	PY4	2012	3.8	4.4
DP&L	PY3	2011	4.0	3.5
DP&L	PY2	2010	4.6	4.1

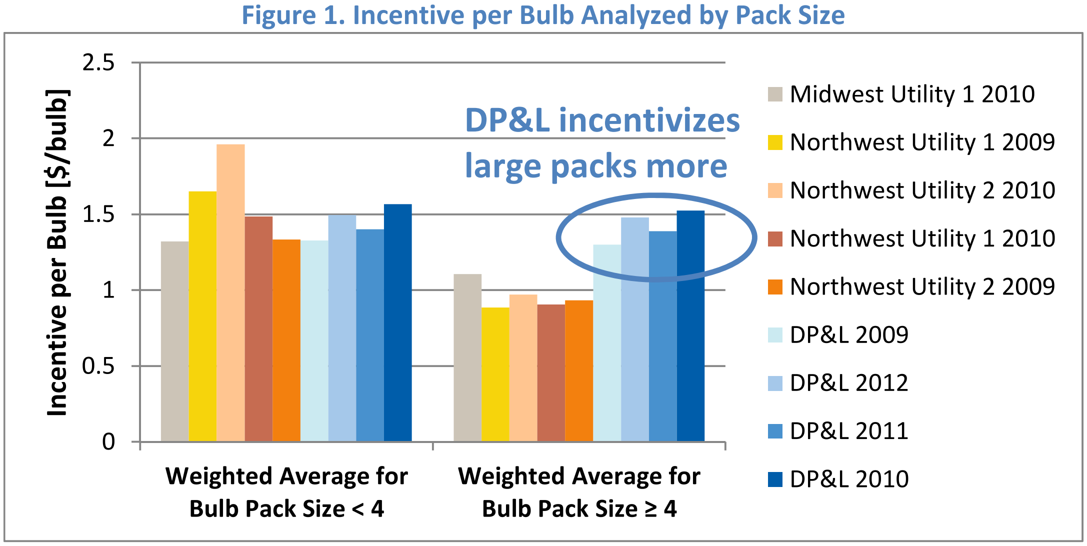
*Number of customers based on US EIA Electric Sales, Revenue and Average Price data: http://www.eia.gov/electricity/sales_revenue_price/pdf/ table6.pdf

**Bulb package data not available for certain utilities

***Bulb count based on program goal

A driver of these higher bulb sales appears to be higher incentives on large quantity packs of bulbs. Figure 1 compares the average incentive per bulb for packages containing fewer than 4 bulbs and packages containing more than or equal to 4 bulbs. While other utilities drop the incentive level for larger quantity packages of bulbs, DP&L maintains similar incentive levels from packages containing one bulb, all the way up to 18 bulb packs.

Figure 1. Incentive per Bulb Analyzed by Pack Size



Since DP&L successfully sells so many bulbs and its upstream lighting program is in its 5th year, we believe it's valuable to understand the impact these sales may have on CFL saturation levels. Table 15 shows a 15% CFL saturation level for DP&L’s territory when the upstream lighting program was in its 2nd year.

Table 15. Comparison of Market Saturation Findings

Source	Data Collection Method	Reported Year	CFLs	LEDs
SRP	NEEP, March 2012	2012	Common: 24% Specialty: 11%	1%
Areas with long-running programs (5+ years)				
West Coast utilities	Primary: site visits	2010	21%	N/A
Midwest state	Primary: site visits	2010	21%	N/A
Northeast state	Primary: site visits	2010	22%	N/A
New England state	Primary: site visits	2010	23%	N/A
Areas with new programs (<1-4 years)				
DP&L*	Primary: site visits	2011	15%	1%
Mid-Atlantic state	Primary: site visits	2010	16%	N/A
Midwest state	Primary: site visits	2011	16%	<1%
Southeast state	Primary: site visits	2010	16%	N/A
Northeast state	Primary: site visits	2010	18%	N/A
Western state	Primary: site visits	2010	19%	N/A
Northeast city	Primary: site visits	2010	22%	N/A
Northeast utility	Primary: site visits	2012	26%	<1%
Areas with no programs at time of data collection (0 years)				
Southwest city	Primary: site visits	2010	12%	N/A
Mid-Atlantic city	Primary: site visits	2010	13%	N/A
Midwest state	Primary: site visits	2010	14%	N/A
Eastern state	Primary: site visits	2010	16%	N/A
Midwest state	Primary: site visits	2010	17%	N/A
Midwest utility	Primary: site visits	2010	19%	N/A
Midwest state	Primary: site visits	2010	21%	N/A

DP&L’s program has matured since this value was calculated so it can be assumed that the CFL saturation level has increased. DP&L’s high bulb sales and maturing program may have several impacts, including lower hours of use and installation rate values. With more CFLs in homes, low use sockets are more likely to be used than high use sockets, which may drive down the CFL hours of use value. Buying high quantities of bulbs may also increase storage rates and drive down installation rates.

Recommendations

Drawn from the preceding findings, Cadmus offers the following recommendations:

- DP&L has helped sell over 15 CFLs to all their customer households over the last four years, and accomplished this in a cost-effective manner. This is certainly a noteworthy accomplishment, and as DP&L continues to promote CFLs, this number will increase. This success should be shifting their residential household composition from 15% of CFL saturation found in the

Cadmus 2010 evaluaton. As energy efficient lighting saturation levels change over time, this may impact other variables such as installation rates and how long CFLs are used. This may also impact the type of efficient lighting DP&L promotes. As the typical A-shaped, medium screw based lamp connected to an on/off switch are converted to CFLs, DP&L may want to look at having a higher emphasis on other specialty lighting. An on-site survey of a representative sample of DP&L's service territory would provide data to help plan for any changes.

Other Ohio utilities have also been successful in promoting CFLs and their residential lighting composition should also be changing. As Ohio utilities enter into their fifth year of promoting energy efficient lighting (some have promoted this longer than five years), it may be worthwhile to conduct a study to better understand the success of these residential lighting programs. The preferred approach would be to conduct a state-wide study initiated and coordinated at the state level. This is likely to provide highest levels of precision and confidence through utilization of larger sample sizes than any one utility could (or should) afford. Findings from this study should be used to update the Ohio TRM in a manner that provides sufficient time for utilities to plan for any significant changes. It should be noted that if the state is not able to conduct a state-wide effort, Cadmus still recommends DP&L perform site visits within their own service territory sometime over the next couple years.

- Through recently conducted phone and in-store surveys, the legacy of general service incandescent lamps remain available despite the phase-in of the EISA of 2007. The availability of general service incandescent lamps should be monitored to understand product availability and when the gross savings energy calculation baseline should shift to reflect available wattage. Due to the nature of needing to collect this information in real-time, Cadmus recommended (and DP&L agreed to) making quarterly secret shopper phone surveys at participating lighting retailers to identify 100W and 75W incandescent availability.

Residential Appliance Recycling Program

Evaluation Overview

Cadmus' evaluation of the 2012 residential Appliance Recycling program (ARP) followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 16 identifies key researchable evaluation questions.

Table 16. Key Researchable Questions

Researchable Question	Activity Used to Address Question
What are average energy savings associated with participating refrigerators and freezers?	• Regression model. • Review of program database. • Participant survey.
How accurately and consistently are relevant appliance unit data being collected?	• Review of program database.
How satisfied are customers with the program and DP&L overall? How efficient has the program process been?	• Participant survey.
Is this program cost-effective?	• Cost-effectiveness analysis.

Detailed Evaluation Findings

The following key findings relate to the impact evaluation and process evaluation:

- **Program Savings:** The program achieved 2,132,918 kWh in energy savings and 338 kW in demand reduction. Compared against claimed *ex ante* claimed savings, the program had realization rates of 96% for energy and 95% for demand savings. However, the program only achieved approximately 54% of its energy and demand goals. This may be due to the absence of a special incentive promotion, like what was implemented in 2011. This incentive promotion increased program participation in 2011.

Table 17. Residential ARP Claimed and Achieved Energy Savings

Measure	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	kWh	kW	kWh	kW	kWh	kW	Precision*
Refrigerators	1,801,470	286	1,801,470	286	1,698,311	270	±11.1%
Freezers	411,255	67	411,255	67	434,608	67	±21.4%
Total	**2,212,725**	**354**	**2,212,725**	**354**	**2,132,918**	**338**	**±9.8%**

* Precision at 90% confidence.

- **Part-Use Factor:** The part-use factor (defined as the average portion of the year during which recycled appliances ran), did not change significantly for either refrigerators or freezers, compared to the 2010 program year evaluation findings[9] (the 2011 evaluation did not calculate part-use in the 2011 evaluation as that was calculated the prior year). Refrigerators recycled through the 2012 program operated 86% and freezers operated 85% of the time.
- **Participants most commonly learned of the program first through bill Inserts:** Survey data indicated 42% of participants first learned about the program through bill inserts or some other

[9] Cofer, S, et. al.. (2011). *2010 Evaluation, Measurement, and Verification Report.*

form of direct mail. This is consistent with last time ARP participants were surveyed in 2010, where 38% of participants found out through utility bill inserts.

- **Overall program satisfaction ran very high:** Program participants generally experienced high overall satisfaction rates. Approximately 96% of participants reported being either "very satisfied" or "satisfied" with the program. This finding aligns with satisfaction rates observed in other ARPs and the 2010 DP&L ARP participant survey.

Evaluation Data Collection Methods

Cadmus used the approaches detailed below in evaluating the 2012 program.

Participant Telephone Survey

In January 2013, Cadmus surveyed 2012 residential ARP participants by appliance type, with a goal of 90% confidence within 10% precision for refrigerators, and 90% confidence within 20% precision for freezers (precision is used to account for variance in both survey results and gross savings values). Cadmus surveyed 70 participating households reported to have recycled a refrigerator through the program and 70 participating households reported to have recycled a freezer (as shown in Table 18). The JACO program tracking database[10] indicated refrigerators made up 77% and freezers made up 23% of units recycled.

Table 18. Participant Telephone Survey Sampling Plan

	Quantity
Total Participants	1,953
Eligible Participants in Call List	1,953
Screened out due to change in occupancy or bad phone number	0
Completed Surveys	140
Number of Calls Required to Achieve Sample	834
Response Rate (RR1)	63.3%
Cooperation Rate (COOP1)	88.6%
Refusal Rate (REF1)	5.9%
Contact Rate (CON1)	71.5%
Sample Size Goal	140

Cadmus designed the participant survey utilizing industry best practices for appliance recycling evaluations. The survey included questions addressing the following pertinent issues:

- **Verification of Measure Removed.** This survey section ensured we spoke with the appropriate person. It contained questions related to: participation recall, involvement in the decision process, and the measure removal.
- **Appliance Context and the Decision-Making Processes***.* These questions addressed key aspects of the participants' decision-making process and informed the verification analysis.

[10] This database contained records from January 2012 through December 2012.

- **Program Satisfaction**. These questions collected process-related information regarding participants' satisfaction with the program and reasons for dissatisfaction (if applicable). The questions also addressed whether participants would refer others to the program.
- **Demographics**. This section captured household and respondent characteristics, including: income, age, type, and square footage of home, energy use, and household income.

In Situ Metering Data Set

Cadmus used the same multivariate regression model as the previous year's evaluation to estimate the average Unit Energy Consumption (UEC) of retired refrigerators and freezers. This model relied on an aggregated *in situ* metering dataset,[11] consisting of 560 appliances metered during five California and Michigan evaluations, conducted between May 2009 and April 2012.[12]

The Impact Evaluation Methodology and Findings section below explains in greater detail the refrigerator model specification and the corresponding freezer model specification Cadmus developed and used in the 2012 evaluation.

Impact Evaluation Methodology and Findings

As a preliminary evaluation step, we reviewed JACO's participant database to test the reliability of program data. The database contained 2,071 participant records from January 2012 through December 2012. Some participants recycled more than one appliance through the program.

Table 19 shows the distribution of refrigerators and freezers identified in the JACO database.

Table 19. Program Participation by Measure

Measure	Participation
Recycled Refrigerator	1,590
Recycled Freezer	481
Total	**2,071**

Table 20 shows typical refrigerator and freezer configurations identified in the database.

Table 20. Refrigerator and Freezer Configurations

Measure	Configuration
Refrigerator	Bottom Freezer
	Side-by-Side
	Single Door
	Top Freezer
Freezer	Chest
	Upright

11 *In situ* metering involves metering units in the environment in which they are typically used. This approach contrasts with lab testing, where units are metered under controlled conditions.

12 Southern California Edison, Pacific Gas & Electric, San Diego Gas & Electric, DTE Energy, and Consumers Energy.

Table 21 provides the average age and size of the units identified in the database.

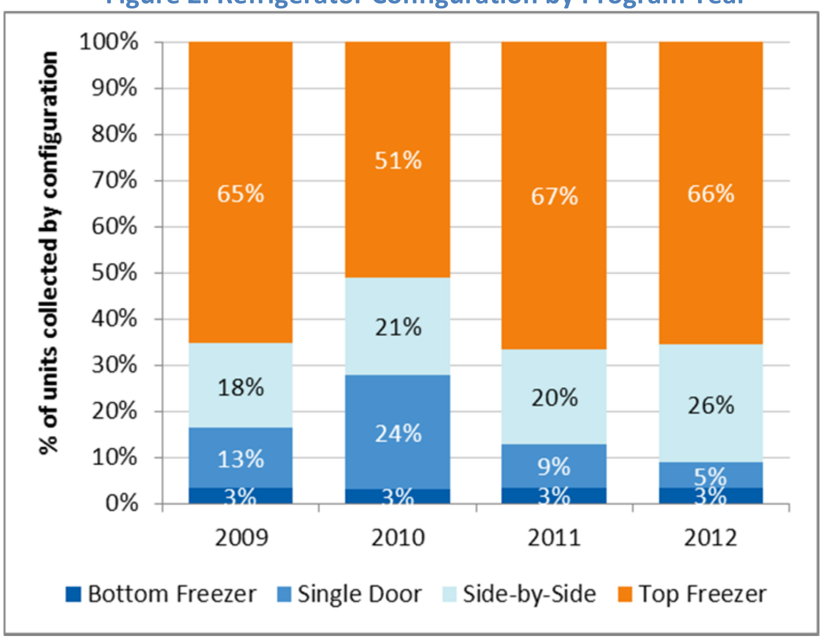
Table 21. Average Unit Age and Unit Size

Appliance	Average Age (Years)	Average Size (ft^3)
Refrigerator	25	18
Freezer	31	16

Summary of Program Participation

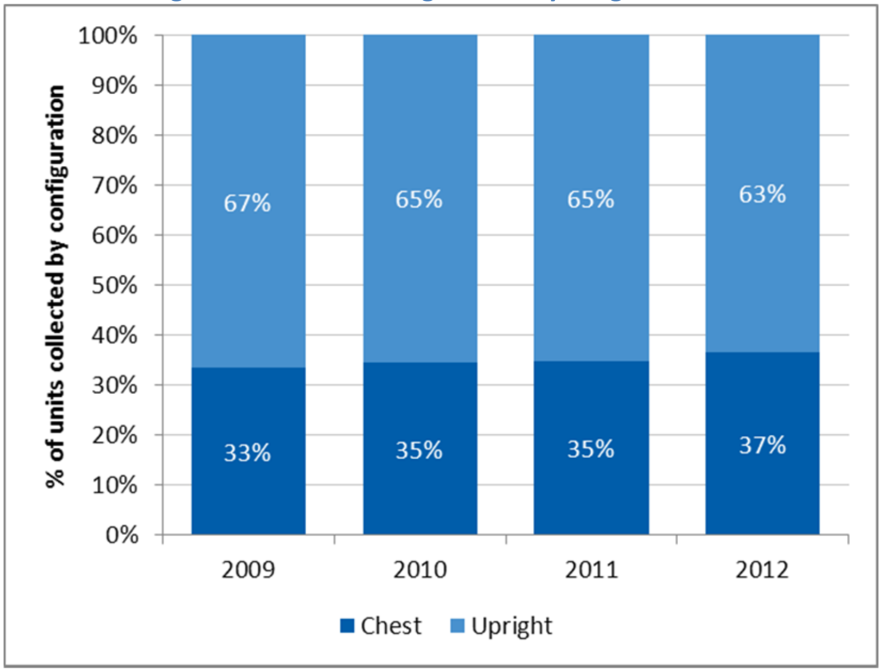
Cadmus compared the 2012 data tracking to results from past years to identify any noticeable trends in unit age, size, and configuration. As shown in Figure 2, the program realized a similar composition of units as those seen at the program's beginning. The 2010 program year appeared to be the outlier, with a much higher concentration of single-door units, and much lower concentrations of top freezer units than those typically seen. The 2012 program, however, appeared to follow the typical trend seen in other evaluations of mature ARPs, with: increases in shares of units with side-by-side configurations; a consistently large share of top freezer units; and only a small share of bottom freezer and single door units.

Figure 2. Refrigerator Configuration by Program Year



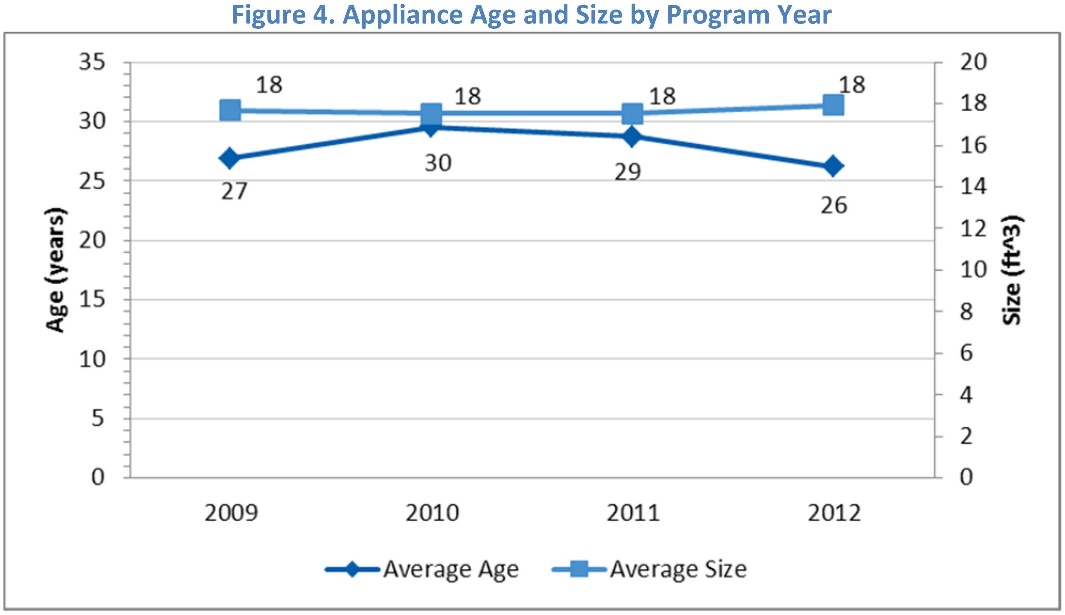
As shown in Figure 3, the distribution of freezer configurations did not substantially change over the program's course.

Figure 3. Freezer Configuration by Program Year



In 2012, recycled appliances averaged 26 years old, with 18 cubic feet of internal capacity. As indicated in Figure 4, the average appliance age and size have not changed considerably since the program's inception.

Figure 4. Appliance Age and Size by Program Year



Determination of Average Annual Gross Energy Consumption

Cadmus developed a multivariate regression model to estimate the UEC for retired refrigerators and freezers, estimating model coefficients using an aggregated *in situ* metering dataset, composed of more than 560 appliances (metered as part of four California and Michigan evaluations, conducted between May 2009 and April 2012).[13] Collectively, these evaluations offered a wide distribution of appliance ages, sizes, configurations, usage scenarios (primary or secondary), and climate conditions. The dataset's diverse nature provided an effective secondary data source for estimating energy savings.

Cadmus prefers using in-home metering data for estimating energy consumption, as opposed to the U.S. Department of Energy's (DOE) testing protocols for two reasons:

1. Metering an appliance in its original location captures impacts of critical external factors on appliance energy use (such as door openings, unit locations, and weather). These factors cannot be accounted for when relying on DOE databases, which contain data on units metered under controlled conditions.
2. Most existing DOE databases estimate energy consumption at the time of appliance manufacture, not at unit retirement.[14] Consequently, evaluations require devising and applying additional assumptions in appliance degradation. In-home metering data reflect observed usage of appliances actually participating in ARPs at the time of retirement, and as used in the homes from which they have been removed.

Each observation in the aggregated dataset represented an appliance metered for a minimum of 10 days, in a manner consistent with its pre-program use (e.g., in the same location, cooling food, used by the home's occupants). Cadmus mapped weather data to participating homes' ZIP code-specific National Oceanic and Atmospheric Administration (NOAA) weather stations, and collected additional on-site data on relevant appliance characteristics to ensure data consistency with administrator tracking databases.

Cadmus' approach to model specification weighed the impacts of including alternative independent variables, using a variety of criteria. The model specification process sought to include variables that adequately reflected program design, while maintaining model simplicity. For each set of estimated parameters, the analysis assessed variance inflation factors (VIFs), adjusted R^2s, and measures of statistical significance.[15]

Cadmus incorporated the following modeling considerations into the specification process:

- **Considering all relevant appliance characteristics for inclusion in the model.** These included: configuration, defrost type, age, size, and (in the case of refrigerators) primary or secondary designations. Age was considered as: a continuous variable (capturing degradation); dummy variables for decades of manufacture (to approximate vintages); and a dummy variable for units

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[13] Southern California Edison, Pacific Gas & Electric, San Diego Gas & Electric, DTE Energy, and Consumers Energy.

[14] The California Energy Commission maintains one such database, which can be accessed at: http://www.energy.ca.gov/appliances/database/historical_excel_files/Refrigeration/

[15] VIFs, R^2s, and statistical significance are tests of the validity of a regression model.

manufactured before enactment of 1990's National Appliance Energy Conservation Act, which required new refrigerators and freezers to be more energy efficient.

- **Considering two environmental factors in the *in situ* model.** In addition to terms pertaining to appliance characteristics, the analysis considered two environmental factors in the *in situ* model: cooling/heating degree-days (CDD/HDD); and an identification of primary or secondary appliances. Appliances in warmer climate zones were assumed to consume greater energy—as were primary appliances—due to more frequent door openings.
- **Including interaction terms only due to theoretical importance to the model.** The model only included one interaction term, between units located in garages and CDDs, to account for additional impacts of warmer temperatures on refrigerators in unconditioned spaces.
- **Considering transformations of explanatory variables**. These included logged and squared values, based on theoretical and empirical grounds.

Cadmus used regression models to estimate consumption for refrigerators and freezers (as shown in Table 22 and Table 23). Each independent variable's coefficient indicated the influence of that variable on daily consumption, holding all other variables constant. A positive coefficient indicated an upward influence on consumption; a negative coefficient indicated a downward effect.

The coefficient's value indicated the marginal impact of a one-point increase in the independent variable on the UEC. For instance, a 1 cubic foot increase in refrigerator size resulted in a 0.067 kWh per day increase in daily consumption. In the case of dummy variables, the value of the coefficient represented the difference in consumption, if the given condition was true. For example, in the refrigerator model, the coefficient for the variable indicating a refrigerator as a primary unit was 0.605, indicating, all else being equal, a primary refrigerator consumed 0.605 kWh per day more than a secondary unit.

Table 22 details the final model specification used to estimate energy consumption of participating refrigerators.

Table 22. Refrigerator UEC Regression Model Estimates (Dependent Variable = Average Daily kWh, Adj. R^2 = 0.29)

Independent Variables	Coefficient	p-Value	VIF
Intercept	0.582	0.288	0.00
Age (years)	0.027	0.009	2.05
Dummy: Manufactured Pre-1990	1.055	<.0001	1.66
Size (ft.^{3})	0.067	0.010	1.82
Dummy: Single Door	-1.977	<.0001	1.24
Dummy: Side-by-Side	1.071	<.0001	1.57
Dummy: Primary	0.605	0.002	1.62
Interaction: Unconditioned Space x HDDs	-0.045	0.002	1.28
Interaction: Unconditioned Space x CDDs	0.020	0.379	1.50

Table 23 details the final model specifications used to estimate energy consumption of participating freezers.

Table 23. Freezer UEC Regression Model Estimates (Dependent Variable = Average Daily kWh, Adj. R^2 = 0.40)

Independent Variables	Coefficient	p-Value	VIF
Intercept	-0.892	0.263	0.00
Age (years)	0.038	0.030	2.18
Dummy: Unit Manufactured Pre-1990	0.695	0.105	2.08
Size (ft.^{3})	0.129	0.000	1.16
Dummy: Chest Freezer	0.350	0.189	1.12
Interaction: Unconditioned Space x HDDs	-0.031	0.274	1.06
Interaction: Unconditioned Space x CDDs	0.070	0.044	1.11

After estimating the final regression models, Cadmus analyzed the corresponding characteristics (the independent variables) for participating appliances (as captured in the JACO database). Table 24 summarizes program averages or proportions for each independent variable.

Table 24. 2012 Participant Mean Explanatory Variables*

Appliance	Independent Variables	Participant Population Mean Value
Refrigerator	Age (years)	24.61
	Dummy: Manufactured Pre-1990	0.56
	Size (ft.3)	18.47
	Dummy: Single Door	0.05
	Dummy: Side-by-Side	0.26
	Interaction: Unconditioned Space x CDDs	0.76
	Interaction: Unconditioned Space x HDDs	4.15
	Dummy: Primary	0.54
Freezer	Age (years)	31.44
	Dummy: Unit Manufactured Pre-1990	0.81
	Size (ft.3)	16.17
	Dummy: Chest Freezer	0.36
	Interaction: Unconditioned Space x CDDs	1.63
	Interaction: Unconditioned Space x HDDs	9.23

*CDDs/HDDs are weighted average CDDs/HDDs from TMY3 data for weather stations mapped to participating appliance ZIP codes. TMY3 is a typical meteorological year, using median daily values for a variety of weather data collected from 1991–2005.

For example, using values from Table 23 and Table 24, the estimated annual UEC for freezers could be calculated as:

$$Freezer\ UEC = 365.25\ days * (-0.8918 + 0.0384 * [31.44\ years\ old] + 0.6952 * [81\%\ units\ manufactured\ pre - 1990] + 0.1287 * [16.17\ ft.^3\ ] + 0.3502 * [36\%\ units\ that\ are\ chest\ freezers] + 0.06954 * [1.63\ Unconditioned\ CDDs] - 0.0313 * [9.23\ Unconditioned\ HDDs]) = \ 1{,}063\ kWh/year$$

Figure 5 compares distributions of estimated UEC values for refrigerators and freezers.

Figure 5. 2012 Distribution of Estimated Annual UECs by Appliance Type

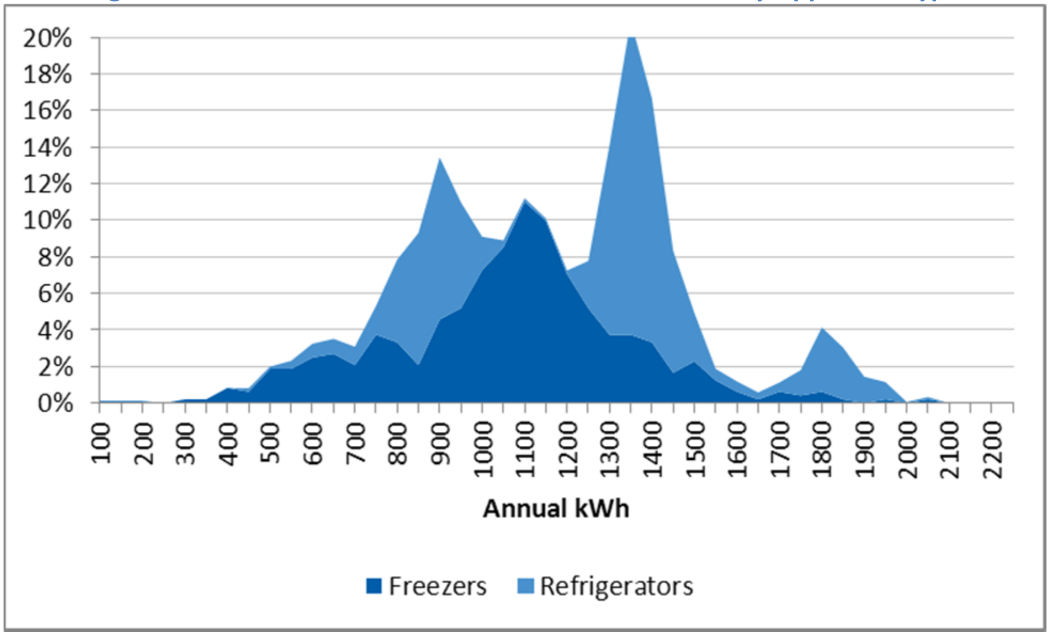


Table 25 presents estimated per-unit average annual energy consumption for refrigerators and freezers recycled by DP&L in 2012. The next section describes how we adjusted these estimates to arrive at gross per-unit saving estimates for participant refrigerators and freezers.

Table 25. Estimate of Per-Unit Annual Energy Consumption

Appliance	*Ex Ante* Annual UEC (kWh/year)	*Ex Post* Annual UEC (kWh/year)	Precision at 90% Confidence Interval
Refrigerators	1,200	1,242	5%
Freezers	965	1,063	12%

Part-Use Factor

To determine average per-unit gross energy savings for refrigerators and freezers, Cadmus calculated and applied the program's part-use factor, which accounted for participating appliances not plugged in year-round prior to participation. Retirement of appliances not previously in operation or operated for only part of the year would not yield the full year of energy savings presented in Table 25. We analyzed data from the 2012 participant survey to calculate part-use factors, which were used in the following three participant categories:

- Participating units, not used for at least one full year prior to being recycled, were assigned a part-use factor of 0. As the unit did not consume electricity, its retirement did not generate savings.
- Recycled units operating for the full year prior to participation were assigned a part-use factor of 1.

- To determine part-use factors for units used only a portion of the previous year, we divided the average number of months such units were used by 12. The part-use factor for these appliances ranged between 0 and 1.

In 2012, surveyed participants indicating they did not run the appliance for the full year estimated their refrigerator use, on average, at five months a year; freezers averaged three months a year. Final, part-use adjusted gross savings resulted from the weighted average of the three outlined usage scenarios.

Table 26 illustrates how Cadmus applied part-use factors for each of the three categories to determine average per-unit gross annual energy savings for refrigerators and freezers.

Table 26. Part-Use Adjusted Gross Per-USE for Refrigerators and Freezers

Operational Status	Refrigerators			Freezers		
	Percent of Total Recycled Refrigerator	Average Part-Use Factor	Part-Use Adjusted Energy Savings (kWh/Year)	Percent of Total Recycled Freezers	Average Part-Use Factor	Part-Use Adjusted Energy Savings (kWh/Year)
Not Running*	11%	0	0	10%	0	0
Running Part Time	6%	0.42	522	7%	0.25	266
Running All Time	83%	1	1,242	83%	1	1,063
Total		**0.86**	**1,068**		**0.85**	**904**

*"Not Running" refers to units not plugged in, as the program excluded inoperable units.

For the 2010 evaluation (the last time survey data were collected to calculate part use), Cadmus found part-use factors of 0.94 and 0.89 for refrigerators and freezers, respectively.

Based on the adjusted, part-use, per-unit gross annual energy savings presented in Table 26 (for 2012), we determined program-wide annual gross energy savings generated by DP&L's participation in 2012, as presented in Table 27.

Table 27. 2012 Adjusted Part-Use Gross Annual Energy Savings

Appliance	Adjusted Gross Energy Savings (kWh/Year)	Adjusted Gross Demand Savings (kW/Year)*	2012 Participation	Total Program Gross Savings (kWh/Year)	Total Program Gross Demand (kW/Year)	Precision at 90% Confidence
Refrigerator	1,068	0.17	1,590	1,698,311	270	±11.1%
Freezer	904	0.14	481	434,608	67	±21.4%
Total			**2,071**	**2,132,918**	**338**	**±9.8%**

* We derived refrigerator and freezer summer coincident peak demand savings by applying the draft Ohio TRM formula. For the change in the kWh input, we used results from this evaluation.

Process Evaluation Methodology and Findings

Cadmus used the approaches detailed below in evaluating the 2012 program.

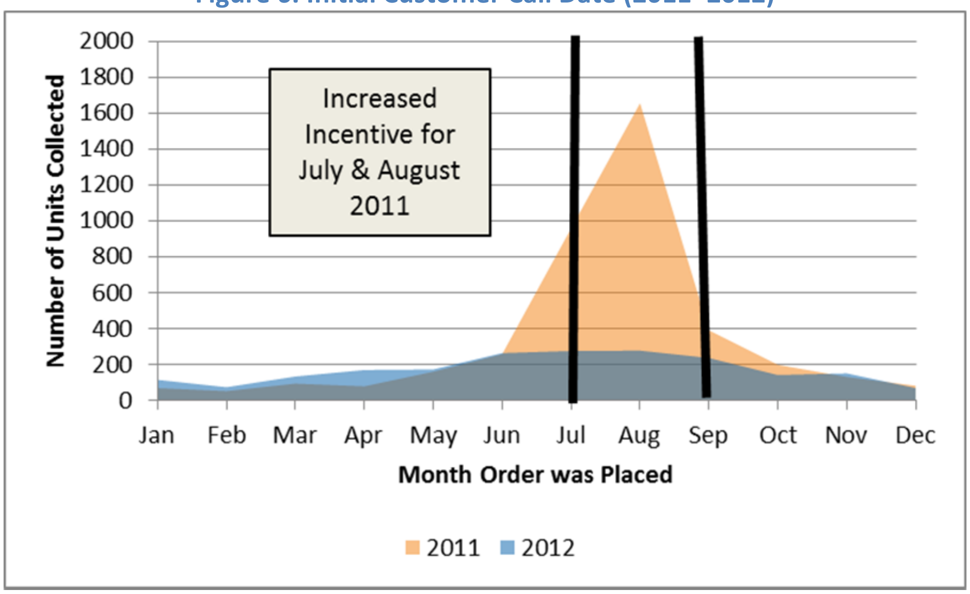
Stakeholder Interviews

Cadmus conducted stakeholder interviews with the implementer (JACO) and DP&L to understand program changes, process goals, and relationships between DP&L and JACO.

Cadmus noted the residential ARP administrator formed a retail partnership with Sears® in July 2011. Through Sears, JACO picked up 156 units in 2012 (compared to 135 units in 2011). JACO primarily coordinates the program with Sears, and has a retail team that trains the retailer (Sears) in the field. They deal with the national headquarters (of retailers) to reiterate the programs' importance.

Program participation rates fell by 50% from 2011 to 2012. This drop in participation may be due to the absence of a special promotion, like the incentive promotion implemented in 2011. In July and August of 2011, DP&L offered a $50 incentive promotion, which led to a large increase in program participation. More than 60% of all units collected in 2011 occurred in the two months with the $50 rebate (200 per month usually, 1,500 on average per month during promotion period in July and August 2011). Figure 6 shows this spike in program participation for 2011.

Figure 6. Initial Customer Call Date (2011–2012)



The 2012 residential ARP offered a $25 incentive for the entire program year. JACO believes the DP&L residential ARP's participation can be improved with an increased rebate because of the participation spike that resulted from the 2011 promotion. The absence of a special promotion and the subsequent drop in participation may be the primary reason that the program was only able to achieve 54% of its energy and demand goals for 2012. To mitigate this decline, DP&L has increased the incentive to $35 for 2013.

Representatives from JACO and DP&L expressed high satisfaction levels with the residential ARP implementation partnership. DP&L specifically expressed satisfaction with JACO's program processes and customer service, while JACO stated DP&L was *"easy to get a hold of and easy to work with."*

According to DP&L's program administrator, specific process goals for the residential ARP included:

- Customer education;
- High customer satisfaction levels; and
- Minimal customer complaints.

Interviews with program stakeholders and surveys of program participants indicate that these goals were achieved. Stakeholders stated that program satisfaction remained high and that the program continued to act as a gateway to participation in other programs. Ninety six percent of program participants reported being at least somewhat satisfied with the program. Additionally, 80% indicated that they were at least somewhat knowledgeable about energy efficient technologies, supporting the theory that the program is increasing awareness of energy efficiency.

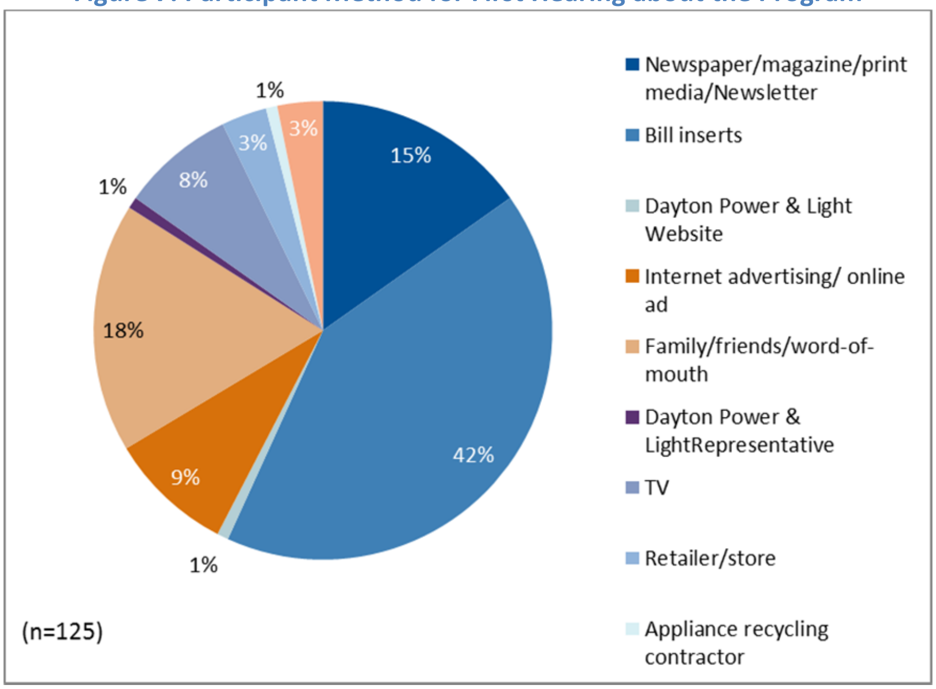
Participant Survey Analysis

DP&L and JACO market the residential ARP through an array of channels, including:

- Newspaper advertisements;
- Television advertisements;
- A program Website;
- Customer information sheets;
- Bill inserts;
- Retailers (e.g. Sears).

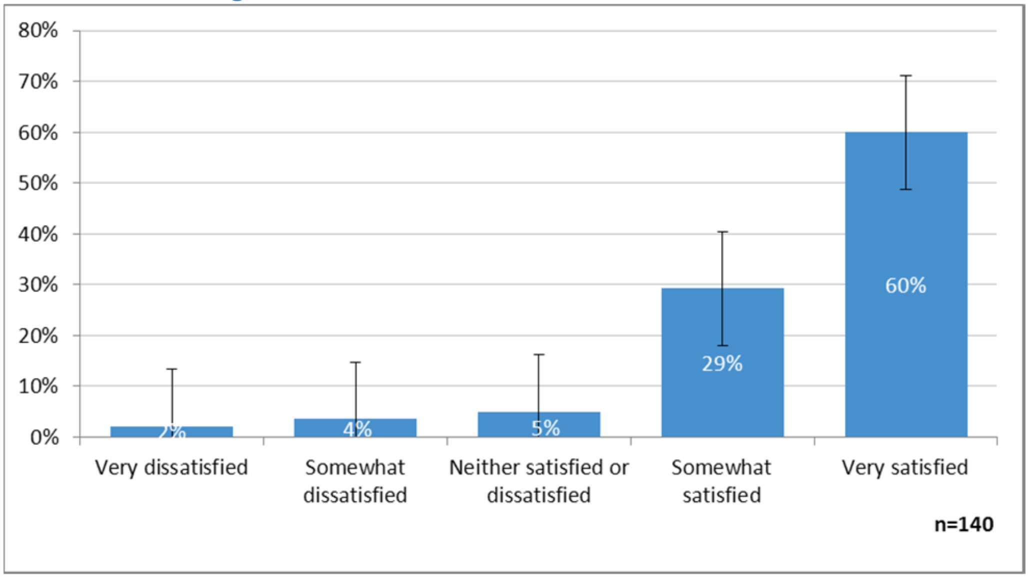
JACO staff noted participants learned about the program primarily through bill inserts, which have proved the most effective approach.

Figure 7. Participant Method for First Hearing about the Program



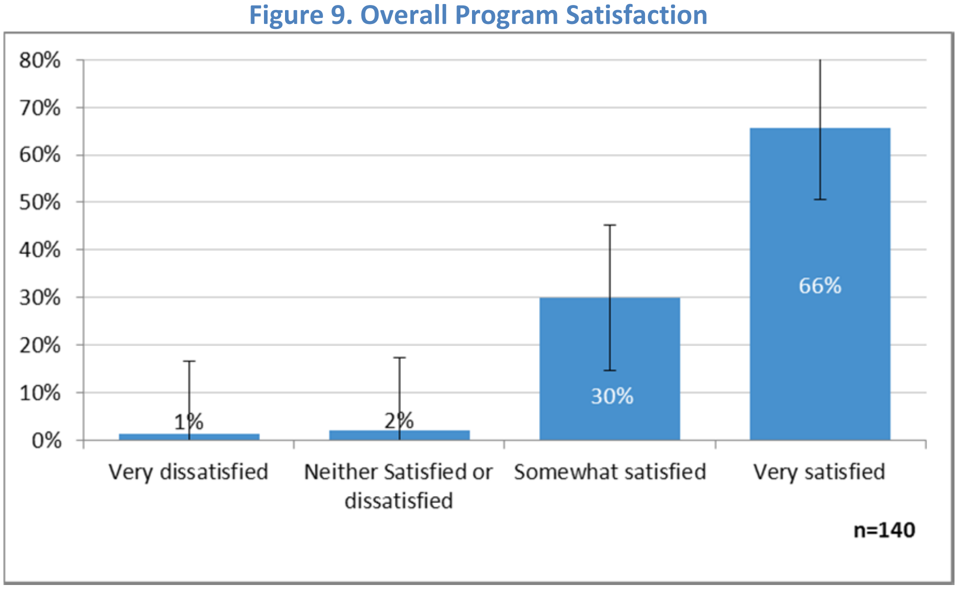
Although the 2012 program year did not include an increased incentive promotion, customers reported high satisfaction levels regarding the incentive amount. Eighty-nine percent of survey respondents reported being *"very satisfied"* or *"somewhat satisfied"* with the $25 rebate amount.

Figure 8. Overall Satisfaction with Rebate Amount



Program participants reported high overall satisfaction levels with the program. As shown in Figure 9, 96% of survey respondents reported being *"very satisfied"* or *"somewhat satisfied"* with the program. Utility residential ARPs typically experience high satisfaction rates.

Figure 9. Overall Program Satisfaction



Benchmarking

Cadmus benchmarked the 2012 DP&L residential ARP against similar utility ARPs, as reports for the three benchmarked utility programs were not available publically.

Figure 10 compares four common methods for informing participants about their respective residential ARPs. Among all compared programs, bill inserts and word-of-mouth were the first or second most popular way to inform participants. For DP&L, a higher proportion of participants learned of the program through print media than did participants of the other programs included in the benchmarking.

Figure 10. Benchmarking Main Method for Hearing about Program

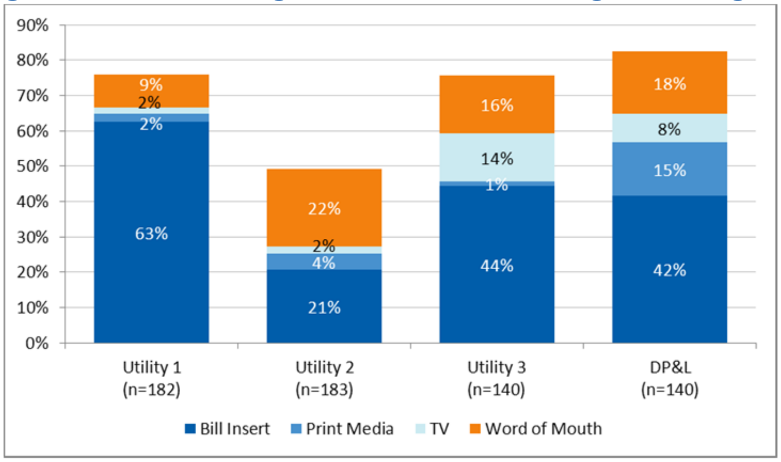
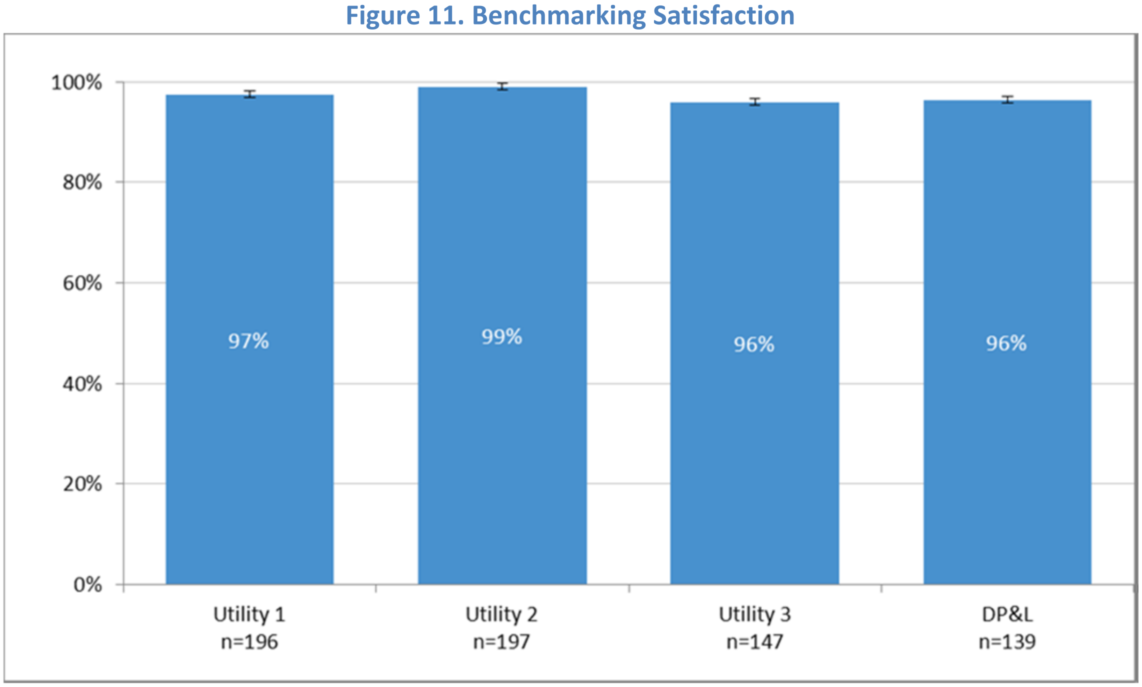


Figure 11 compares participants stating they were *"somewhat satisfied"* or *"very satisfied"* with their respective residential ARP, or who rated their program a 7 or higher on a 10-point scale. The DP&L residential ARP reported customer satisfaction levels in the same range as the other three benchmarked programs.

Figure 11. Benchmarking Satisfaction



Recommendations

Drawing upon the preceding findings, Cadmus offers the following recommendations:

- As residential ARPs mature, unit ages typically decline, meaning more units will be recycled that were manufactured after the energy-efficiency standards of the early 1990s (such as the National Appliance Energy Conservation Act implemented in 1990). By replacing more efficient units in the future, the program will likely see per-unit savings values shift over time. Therefore, we recommend DP&L continue to use evaluated savings for reporting purposes. This will provide more accurate saving estimates based on the unit composition being recycled.
- Based on results from the review of 2011 JACO tracking data, the higher incentive increased program participation during the promotional period. Cadmus agrees with DP&L and JACO: program participation will benefit from a higher incentive. Cadmus supports DP&L's decision to increase the program incentive to $35.
- Cadmus recommends DP&L consider distributing CFL kits to ARP participants. These kits would be delivered directly to program participants and would include 2-4 CFL bulbs. Based on previous experience in evaluating ARPs with CFL kits, Cadmus believes that this addition to the program would increase gross program energy savings in a cost effective manner.

Residential Low-Income Program

Evaluation Overview

Cadmus' evaluation of the 2012 residential low-income weatherization program followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 28 identifies key researchable evaluation questions.

Table 28. Key Researchable Questions

Researchable Question	Activity Used to Address Question
What gross electric savings and demand reductions were generated by the program?	• Program database review • Engineering analysis • Participant surveys
Are participants satisfied? Were measures installed? Are participants experiencing decreases in bills? What other benefits, such as health improvements, have they experienced?	• Participant surveys
Are customers aware DP&L funds a portion of weatherization services?	• Participant surveys
Is this program cost-effective?	• Cost-effectiveness tests

Detailed Evaluation Findings

The key findings that follow relate to the impact evaluation and process evaluation efforts.

- The program achieved 982,318 kwh in energy savings and 122 kW in demand reductions. Compared against claimed *ex ante* claimed savings, the program had realization rates of: 109% for energy savings; and 78% for demand savings. The demand realization rate of less than 100% largely resulted due to incorrect calculations for attic insulation demand savings. Adjusted gross savings achieved 58% and 94% of DP&L's filed kWh and kW goals, respectively.

Table 29. Residential Low-Income Weatherization Program Claimed and Achieved Energy Savings

Program	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	kWh	kW	kWh	kW	kWh	kW	Precision*
Attic Insulation	44,005	36.4	59,690	0.94	59,690	0.94	±10%
Central Air Conditioning(AC) Replacement	0	0.06	694	0.50	694	0.50	±10%
CFM Reduction	229	0.19	33,889	0.20	33,889	0.20	±10%
Compact Fluorescent Light Bulbs	303,831	33.1	325,806	38.8	339,856	40.4	±6%
Energy-efficient Showerhead	17,195	1.93	8,944	1.14	20,396	1.37	±16%
Faucet Aerator	3,038	0.38	2,842	0.35	9,982	0.97	±13%
Foundation Wall Insulation	2,616	2.07	6,109	-	6,109	-	±10%
Freezer Replacement	85,956	13.3	60,654	9.13	60,654	9.13	±10%
Heat Pump Replacement	-	-	3,911	-	3,911	-	±10%
LED 0.5 W Nightlight	273	0.03	295	0.04	2,234	0.08	±6%
Refrigerator Replacement	439,101	67.4	342,576	52.4	439,101	67.5	±10%
Smart Strip Power Outlet	-	-	1,130	0.13	1,130	0.13	±10%
Wall Insulation	-	-	2,641	0.05	2,641	0.05	±10%
Water Heater Pipe Insulation	3,045	0.35	1,602	0.18	514	0.06	±14%

Program	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	kWh	kW	kWh	kW	kWh	kW	Precision*
Water Heater Temperature Setback	-	-	339	0.04	339	0.04	±10%
Water Heater Wrap	1,185	0.14	1,180	0.13	1,180	0.13	±12%
Total**	**900,475**	**155**	**852,303**	**104**	**982,318**	**122**	±9%

* Precision at 90% confidence.
** Values in table may not exactly sum to 100% due to rounding.

- Eighty percent of energy savings derived from two measures: CFLs and refrigerator replacements. Freezer replacements and attic insulation installations make up another 12% of savings.
- While the new program tracking system for 2012 demonstrated improvements over the previous system, Cadmus identified a series of issues with the program tracking database pertaining to two primary categories:
  1. Accurate and consistent collection of key assumptions used in draft Ohio TRM savings algorithms; and
  2. Database accuracy and consistency in calculating savings.

  Relating to the second issue, Cadmus found instances where:
  1. Electric savings were calculated for measures in homes without electric heating, cooling, or electric water heating systems;
  2. Electric savings were not calculated for homes that apparently should receive them; and
  3. Savings were incorrectly calculated.

  While these issues affected DP&L program data tracking and reporting, they were not DP&L-specific based on conversations with DP&L and First Energy (the utility hosting the database).
- Participants reported 5% of CFLs missing, either because they had not been received, had been left behind and never installed, or were removed. The 96% measure-level CFL installation rate (including reinstallations), reported through participant surveys, was above the 81% draft Ohio TRM ISR for CFLs direct install programs. This installation rate is also consistent with 2011 program year evaluation findings.
- Approximately 71% of survey respondents reported their utility bills were more affordable due to weatherization, marking a statistically significant increase over the prior year's response of 47% of respondents.
- Seventy-seven percent of respondents felt more comfortable in their homes following weatherization work.
- Ninety-nine percent (n=120) of respondents were "very satisfied" or "somewhat satisfied" with the program services.

Evaluation Data Collection Methods

In addressing program energy-saving impacts, Cadmus primarily relied on DP&L participant tracking data, along with savings algorithms provided in the draft Ohio TRM. Additionally, Cadmus conducted 120 participant phone surveys to evaluate program processes, determine participant benefits, and verify measure installations.

Program Database Review

Starting in 2012, DP&L's low-income weatherization program tracking transitioned from using the Ohio Partners for Affordable Energy's (OPAE) C-3 data collection tracking system to a new database (the CC System), developed and hosted by FirstEnergy, for program participant and installation information. Community action agencies (CAAs) implementing the program used this Web-based system for tracking and directly reporting installation data.

Cadmus reviewed the new tracking system to determine whether all relevant fields for energy-savings calculations had been collected, and, from a more general perspective of database integrity, for consistency and the accuracy of populated values. We also reviewed the savings estimates calculated within the CC System, comparing these to savings recalculated using the draft OH TRM algorithms and inputs from the database. Multiple meetings took place with FirstEnergy and DP&L staff to discuss the CC System's database structure and calculations. Additionally, Cadmus made a separate data request to OPAE to collect CAA-specific measure data missing from the CC System.

Telephone Survey

In January 2013, Cadmus conducted a phone survey of 120 residential Low-Income Program participants. Cadmus developed the participant survey and sample, which RDD implemented.

Table 30 provides details regarding the telephone survey planned and achieved completes.

Table 30. Participant Telephone Survey Sampling Plan

	Quantity
Total Participants	526
Eligible Participants in Call List	508
Screened out due to change in occupancy or bad phone number	18
Completed Surveys	120
Number of Calls Required to Achieve Sample	717
Response Rate (RR1)	64.9%
Cooperation Rate (COOP1)	89.6%
Refusal Rate (REF1)	3.8%
Contact Rate (CON1)	72.4%
Sample Size Goal	120

Cadmus selected a random sample of participants from the entire 2012 participant population, available in January 2013 (526 participants), seeking to attain 120 completed survey responses and to achieve over ±10% precision at the 90% confidence level at the program level, oversampling to reach more responses for low-frequency measure installations.

We asked participants about their experiences with the program, addressing the following topics:

- Awareness of utility sponsorship;
- Measure verification;
- Non-energy benefits, including health and comfort;
- Levels of overall and measure satisfaction; and
- Household and demographic data.

Impact Evaluation Methodology and Findings

Engineering Analysis

Ex ante claimed savings are derived directly from the CC System database, with estimates reportedly based on the draft Ohio TRM algorithms.

Verified gross savings were calculated primarily using the draft OH TRM algorithms and inputs collected through the CC System or reported by the CAAs. Two additional factors differentiated the verified gross savings calculation from *ex ante* savings:

1. Revisions to calculation assumptions, based on evaluation activities (e.g., CFL installation rate); and
2. Corrections to inputs and savings calculations, based on the database review.

For CFLs, the ISR was updated from 81% (draft Ohio TRM assumption) to 96%, based on telephone survey results (see Table 40 for the calculations).

Cadmus applied a few different corrections when calculating verified gross savings in response to inputs and savings calculated in the CC System database. For shell measures (e.g., CFM reduction, insulation), we applied thresholds on specific input assumptions to limit unreasonably high savings. Specifically, for CFM reduction measures, we limited air sealing CFM improvements to 30% (some cases had greater than 50% improvements). For attic and wall insulation measures, Cadmus set savings thresholds at 50% and 20% of total home heating energy usage, respectively. Additionally, we removed savings from a series of installations with ineligible electric savings, based on heating, cooling, or water heating fuels and systems listed in the database. This affected savings claims for attic insulation, air sealing, energy-efficient showerheads, and faucet aerators installations.

Lastly, verified gross savings relied on internal engineering calculations for two measures not included in the Ohio TRM (freezer replacements and water heater temperature setbacks). Sources for all measure-specific algorithms can be found in Appendix D: Energy and Demand Savings Calculation Sources.

For many measures, adjusted gross savings equaled verified gross savings.

Table 31 shows sources used where adjusted gross savings differed from verified gross savings.

Table 31. Sources for Adjusted Gross Savings Calculations

Measure	Source
CFLs	Residential Lighting program wattage research
Energy-Efficient Showerhead	Internal engineering algorithms from other evaluations
Faucet Aerator	Internal engineering algorithms from other evaluations
LED Nightlight	Internal engineering algorithms from other evaluations
Refrigerator Replacement	Draft Ohio TRM Joint Objections and Comments
Water Heater Pipe Insulation	Internal engineering algorithms from other evaluations

Database Review Findings

In reviewing the CC System database, Cadmus identified elements that worked well as well as some shortcomings specific to data integrity and savings calculations. Generally, the CC System provides an electronic, centralized, Web-based platform for standardized data collection and reporting, and represents a move to a more efficient data tracking system than the Excel-based C-3 data collection forms used in previous years. This system should provide a framework to collect all relevant inputs for calculating savings using the draft Ohio TRM algorithms, while ensuring clean, standardized data values.

The review did identify a series of issues that can be defined using the following categories:[16]

1. Savings inconsistent with participant heating, cooling, or water-heating systems.
2. Key assumptions for estimating savings missing or incorrect.
3. Inaccurate savings calculations.

First, the CC System did not incorporate fields identifying a customer's heating, cooling, or water-heating fuel or equipment when calculating savings. Consequently, instances occurred where electric savings were calculated for insulation or CFM reduction measures in homes with gas heating and without electric central cooling systems. Additionally, electric savings were calculated for water-savings measures in homes with gas water heating.

Second, a series of inputs necessary for calculating measure savings were missing (left unpopulated by the agency) or fell outside of reasonable ranges for specific fields. Fields with missing input data included: new and existing R-values; pre- and post-blower door readings; and values for equipment efficiency (e.g., SEER, EER).

Finally, several fields contained inaccurate savings estimates for specific measure installations. For example:

- Instances where electric savings were not calculated for measures that appeared to have all required fields;

[16] While these issues affected DP&L program data tracking and reporting, they were not DP&L-specific and should affect other utility low-income weatherization programs similarly in the way data are tracked through the CC System.

- Instances where savings algorithms were applied incorrectly (for example, kW impacts for attic insulation were calculated for heating and cooling, even when a home had a non-electric heating system);
- Instances where inputs used in savings calculations were incorrect (e.g., water heater pipe insulation savings calculated using an assumption of a 1-foot pipe circumference, resulting in 1,872 kWh claimed, while other instances assumed 0.2-foot and claimed 320 kWh);
- Instances where savings were calculated despite missing relevant inputs (e.g., air sealing measures where cooling efficiency was not collected, though savings were claimed).

Measure Specific Findings

Appendix A: Measure-Level Savings Table provides a list of energy-saving measures (and quantities) installed through the program.

The program installed a series of measures, paid for by DP&L, in homes with non-electric heating, cooling, or water-heating, and that could not claim electric savings; thus electric savings could not be calculated for these homes in verified and adjusted gross savings. These measures are summarized in Table 32.

Table 32. Summary of Installed Measures with No Electric Sources

Measure	Total Number of Measures Installed	Number of Measure Installations with no Electric Source	Notes
Attic Insulation	49	8	No electric heat or central AC
Wall Insulation	2	1	No electric heat or central AC
CFM Reduction	53	10	No electric heat or central AC
Energy-efficient Showerhead	81	12	Gas DWH
Faucet Aerator	124	8	Gas DWH

There are also a number of measures identified that should have received electric savings, but for which the CC system did not claim any savings. For attic insulation, of 41 homes that should have received electric savings, only 12 homes in the database reported savings. Similarly, for the CFM reduction measure, of 43 homes that should have received electric savings, only nine had savings reported. Additionally, homes with 20 smart strip installations and two with heat pumps should have reported electric savings. In some cases, missing savings resulted from incomplete data fields (e.g., wall insulation); in other cases, all relevant data appeared to be collected and the reasons for unclaimed savings remains unclear (e.g., attic insulation).

Process Evaluation Findings

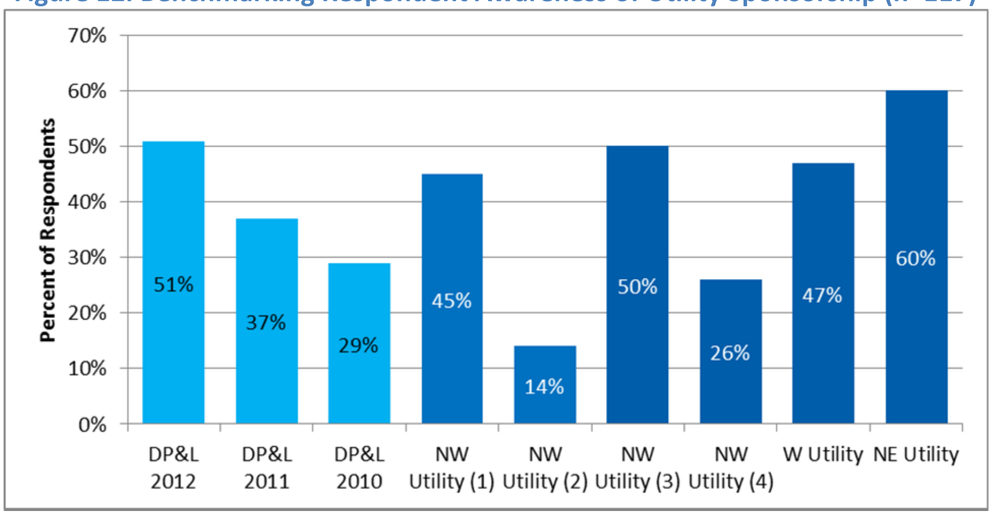
The process evaluation component included a telephone survey of participants, which sought to gather information highlighting customer experience with the program as well as to ensure incented measures were installed and operating. Findings from the customer telephone survey follow below.

Participant Findings

Participant Awareness

Cadmus asked participants if they knew DP&L had paid for part of the weatherization services, and 51% responded affirmatively. A percentage higher than the 37% reported in 2011, this amounts to a statistically significant difference. Participant awareness of DP&L's contribution has steadily climbed every year for the past three years. Figure 12 compares participant awareness of utility involvement in low-income weatherization programs.

Figure 12. Benchmarking Respondent Awareness of Utility Sponsorship (n=117)



Participants exhibited above-average awareness of DP&L's program sponsorship, compared to results from a series of recent low-income weatherization evaluations conducted across the country.

Household Changes and Take-Back

Cadmus asked participants several questions designed to understand changes in household, usage, or behavioral characteristics that occurred after the program, which may affect the level of savings realized in a given home. Specifically we looked at: changes in usage patterns (i.e., take-back), numbers of occupants, or household activities. Eleven percent of respondents reported increasing temperature settings on their thermostats, and 42% of respondents reported decreasing temperature settings.

Thirty-six percent of respondents reported supplementing heating with secondary systems, with electric room heaters the most common source (24% of all respondents). Of respondents citing use of electric room heaters, 44% indicated using it less following performance of the work, with only 7% said they used it more.

Nearly all respondents indicated neither the number of people present in their homes nor the number of rooms used changed since work was performed. For those saying their living arrangements had changed, 4% of respondents reported family or roommates moved in, compared to 3% saying someone moved out of the home. Similarly, 2% of respondents said they used more rooms, and only 1% said they used fewer rooms following the work's completion.

Non-Energy Benefits[17]

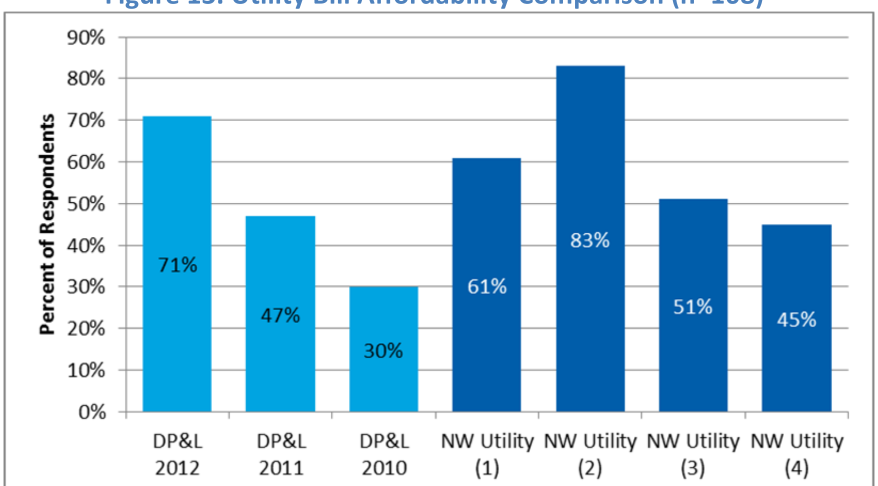
Respondents reported experiencing positive changes in their energy bills due to program activities. Table 33 provides a distribution of participants' changes in utility bill levels, with 71% saying their energy bills decreased since receiving weatherization services, and only 5% showing an increase. All 77 respondents noticing a decrease in their electric bills were "very satisfied" or "somewhat satisfied" with the savings.

Table 33. Changes in Utility Bill Levels (n=108)

Change in Utility Bill After Program	Frequency	Percent	Precision
Decreased by a lot	12	11%	±5%
Decreased some	65	60%	±8%
Stayed about the same	26	24%	±7%
Increased some	2	2%	±2%
Increased by a lot	3	3%	±3%
Total	**108**	**100%**	

This produced a result well above the average reported in other studies, where respondents indicated a positive effect on utility bill affordability due to weatherization (as shown in Figure 13).

Figure 13. Utility Bill Affordability Comparison (n=108)*



* Some variation in question language across studies (e.g., whether bill appears "more affordable" vs. perception of electric bill decreased).

Program participants reported much higher perceptions of increased bill affordability in 2012 than in 2011, with the increase statistically significant.

Installing weatherization measures can also affect the health and comfort of participants. Thirty-five percent of respondents identified improvements in their health or the health of their family members due to services provided through the program, as shown in Table 34. No survey respondents reported a decline in health due to participation.

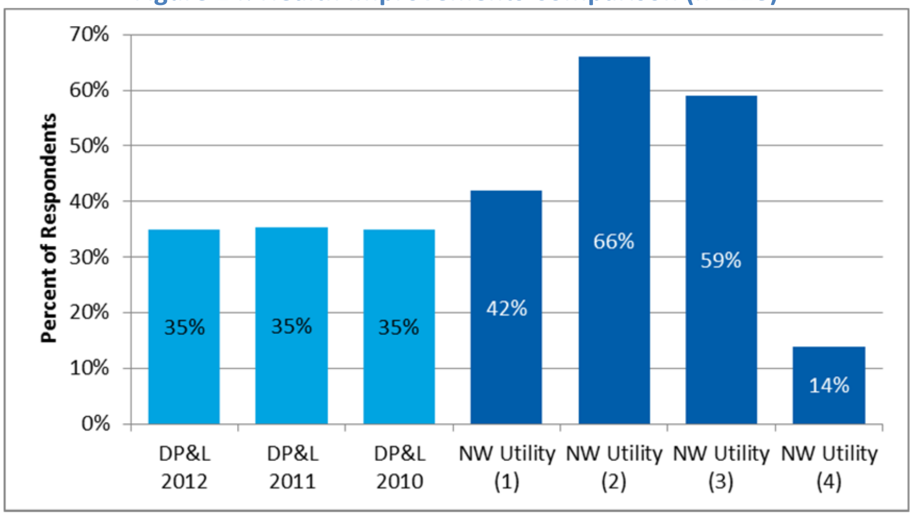
17 For 2012, non-energy benefit frequencies were calculated based on all survey respondents, rather than only on participants receiving shell measure installations in past years.

Table 34. Health Improvements (n=118)

Health Changes as a Result of Program Participation	Frequency	Percent	Precision
Positive effect	41	35%	±7%
No Change	77	65%	±7%
Total	**118**	**100%**	

As shown in Figure 14, comparisons of different utility program respondents indicated a positive health effect attributed to weatherization services.[18]

Figure 14. Health Improvements Comparison (n=118)



The percentage of respondents reporting increases in their health or the health of their family members in 2012 (35%, n=118) matched that in 2011 (35%, n=33).

When asked the ways they experienced health improvements, participants reported a range of health impacts. Multiple DP&L participant respondents reported their homes feel warmer and they are *"breathing better"* due to the work. Others said they had less trouble keeping food in the home because of new refrigerators or freezers. Another respondent reported having diabetes, and the new refrigerator meant not having to leave the house as much.

A number of respondents said the program impacted their mental health—for example, by offering them peace of mind and increased comfort. One respondent said: *"You sleep a lot better knowing [your utilities are] not going to get shut off because you can manage your bill according to your income."*

Additionally, 10% of respondents said their households experienced fewer sick days from work or school due to the program.

Another non-energy benefit widely reported by program participants related to improvements in comfort resulting from the program. Table 35 shows the distribution of participant responses regarding changes in comfort levels.

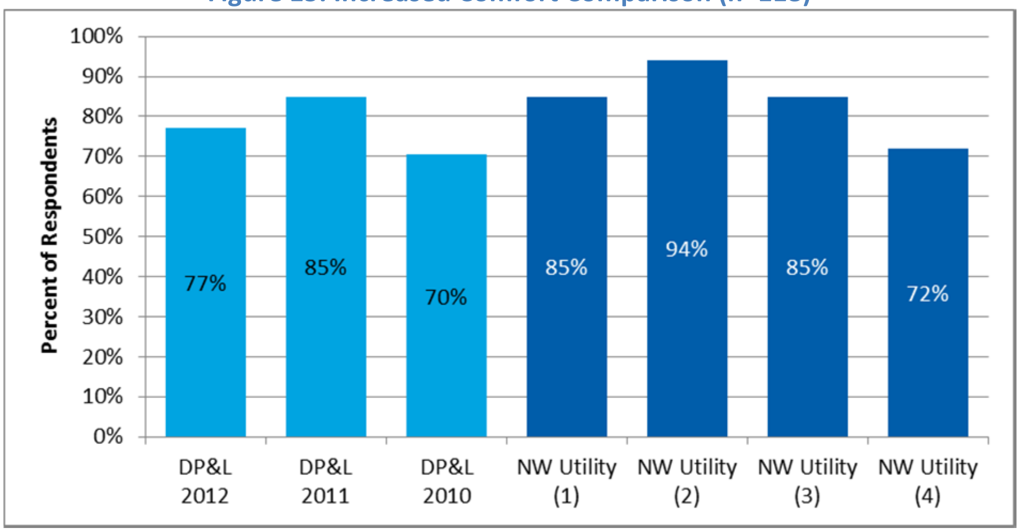
18 Notably, many distinctions in programs contribute to participants' varying levels of perceived non-energy benefits.

Table 35. Changes in Comfort (n=118)

Comfort Changes since Program Participation	Frequency	Percent	Precision
A lot more comfortable in your home	70	59%	±7%
Somewhat more comfortable in your home	21	18%	±6%
About the same level of comfort in your home	27	23%	±6%
Total	**118**	**100%**	

Seventy-seven percent of respondents (n=118) reported feeling more comfortable in their homes following the work, a slight decrease from 2011, when 85% of respondents (n=33) reported improvements in comfort (though not statistically significant). Figure 15 shows this year's incidence of improved comfort, compared to results from other studies.

Figure 15. Increased Comfort Comparison (n=118)



Questions also addressed participants' forced mobility. Significant financial and emotional burdens frequently result from customers being forced to move from their homes. As shown in Table 36, 38% of respondents reported being less likely to move following completion of work to their homes, a response similar to the 36% of respondents in 2011.

Table 36. Changes in Mobility (n=118)

Are you any more or less likely to move now that this work has been done to your home?	Frequency	Percent	Precision
Less likely to move	45	38%	±7%
No change	67	57%	±8%
More likely to move	6	5%	±3%
Total	**118**	**100%**	

Participant Satisfaction

Program Satisfaction

Table 37 provides distributions of participant responses regarding overall satisfaction with services delivered though the program.[19]

Table 37. Overall Satisfaction with Program Services Provided (n=120)

Overall Satisfaction with Program Services	Frequency	Percent	Precision
Very satisfied	99	83%	±6%
Somewhat satisfied	19	16%	±6%
Somewhat dissatisfied	2	2%	±2%
Total	**120**	**100%**	

Just over ninety-eight percent of respondents reported being *"very satisfied"* or *"somewhat satisfied"* with the program services, while only two respondents expressed dissatisfaction, a finding consistent with program satisfaction reports from other studies, which cite overall satisfaction rates between 96% and 98%.

Both respondents reporting dissatisfaction cited wait times for services after approval to participate in the program. Both respondents claimed work remained unfinished, and they continued their wait to hear back from the agency.

Cadmus asked participants to gauge the courtesy of agency staff working on their homes. Table 38 provides the distribution of their responses.

Table 38. Satisfaction with Agency Staff (n=117)

Courtesy of Contractors	Frequency	Percent	Precision
Very courteous	110	94%	±4%
Somewhat courteous	7	6%	±4%
Total	**117**	**100%**	

All respondents (100%) found agency staff courteous and respectful, very similar to 2011 evaluation findings as well.

Respondents provided a variety of suggestions for program improvements. Several stressed a need for improved communication, particularly in returning phone calls and in informing participants regarding wait list status and project timelines. Specifically, two respondents said they would appreciate a call ahead of time to let them know when the services would be occurring. Others suggested:

- Reducing the points of contact with the program to simplify it;
- Advertising the program more broadly to increase involvement; and
- Adding more services or measures.

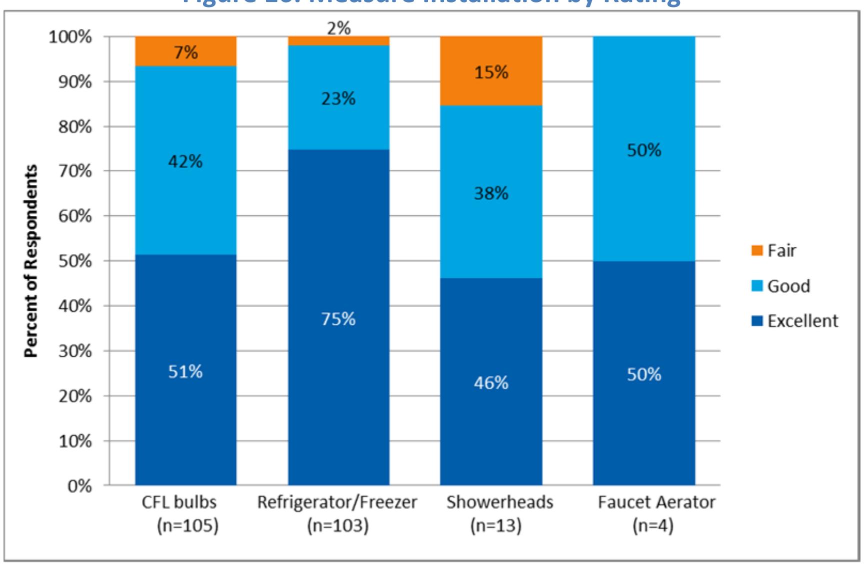
[19] Measures were installed using multiple funding sources, and customers may not be able to distinguish between DP&L and another program. Therefore, satisfaction levels, complaints, and other respondent comments may reflect a more general attitude of the process and not just that of DP&L-funded measures.

Three respondents noted windows as a measure to bring back, and one noted that older homes may be especially in need of these.

Measure Satisfaction

A series of survey questions sought to elicit: a verbal confirmation that the measures paid for by DP&L had been installed in the participant's home; and respondents' satisfaction levels with those measures. While participants likely received other measure installations through non-DP&L funding sources, the survey questions did not extend beyond DP&L-funded measures. Participants also were asked to rate the new measure on a four point scale (*excellent*, *good*, *fair*, or *poor)*. Figure 16 presents participant ratings for measures discussed with survey respondents. Overall, respondents rated their new equipment quite favorably, with the majority citing each item as *"excellent"* or *"good."*

Figure 16. Measure Installation by Rating



Additional details regarding measure-specific satisfaction and installations follow below.

CFL Ratings

Of respondents that recalled receiving light bulbs, 93% rated them as *"excellent"* or *"good"—a slight* increase over the 90% (n=64) reported in 2011. Though the percentage of respondents reporting a positive rating increased over 2011, the change is not statistically significant. Table 39 provides the frequencies of participant opinions that support their rating. Six respondents said they did not know why they gave their rating for the CFLs.

The most common reasons reported for positive reactions to the CFLs include: the bulbs gave good light, and they saved energy. Conversely, bulbs being too dim served as the main reason for a negative response. Although seemingly contradictory findings, the increase in respondents who thought the bulbs give good light was statistically significant, thus indicating that participants generally expressed satisfaction with the quality of light coming from the CFLs.

Table 39. CFL Installation Rating (n=99)

Type of Response	Rationale for Response	Frequency	Percent*	Precision
Positive	They give good light	39	39%	±8%
	They save energy	31	31%	±8%
	They [will] save me money	15	15%	±6%
	I won't have to change the bulb frequently	13	13%	±6%
	They're just fine or I just like them	10	10%	±5%
	They're better than the bulbs I had	8	8%	±5%
	They last longer	5	5%	±4%
	I like the way they look	4	4%	±3%
	They work	3	3%	±3%
	I needed new light bulbs anyway	2	2%	±2%
	They were free	1	1%	±2%
Negative	The light is too dim	5	5%	±4%
	They take too long to light up	1	1%	±2%
	They burn out quickly	1	1%	±2%
Other		7	7%	±4%
	Total	**145**	**146%**	

*Total may not add up to 100% due to multiple responses.

CFL Installation Rate

Three out of 109 participants receiving CFLs (3%) claimed they did not recall receiving any new light bulbs. Of participants acknowledging they received CFLs, 18 reported removing some program CFLs that had been installed. Two-thirds of respondents removing bulbs (12 of 18) said they replaced removed CFL bulbs with additional CFLs. Respondents most commonly removed program CFLs due to burn outs.

While CFL distribution largely occurred through direct-installations, 17% of respondents receiving CFLs (18 of 109) also indicated the agency contractor left CFLs behind for the participant to install themselves. Similarly to 2011, 15% of respondents reported bulbs left behind for them to install. When asked whether they installed left-behind bulbs, 12 respondents (out of 18) said they had not yet installed them (accounting for 39 uninstalled bulbs left behind by contractors).

The installation rate for CFLs was 96%. Table 40 provides details for the CFL installation rate calculation.

Table 40. CFL Installation Rate

CFL Disposition	Respondents (n)	Bulbs
Bulbs given to survey participants	109	2,035
Never Received Bulbs	3	29
Removed Bulbs	18	43
Replaced removed bulbs with CFLs	12	33
Uninstalled left-behind bulbs	12	39
Installation Rate (without reinstalled CFLs)		**95%**
Installation Rate (with reinstalled CFLs)		**96%**

Refrigerator/Freezer Replacement

Ninety-eight percent (n=103) of respondents receiving refrigerators or freezers rated the new equipment as *"excellent"* or *"good"* (as shown above in Figure 16), very similar to 2011 findings. Two respondents rated their new refrigerator as *"fair."* Table 41 provides the frequencies of participant opinions that support their rating. Three respondents said they did not know why they gave their rating for the new appliances.

Table 41. Refrigerator/Freezer Replacement Rating (n=100)

Type of Response	Rationale for Response	Frequency	Percent*	Precision
Positive	It works	33	33%	±8%
	The refrigerator is a good size	24	24%	±7%
	It keeps the food at the right temperature	23	23%	±7%
	It saves energy	22	22%	±7%
	It is just fine or I just like it	15	15%	±6%
	I needed a new refrigerator/ freezer anyway	11	11%	±5%
	My old refrigerator stopped working/wasn't working well	9	9%	±5%
	I like the way it looks	8	8%	±5%
	I like that it is front-facing	2	2%	±2%
	I like the color	2	2%	±2%
Negative	The shelves fall off	1	1%	±2%
	Makes a lot of noise	1	1%	±2%
Other		12	12%	±5%
	Total	**163**	**163%**	

*Total may not add up to 100% due to multiple responses allowed.

Respondents expressed a higher percentage of positive comments about the refrigerator and freezers than for CFLs, with the most common positive response being an appreciation that the new unit worked. Other common responses included: the units were a good size; they kept the food at the right temperature; and they saved save energy. Only two respondents expressed negative opinions about their new refrigerators or freezers. One respondent found the door units quite small, and the refrigerator made too much noise. The other respondent claimed shelves fell off and considered the refrigerator poorly made.

Recommendations

Drawn from the preceding findings, Cadmus offers the following recommendations:

- **Data Tracking and Reporting Improvements:** The program made a big step toward improving data tracking by moving away from Excel to the online database. Improving the quality of data tracked in the CC System will increase the accuracy of *ex ante* savings calculations, and ensure all valid, electric-saving measures receive reported savings. Applying database controls (such as discrete ranges or required fields) will help improve the accuracy of savings calculations. Additionally, integrating information on heating, cooling, and water-heating fuels and equipment types with the savings calculations will help ensure electric savings are appropriately applied.

Through discussions with DP&L and FirstEnergy in March 2012, it became known that the CC System includes the capability to refine cell constraints and employ a level of database controls not currently being applied. As mentioned, these issues affect all utility low-income weatherization programs tracked through the CC sytem and are not specific to the DP&L program. FirstEnergy indicated they would begin taking steps and working with OPAE, CAAs, and other utility partners to implement these applications in the near future. DP&L is currently in communication with FirstEnergy and OPAE and taking steps to address these issues.

- **Funding Electric-Saving Measures:** DP&L's current policy allows shell measures if a home is electrically heated or electrically cooled. However, program data revealed a number of homes receiving insulation or CFM reduction measures where no electric savings could be claimed. Similar issues exist where DP&L funded water-savings measures in homes with gas water heating. DP&L should work with OPAE to ensure all agencies clearly understand eligible electric-savings measures that can be installed, given the home heating, cooling, and water-heating fuel and equipment types. Additionally, DP&L should ensure agencies understand DP&L will only pay for water heating measures in customers' homes that have electric water heat.
- **Electric-Savings Potential in Electric Room Heaters**: Nearly one-quarter (24%) of phone survey respondents reported using electric room heaters as a supplemental heating source. While about one-half (44%) indicated reducing electric heater usage after the work was performed, an opportunity exists to achieve additonal electric savings through the program by addressing these measures. Similar to ARPs, DP&L could consider offering an incentive to customers that relinquish their electric room heaters following weatherization work.
- **Develop Low-Income Specific Savings Estimates for the Ohio TRM**: While the Ohio TRM currently includes a low-income specific refrigerator replacement savings estimate, it is important to consider additional measures where specific baselines or usage assumptions will be different for low-income customers, and merit distinct savings estimates. DP&L should consider a study (possibly in coordination with other utilities) to explore algorithms and assumptions and identify revisions for developing low-income specific savings estimates.

Residential Heating and Cooling Rebate program

Evaluation Overview

Cadmus' evaluation of the 2012 Residential Heating and Cooling Rebate program followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 42 identifies key researchable evaluation questions.

Table 42. Key Researchable Questions

Researchable Question	Activity to Support Question
What were the gross electric savings and demand reductions?	• Participant billing analysis. • Draft Ohio TRM calculation and assumption review. • Program database review.
Is this program cost-effective?	• Cost-effectiveness tests.

In 2012, Cadmus suspended process evaluation activities for the Heating and Cooling Discount Rebate program as evaluations for the previous three years (2009 – 2011) identified very consistent findings, and no significant program changes occurred for either program between 2011 and 2012.

Detailed Evaluation Findings

The following key findings relate to the impact evaluation:

- The program achieved 6,605,094 kWh in energy savings and 1,972 kW in demand reduction. Compared to *ex ante* claimed savings, the program had realization rates of: 94% for energy savings; and 89% for demand reductions. Compared to filed goals, the program achieved realization rates of 391% for energy savings, and 131% for demand reductions.

Table 43. Residential Heating and Cooling Rebate Claimed and Achieved Energy Savings

Measure	*Ex Ante*		Verified		Adjusted		
	Claimed kWh	Claimed kW	Gross kWh	Gross kW	Gross kWh	Gross kW	Precision*
AC Early Retirement 14/15 SEER	1,461,680	803	1,461,680	803	1,369,486	720	±2.75%
AC Early Retirement 16+ SEER	841,434	487	841,434	487	785,661	462	±2.51%
AC New Construction 14/15 SEER	15,870	15	15,870	15	14,907	14	±10.00%
AC New Construction 16+ SEER	18,144	14	18,144	14	18,921	14	±10.00%
AC Std Replacement 14/15 SEER	13,800	13	13,800	13	11,883	14	±11.71%
AC Std Replacement 16+ SEER	9,504	7	9,504	7	11,685	9	±10.00%
HP Early Retirement 14/15 SEER	1,479,850	260	1,479,850	260	1,365,168	231	±4.56%
HP Early Retirement 16+ SEER	1,040,382	254	1,040,382	254	1,059,623	232	±5.20%
HP New Construction 14/15 SEER	587,400	151	587,400	151	287,240	88	±10.00%
HP New Construction 16+ SEER	39,928	11	39,928	11	40,513	11	±10.00%
HP Std Replacement 14/15 SEER	34,176	9	34,176	9	33,240	9	±10.00%
HP Std Replacement 16+ SEER	34,224	9	34,224	9	33,263	9	±10.00%
GSHP Early Retirement 16/18 EER	291,044	33	291,044	33	308,112	17	±10.00%
GSHP Early Retirement 19+ EER	322,677	45	322,677	45	348,778	27	±10.00%
GSHP New Construction 16/18 EER	53,889	4	53,889	4	62,046	4	±10.00%
GSHP New Construction 19+ EER	70,057	6	70,057	6	69,950	6	±10.00%

Measure	*Ex Ante*		Verified		Adjusted		
	Claimed kWh	Claimed kW	Gross kWh	Gross kW	Gross kWh	Gross kW	Precision*
GSHP Std Replacement 16/18 EER	4,899	0	4,899	0	5,090	0	±10.00%
GSHP Std Replacement 19+ EER	21,556	2	21,556	2	21,526	2	±10.00%
Mini-Split AC New Construction	2,184	2	2,184	2	3,390	3	±13.40%
Mini-Split HP New Construction	6,276	0	6,276	0	6,769	0	±30.04%
Mini-Split HP New Construction	191,352	14	191,352	14	211,276	23	±28.88%
Mini-Split HP Replacement 16+	13,668	1	13,668	1	15,103	2	±28.81%
ECM Motor on Furnace (with New	321,434	0	321,434	0	324,462	0	±10.00%
ECM Motor on Furnace (with New	0	0	0	0	0	0	N/A
ECM Motor on Furnace	159,264	69	159,264	69	197,003	75	±10.00%
Total**	**7,034,692**	**2,211**	**7,034,692**	**2,211**	**6,605,094**	**1,972**	**±1.74%**

* Precision at 90% confidence

** Values in table may not sum to 100% exactly due to rounding.

- The program realization rate of 94% for energy savings is the result of slightly lower observed unit energy savings calculated for early replacment central air conditioner and air-source heat pump measures, the largest source of savings for the program. Further, *ex ante* UES estimates for these measures were derived from values included in the 2011 Cadmus evaluation report and include some rounding error.
- The program realization rate of 89% for demand reduction is almost entirely the result of rounding issues in *ex ante* per-unit demand reduction estimates for the central AC and air-source heat pump measures. The *ex ante* per-unit demand reduction estimates for these measures were derived from values included in the 2011 Cadmus evaluation report. However, the evaluation report only provided gross values for each measure accurate to one decimal point.
- The mix of measures incented through the program is trending away from strictly early replacement central AC and air-source heat pump measures. In 2009, the first year of the program, approximately 95% of energy savings and demand reductions resulted from these measures. In 2012, steady increases in the number of incentives paid for other measures types (e.g., gound-source and mini-split heat pumps) as well as the addition of the ECM measure has resulted in 71% of energy savings and 83% of demand reductions from these measures.

Evaluation Data Collection Methods

Cadmus used the approaches detailed below in evaluating the 2012 program.

Program Participant Utility Bill Regression Analysis

In January 2013, Cadmus conducted a billing analysis of program participants. As no significant changes occurred between the 2009, 2010, 2011, and 2012 program years regarding measure categories included in the billing analysis, participants from all four years could be considered. Billing analysis results were used to evaluate measure-level kWh savings estimates.

Data Tracking System Review

Cadmus reviewed the final 2012 program tracking database for input, accuracy, and completeness of data tracked. The review included the following key areas:

- Data necessary to calculate savings collected;
- Reported savings estimates match measure types; and
- Existing and installed equipment types meet measure requirements.

In addition to the review's impact focus, we compared the following key areas to program tracking databases from 2009, 2010, and 2011:

- Changes in the composition of incentives offered;
- Changes in incented equipment type, size, and efficiency; and
- Changes in replaced equipment type, size, and efficiency.

Impact Evaluation Methodology and Findings

Cadmus used the approaches detailed below when evaluating the 2012 program.

Program Participant Utility Bill Regression Analysis

Cadmus used a pre- and post-fixed effects modeling approach, allowing for directly developing savings estimates for each program measure category.

Cadmus received billing data for program participants from October 2008 through December 2012, pairing monthly billing information pre- and post-installation of incented equipment. This ensured the same months would be used in the pre- and post-periods, preventing bias resulting from using mismatching months. We found a model including participants with 11 months of pre- and post-billing information provided the most accurate results.

We obtained daily weather data from NOAA weather stations, corresponding to program participant ZIP codes. From the daily weather data, we obtained the base 65 reference temperature HDDs and CDDs, and then matched participant billing data to the nearest weather station by ZIP code, and matched each monthly billing period to the associated base 65 HDDs and CDDs.

Model Specification

We used a fixed effects modeling method, where we employed pooled monthly time-series (panel) billing data. The modeling approach corrected for differences between pre- and post-weather as well as for differences in the magnitude of usage between participants. The fixed effects component was characterized by normalization of variations across the range of participants by including a separate intercept for each customer. This assured model savings estimates would not be skewed by unusually high-usage or low-usage participants. Appendix E: Billing Analysis Specifications and Model Output provides model specification and output data.

Baseline Assumptions

The evaluation used the following measure baseline assumptions:

- *Central AC and Air-Source Heat Pump (Early Replacement):* Cadmus assumed the baseline condition as the existing, inefficient unit for the remaining useful life[20] of the unit, and then, for the remainder of the measure life, the baseline became a new replacement unit, meeting the minimum federal efficiency standards (13 SEER).
- *Central AC and Air-Source Heat Pump (Standard Replacement):* We assumed the baseline equipment to be a ducted, split-control central AC unit or an air-source heat pump, meeting minimum federal efficiency level standards (13 SEER).

Data Screening

Cadmus used the following criteria to screen customer billing data prior to analysis:

- We removed participants with fewer than 11 paired months in the pre- or post-period. This screen removed most 2012 program participants from analysis.
- We excluded participants with expected deemed savings over 70% of the pre-usage from analysis. In effect, this eliminated low-usage accounts, where expected savings from measure installations were too large in reference to the total pre-period usage.
- We excluded accounts changing usage from the pre- to post-period by more than 70%.
- We removed participants using less than 1,825 kWh in the pre- or post-year, and participants using less than 5 kWh per day in the pre- or post-period from the analysis. This would indicate insufficient cooling or heating usage, or vacant participant homes.

These screens eliminated 37% of the 2009–2012 program participants.

Model Results

Table 44 summarizes measure savings for the program. Generally, per unit adjusted gross savings estimates are slightly lower than *ex ante* estimates provided by DP&L and the program implementer Conservation Services Group (CSG).[21]

Table 44. Measure Savings Estimates (kWh)

Measure	Accounts Included in Analysis	*Ex Ante* UES Estimate	Adjusted Gross UES Estimate	Realization Rate
AC Early Retirement 14/15 SEER	2,423	1,210	1,134	93.7%
AC Early Retirement 16+ SEER	1,836	1,342	1,253	93.4%
AC Std Replacement 14/15 SEER	81	230	198	86.1%
HP Early Retirement 14/15 SEER	961	3,482	3,212	92.3%
HP Early Retirement 16+ SEER	604	3,231	3,291	101.8%

20 We obtained useful life (and remaining useful life for replaced equipment) estimates for all measures incented through the Residential Heating and Cooling Rebate Program from the draft Ohio TRM and DEER.

21 For several measures, CSG used results from previous Cadmus evaluation reports.

To verify the screening process outlined above did not introduce bias, and the billing analysis sample population was comparable to the 2012 program population for these measure categories, we compared the two populations in the following areas:

- Average SEER rating of incented equipment;
- Average size (tons) of incented equipment;
- Average SEER rating of replaced equipment;
- Average size (tons) of replaced equipment; and
- Average age (years) of replaced equipment.[22]

Table 45 and Table 46 compare these populations (with data tracking errors removed). This comparison reveals several minor differences regarding the characteristics of incented and replaced equipment.

Table 45. Comparison of Billing Analysis Sample to Program Population: Incented Equipment

Measure	Incented Equipment			
	Average SEER		Average Size (Tons)	
	Sample	Population	Sample	Population
AC Early Retirement 14/15 SEER	14.36	14.45	2.66	2.68
AC Early Retirement 16+ SEER	16.24	16.21	2.68	2.76
AC Std Replacement 14/15 SEER	14.35	14.41	2.72	2.73
HP Early Retirement 14/15 SEER	15.02	14.86	2.69	2.67
HP Early Retirement 16+ SEER	16.60	16.79	2.90	2.88

Table 46. Comparison of Billing Analysis Sample to Program Population: Replaced Equipment

Measure	Replaced Equipment					
	Average SEER		Average Size (Tons)		Average Age (Years)	
	Sample	Population	Sample	Population	Sample	Population
AC Early Retirement 14/15 SEER	9.51	9.81	2.65	2.65	20.06	19.84
AC Early Retirement 16+ SEER	9.62	9.88	2.60	2.69	19.84	18.98
AC Std Replacement 14/15 SEER	9.01	9.71	2.64	2.76	23.13	20.42
HP Early Retirement 14/15 SEER	10.40	10.33	2.62	2.60	17.28	18.63
HP Early Retirement 16+ SEER	10.37	10.47	2.73	2.69	17.46	17.30

This comparison reveals several minor differences regarding the characteristics of incented and replaced equipment. While some of these differences are statistically different, these differences generally tend to be very small and have a limited impact on the UES estimates. Therefore, we concluded the populations sufficiently similar to justify applying UES estimates, identified through the billing analysis to the 2012 population.

Cadmus applied UES estimates, identified through the participant billing analysis, to the program population to derive adjusted gross savings for the selected measures. Table 47 provides the results.

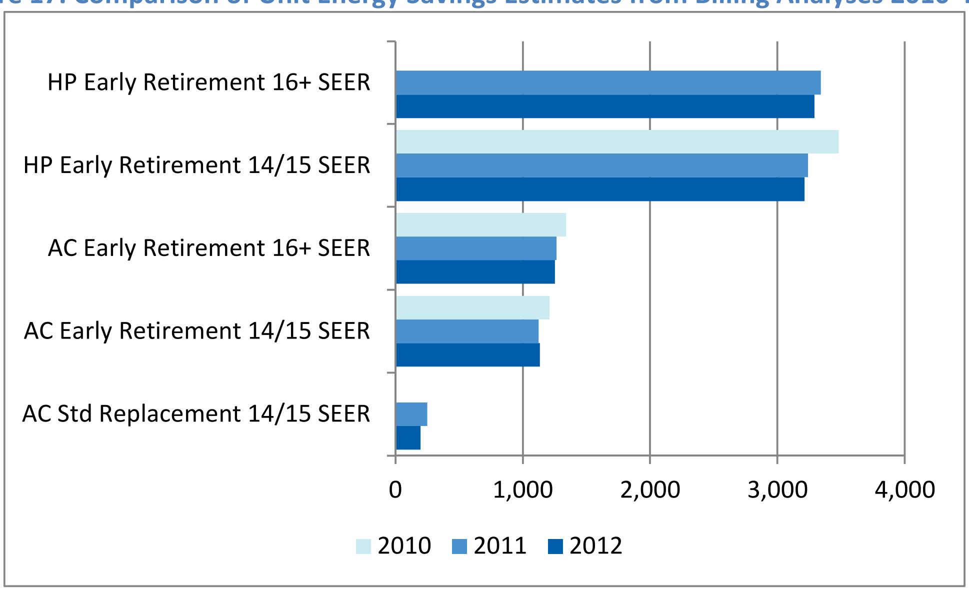
[22] Age of the replaced equipment can be calculated using the year the equipment was manufactured (we assumed January 1 for month and day) and the date the incented equipment was installed.

Table 47. Adjusted Gross Energy Savings from Participant Billing Analysis

Measure	2012		
	Participating Units	UES Estimate (kWh)	Total Annual Adjusted Gross kWh Savings
AC Early Retirement 14/15 SEER	1,208	1,134	1,369,486
AC Early Retirement 16+ SEER	627	1,253	785,661
AC Std Replacement 14/15 SEER	60	198	11,883
HP Early Retirement 14/15 SEER	425	3,212	1,365,168
HP Early Retirement 16+ SEER	322	3,291	1,059,623
Total	**2,642**		**4,591,821**

Overall, billing analysis results aligned with expectations. The UES estimates calculated through the 2012 billing analysis are similar to findings from the 2010 and 2011 analyses. Figure 17 provides a summary of the billing analyses. We used the draft Ohio TRM to calculate adjusted gross UES in 2009 as not enough time had elapsed between the installation of the incented equipment and our evaluation activities to conduct a billing analysis. Thus, the comparison below does not include results from 2009. Similarly, the billing analysis only included early replacement central AC (SEER 14/ 15 and 16+) and air-source heat pump (SEER 14/ 15) measures in 2010.

Figure 17. Comparison of Unit Energy Savings Estimates from Billing Analyses 2010–2012



Draft Ohio TRM Calculations

Cadmus deferred to the draft Ohio TRM when calculating the adjusted gross energy savings for all measures, except mini-splits and ECMs and measures included in the participant billing analysis. The draft Ohio TRM does not include mini-splits and ECMs measures. Though the draft Ohio TRM does not address some variations of common measures, specifically early replacement heat pumps, savings calculations and assumption for these measures can be adapted from information provided. Additional detail follows below.

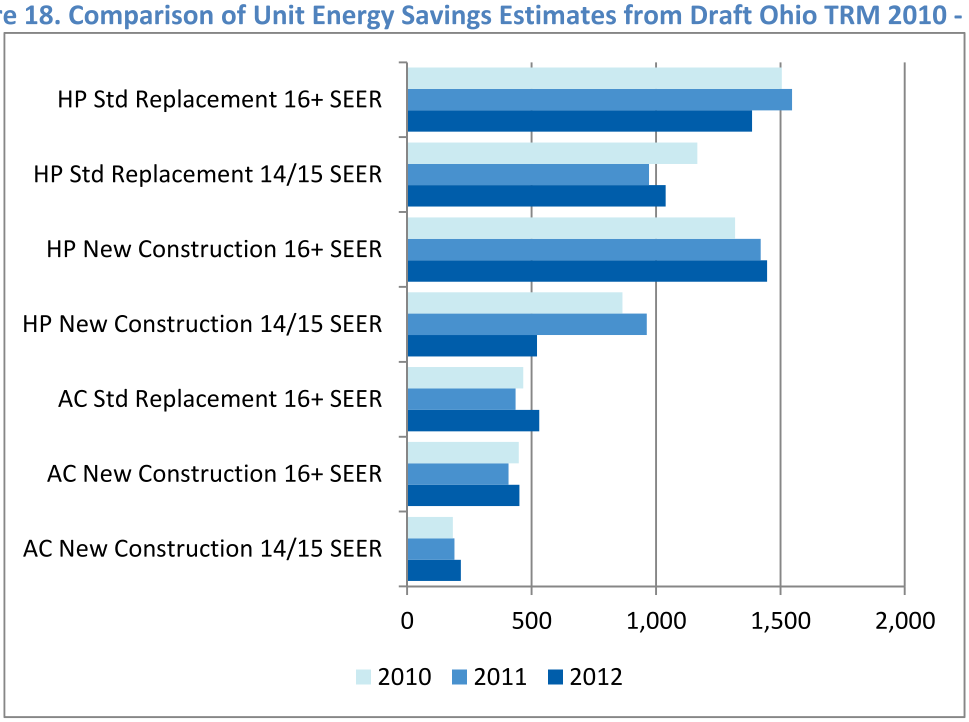
We applied draft Ohio TRM energy savings equations and assumptions to the 2012 program participants, resulting in the annual energy savings estimates provided in Table 48.

Table 48. Adjusted Gross Energy savings from Draft Ohio TRM Calculations

Measure	2012		
	Participating Units	Average UES Estimate (kWh)	Total Annual Adjusted Gross kWh Savings
AC New Construction 14/15 SEER	69	216	14,907
AC New Construction 16+ SEER	42	450	18,921
AC Std Replacement 16+ SEER	22	531	11,685
HP New Construction 14/15 SEER	550	522	287,240
HP New Construction 16+ SEER	28	1,447	40,513
HP Std Replacement 14/15 SEER	32	1,039	33,240
HP Std Replacement 16+ SEER	24	1,386	33,263
GSHP Early Retirement 16/18 EER	52	5,925	308,112
GSHP Early Retirement 19+ EER	51	6,839	348,778
GSHP New Construction 16/18 EER	11	5,641	62,046
GSHP New Construction 19+ EER	13	5,381	69,950
GSHP Std Replacement 16/18 EER	1	5,090	5,090
GSHP Std Replacement 19+ EER	4	5,381	21,526
Total	**899**		**1,255,271**

As indicated in Figure 18,[23] the adjusted gross UES estimates calculated using the draft Ohio TRM are generally in line with values observed in previous years.

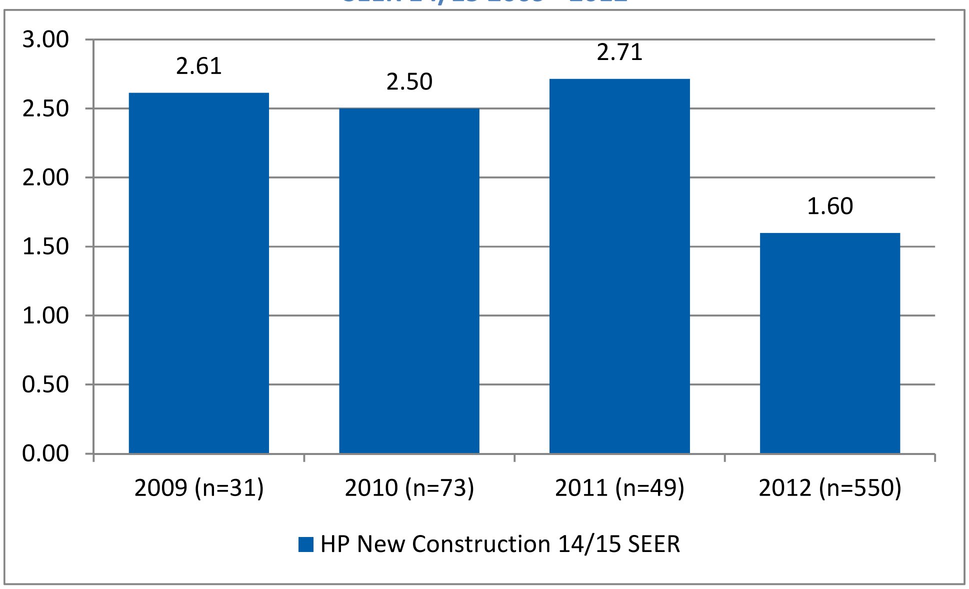
Figure 18. Comparison of Unit Energy Savings Estimates from Draft Ohio TRM 2010 - 2012



23 Ground-source heat pump measures are not included as efficiency requirements for this measure increased in 2012 and a direct comparison to previous years is not appropriate.

The decrease in UES for the new construction heat pump 14/15 SEER measure is due to an appreciable decrease in the size of the incented units in 2012. The observed increase in the total number of new construction heat pump 14/15 SEER measures (550) and reduction in the average size for this measure is the result of a single large contractor installing these measures in numerous model home properties. Figure 19 provides additional detail.

Figure 19. Average Sizes (Tons) of Incented New Construction Heat Pump Measures SEER 14/15 2009 - 2012



When calculating energy savings, Cadmus adhered to all savings equations and assumptions articulated in the draft Ohio TRM, with the exceptions described below.

Central AC and Air-Source Heat Pump

- The draft Ohio TRM lists 631 as the full-load cooling hours for the Dayton, Ohio, area. However, this estimate included a 33% reduction for oversizing of newly installed equipment. We established this oversizing correction was not applicable for this program, based on discussions with program staff; we used full-load cooling hours from the ENERGY STAR® Calculator (947). The billing analysis results also implied cooling hours in the draft Ohio TRM were too low.
- The draft Ohio TRM does not include early-replacement, air-source heat pump measures. To calculate energy savings and demand reductions for these measures, we adapted the appropriate Time of Sale calculations to include the size and efficiency of the replaced equipment.
- The draft Ohio TRM indicates, where available, actual installation data (e.g., replaced unit size and SEER rating) should be used instead of draft Ohio TRM assumptions. The participant database contained all necessary data to calculate energy and demand savings. However, 12 early replacement central AC and 9 early replacement air-source heat pump installations lacked the SEER rating of the replaced equipment. When calculating savings for these measures,

the average size SEER ratings of equipment replaced from the same incented measure category were used as proxies.

Ground-Source Heat Pump

- The draft Ohio TRM lists 631 as the full-load cooling hours for the Dayton, Ohio, area. However, this estimate included a 33% reduction for oversizing of newly installed equipment. We established this oversizing correction was not applicable for this program, based on discussions with program staff; we used full-load cooling hours from the ENERGY STAR® Calculator (947). The billing analysis results also implied cooling hours in the draft Ohio TRM were too low.
- The draft Ohio TRM does not include early replacement ground-source heat pump measures. To calculate energy savings and demand reductions for these measures, we adapted the appropriate Time of Sale calculations to include the size and efficiency of the replaced equipment.
- Noted in the draft Ohio TRM Joint Objections and Comments document, the energy savings algorithm for replace-on-burnout, ground-source heat pump measures lacks the equation's "/1000" component, which was included in the gross savings calculations.
- The program tracking database did not capture the Heating Seasonal Performance Factor (HSPF) of the replaced unit; so we assumed the federal minimum standard between 1992 and 2006 (included in the footnote on page 28 of the draft Ohio TRM in the residential HVAC Diagnostic & Tune-Up section).
- Sixteen early replacement installations lacked data on the SEER value of the replaced unit, therefore we used average SEER estimates from the same measure categories as proxies.
- The program tracking database only contained four entries for coefficient of performance (COP) of the existing unit (out of the 103 incented early replacment units). Therefore, we used the HSPF value from page 28 of the draft Ohio TRM and the HSPF to COP conversion factor from page 84 of the draft Ohio TRM as a proxy.
- The program tracking database only contained eight entries for EER ratings of existing units (out of 103 incented early replacment units). Therefore, we used the EER value of 11, provided on page 85 of the draft Ohio TRM, as a proxy.
- Ground-source heat pumps tend to be sized for heating rather than cooling. In an area such as Ohio, this generally leads to oversized equipment on the cooling side. Draft Ohio TRM savings equations use a unit's overall capacity to determine savings. This may overstate cooling savings for a unit. To correct for such oversizing when calculating cooling savings for early replacement and replace-on-burnout units, we used the capacity of the replaced unit. For new construction, we could not make this adjustment, and therefore used the capacity of the newly installed unit.

Engineering Calculations Based on Secondary Sources

The draft Ohio TRM did not provide savings equations and assumptions for mini-split air conditioners and heat pumps, and too few participants could be included in the billing analysis to provide precise savings estimates. Therefore, to determine adjusted gross energy savings and demand reductions for these measures, we followed the same general approach used for the 2010 and 2011 evaluations: relying on engineering calculations, based on secondary source data. For this round of evaluation, we updated the assumed size and efficiency of the incented units included in the calculations, using data from the 2012 program tracking database.

The program added the ECM measure in 2012. To determine adjusted gross energy savings and demand reductions for this measure, we reviewed engineering calculations provided by CSG. These calculations included algorithms and assumptions from the draft Ohio TRM and secondary sources. Overall, we agreed with the algorithms and assumptions. However, we updated the annual fuel utilization efficiency, for a customer's furnace on which incented ECMs have been installed and size of the customer's cooling equipment using program tracking data from the 2012 population.

Cadmus also used the methodology CSG employed when calculating savings for ECM measures installed with new central AC or air-source heat pump measures: including only heating savings for ECMs installed with new central ACs, and not including savings for ECMs installed with new heat pumps. If an ECM is installed with a new HVAC system, and that system's Air-Conditioning, Heating and Refrigeration (AHRI) SEER rating is based on the furnace with ECM motor installed, the SEER rating accounts for cooling savings attributable to the ECM's presence. For example, Figure 20 and Figure 21 present two identical AHRI systems. Figure 20 includes a furnace model with an ECM, resulting in a 16.5 SEER rating. Figure 21 does not include the furnace efficiency, defaulting to a standard efficiency fan, and resulting in a 14.2 SEER rating.

Figure 20. Split System, Air-Cooled Condensing Unit, Coil with Blower

AHRI CERTIFIED™
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Certificate of Product Ratings

AHRI Certified Reference Number: 3933028 Date: 4/18/2013

Product: Split System: Air-Cooled Condensing Unit, Coil with Blower
Outdoor Unit Model Number: XC16-036-230-03
Indoor Unit Model Number: CX34-43+TDR
Furnace Model Number: SL280UH090V60C*
Manufacturer: LENNOX INDUSTRIES, INC.
Trade/Brand name: XC16 SERIES

Manufacturer responsible for the rating of this system combination is LENNOX INDUSTRIES, INC.

Rated as follows in accordance with AHRI Standard 210/240-2008 for Unitary Air-Conditioning and Air-Source Heat Pump Equipment and subject to verification of rating accuracy by AHRI-sponsored, independent, third party testing:

Cooling Capacity (Btuh):	36400
EER Rating (Cooling):	12.00
SEER Rating (Cooling):	16.50

Figure 21. Split System, Air-Cooled Condensing Unit, Coil Alone

AHRI CERTIFIED™
www.ahridirectory.org

Certificate of Product Ratings

AHRI Certified Reference Number: 3068635 Date: 4/18/2013

Product: Split System: Air-Cooled Condensing Unit, Coil Alone
Outdoor Unit Model Number: XC16-036-230-03
Indoor Unit Model Number: CX34-43+TDR
Manufacturer: LENNOX INDUSTRIES, INC.
Trade/Brand name: XC16 SERIES

Manufacturer responsible for the rating of this system combination is LENNOX INDUSTRIES, INC.

Rated as follows in accordance with AHRI Standard 210/240-2008 for Unitary Air-Conditioning and Air-Source Heat Pump Equipment and subject to verification of rating accuracy by AHRI-sponsored, independent, third party testing:

Cooling Capacity (Btuh):	35200
EER Rating (Cooling):	11.00
SEER Rating (Cooling):	14.20

If the AHRI rating of a new central AC or heat-pump does not include the ECM fan, additional savings would occur, though this would be difficult to assess, requiring a search that includes the new SEER with the matched furnace model number (and these sometimes do not exist).

Table 49 presents the annual savings estimates produced by these approaches. Annual demand reduction estimates identified through these approaches are presented below.

Table 49. Adjusted Gross Energy Savings from Engineering Calculations Based on Secondary Sources

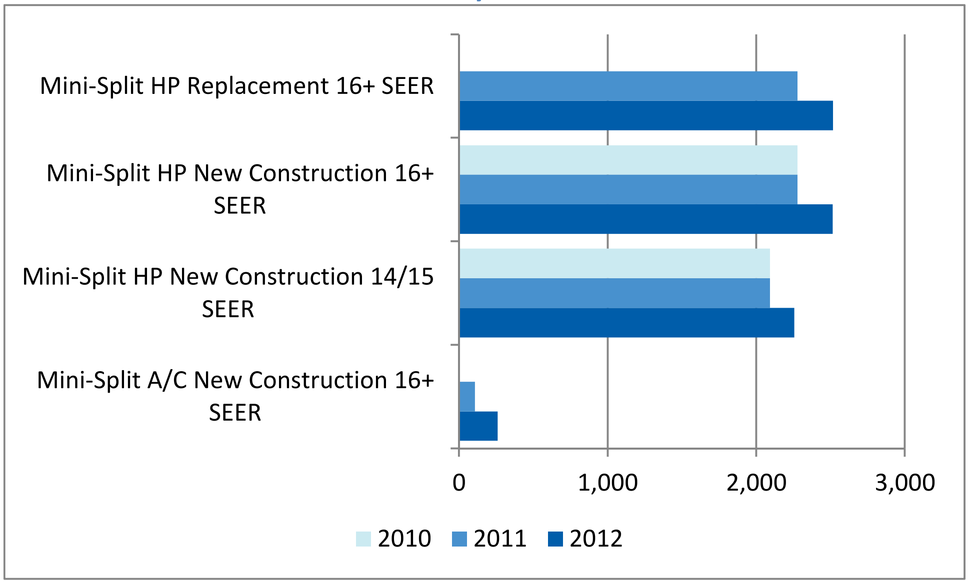
Measure	2012		
	Participating Units	Average UES Estimate (kWh)	Total Annual Adjusted Gross kWh Savings
Mini-Split AC New Construction 16+ SEER	13	261	3,390
Mini-Split HP New Construction 14/15 SEER	3	2,256	6,769
Mini-Split HP New Construction 16+ SEER	84	2,515	211,276
Mini-Split HP Replacement 16+ SEER	6	2,517	15,103
ECM Motor on Furnace (with New AC)	929	349	324,462
ECM Motor on Furnace (with New HP)	23	0	0
ECM Motor on Furnace	288	684	197,003
Total	**1,346**		**758,002**

As indicated in Figure 22,[24] the adjusted gross UES estimates, calculated using engineering calculations based on secondary sources, generally ran slightly higher than those observed in previous years. The

[24] As a new measure offering in 2012, ECMs cannot be directly compared to previous years.

slight upward trend in 2012 reflects the incorporation of actual program tracking data into the estimates, as discussed above.

Figure 22. Comparison of Unit Energy Savings Estimates from Engineering Calculations Based on Secondary Sources 2010–2012



Calculating Demand Reduction

Cadmus used the draft Ohio TRM to calculate adjusted gross demand reduction estimates for all measures in the 2012 participant database, except mini-split and ECM measures. We did not deviate from draft Ohio TRM equations or assumptions when calculating demand savings for these measures, with the following three exceptions:

- The draft Ohio TRM did not include early replacement air- or ground-source heat pump measures. To calculate energy savings and demand reductions for these measures, we adapted the appropriate Time of Sale calculations to include the size and efficiency of the replaced equipment.
- For ground-source heat pumps, the program tracking database only contained eight entries for EER ratings of existing units (out of the 103 incented early replacment units). Therefore, we used the EER value of 11, provided on page 85 of the draft Ohio TRM, as a proxy.
- We calculated demand UES for mini-split and measures using the aforementioned mini-split studies and engineering calculations.

Table 50 provides the resulting annual demand reduction.

Table 50. Adjusted Gross Demand Reduction

Measure	2012		
	Participating Units	Average UDR Estimate (kW)	Total Annual Adjusted Gross kW Reduction
AC Early Retirement 14/15 SEER	1,208	0.60	719.99
AC Early Retirement 16+ SEER	627	0.74	462.08
AC New Construction 14/15 SEER	69	0.21	14.16
AC New Construction 16+ SEER	42	0.35	14.49
AC Std Replacement 14/15 SEER	60	0.23	13.60
AC Std Replacement 16+ SEER	22	0.41	9.02
HP Early Retirement 14/15 SEER	425	0.54	230.73
HP Early Retirement 16+ SEER	322	0.72	231.57
HP New Construction 14/15 SEER	550	0.16	88.33
HP New Construction 16+ SEER	28	0.39	10.81
HP Std Replacement 14/15 SEER	32	0.27	8.63
HP Std Replacement 16+ SEER	24	0.38	9.02
GSHP Early Retirement 16/18 EER	52	0.33	17.28
GSHP Early Retirement 19+ EER	51	0.52	26.71
GSHP New Construction 16/18 EER	11	0.37	4.05
GSHP New Construction 19+ EER	13	0.44	5.72
GSHP Std Replacement 16/18 EER	1	0.29	0.29
GSHP Std Replacement 19+ EER	4	0.48	1.93
Mini-Split AC New Construction 16+ SEER	13	0.27	3.46
Mini-Split HP New Construction 14/15 SEER	3	0.16	0.48
Mini-Split HP New Construction 16+ SEER	84	0.27	22.83
Mini-Split HP Replacement 16+ SEER	6	0.28	1.67
ECM Motor in Furnace	929	0.00	0.00
ECM Motor in Furnace	23	0.00	0.00
ECM Motor in Furnace	288	0.26	75.12
Total	**4,887**		**1,971.96**

As indicated in Figure 23, Figure 24, and Figure 25, per-unit demand reduction estimates for central AC and air-source heap pump measures generally aligned with values observed in 2011. The marked upward trend observed in the 2012 estimates for mini-split AC and heat pump measures reflected incorporation of actual program tracking data into the estimates, as discussed. The decrease observed in between 2010 and 2011 for most measures was due in large part to a marked increase in the efficiency of replaced units for early replacement measures and a minor dip in the average efficiency of incented equipment in several measure categories.

Figure 23. Comparison of Per-Unit Demand Reduction Estimates for CAC Measures from Draft Ohio TRM 2010–2012

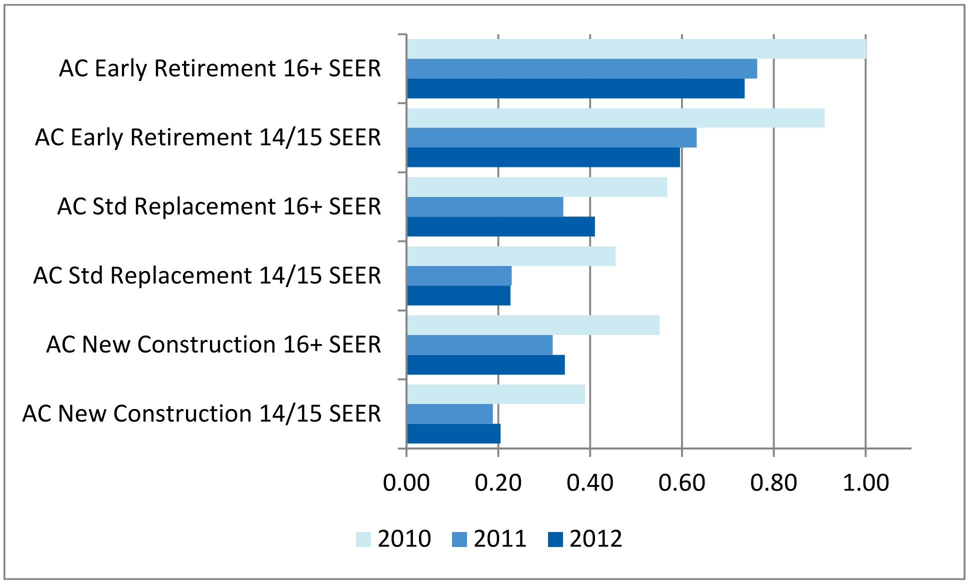


Figure 24. Comparison of Per-Unit Demand Reduction Estimates for ASHP Measures from Draft Ohio TRM 2010–2012

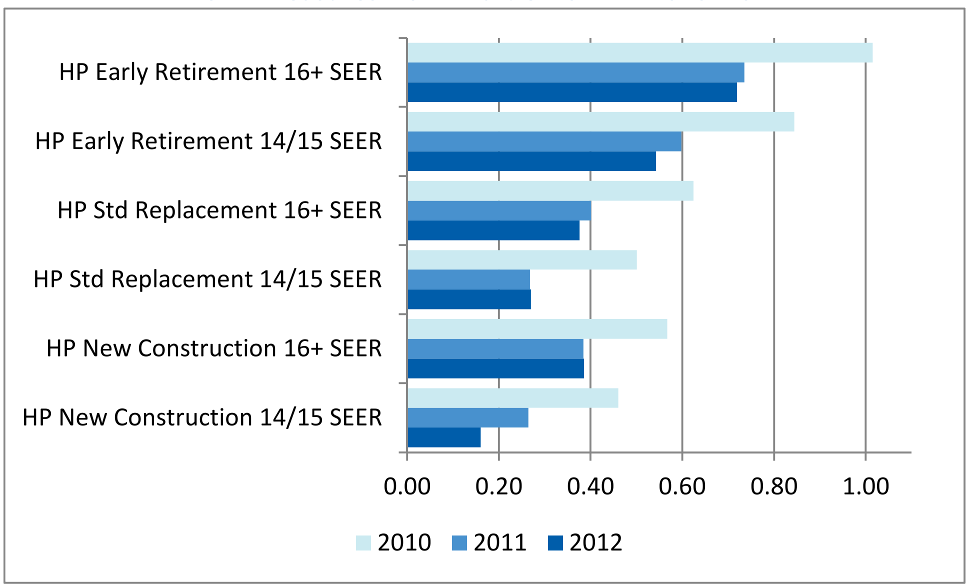
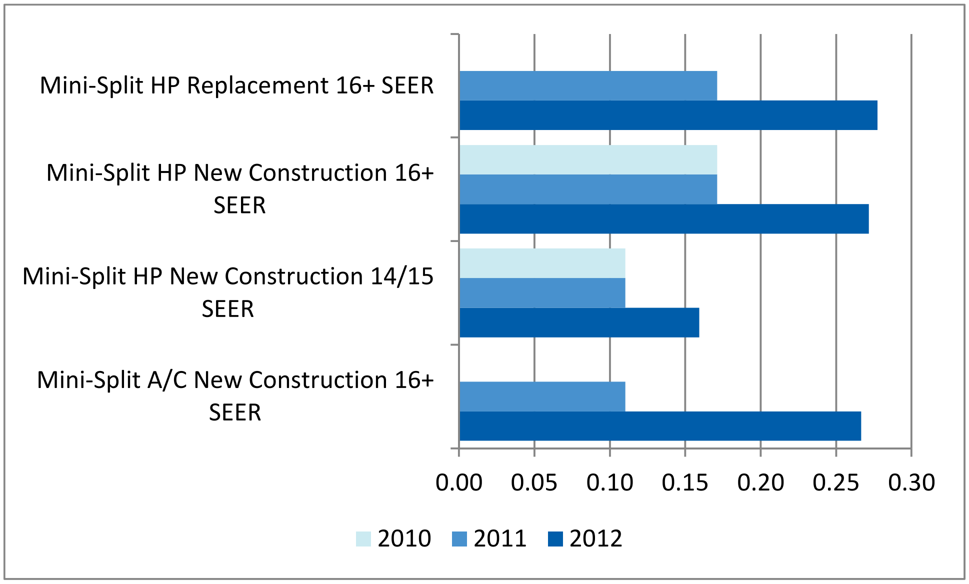


Figure 25. Comparison of Per-Unit Demand Reduction Estimates from Engineering Calculations Based on Secondary Sources 2010–2012



Data Tracking System Review

Database Accuracy and Completeness

Similar to evaluation findings from previous years, program tracking data for the 2012 Residential Heating and Cooling Rebate program generally were complete, accurate, and provided the necessary information to calculate informed energy savings and demand reduction estimates. The few data tracking issues identified included minor omissions in size and efficiency fields for some replaced equipment in a limited number of database entries, as noted in the energy savings methodology section.

Trends in Replaced and Incented Equipment

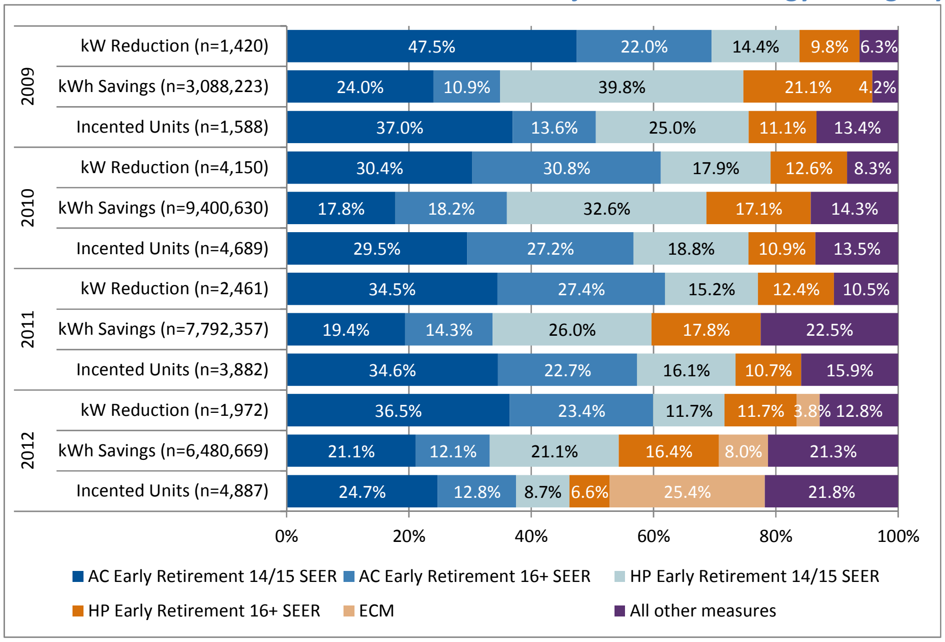
For over four years, the residential Heating and Cooling Rebate program has incented installation of high-efficiency HVAC equipment. The incentive mix offered has changed slightly (e.g., increased efficiency requirements for ground-source heat pump measures, the addition of ECM measures), but the program consistently has paid incentives on more measure types each year. Table 51 summarizes the number of types of measures incented, by year.

Table 51. Number of Different types of Incentives Paid 2009–2012

	2009	2010	2011	2012
Number of measure-types with one or more rebate paid	12	19	22	23

Despite the addition of several new measures, however, the majority of incentives, energy savings, and demand reductions are consistently derived from early replacement AC and air-source heat pump measures. The most appreciable change in 2012 occurred with the addition of the ECM measure. Figure 26 provides additional detail.

Figure 26. Distribution of Incented Measures and Adjusted Gross Energy Savings by Year



As the program incents removal of older equipment, we expect the composition of replaced equipment will change over time. Through a review of program tracking data for early replacement measures, incented continuously from 2009 through 2012, we see the efficiency of incented equipment generally remained constant, while average efficiency of replaced equipment increased. This trend may result in lower energy saving and demand reductions over time. Figure 27 and Figure 28 provide additional details. Appreciable trends did not become apparent in the size or age of replaced or incented equipment.

Figure 27. Average SEER Ratings of Incented Early Replacement Equipment by Year

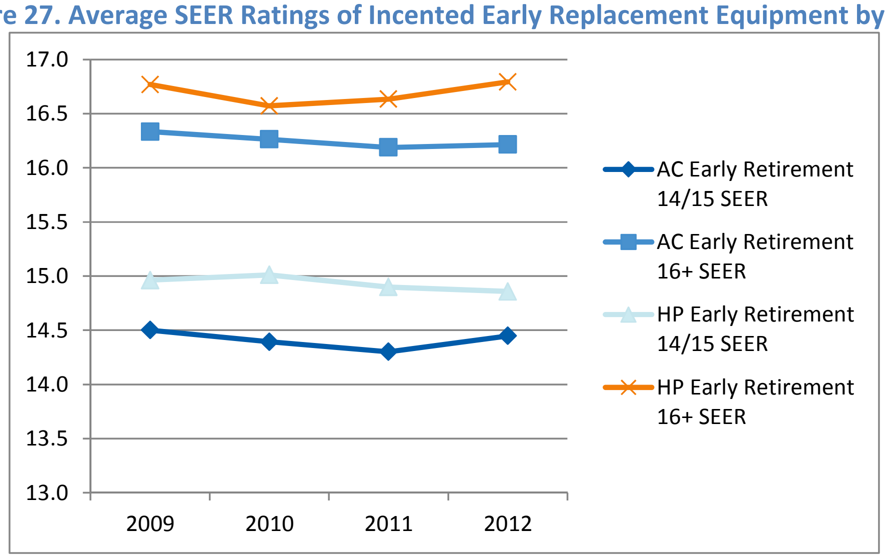
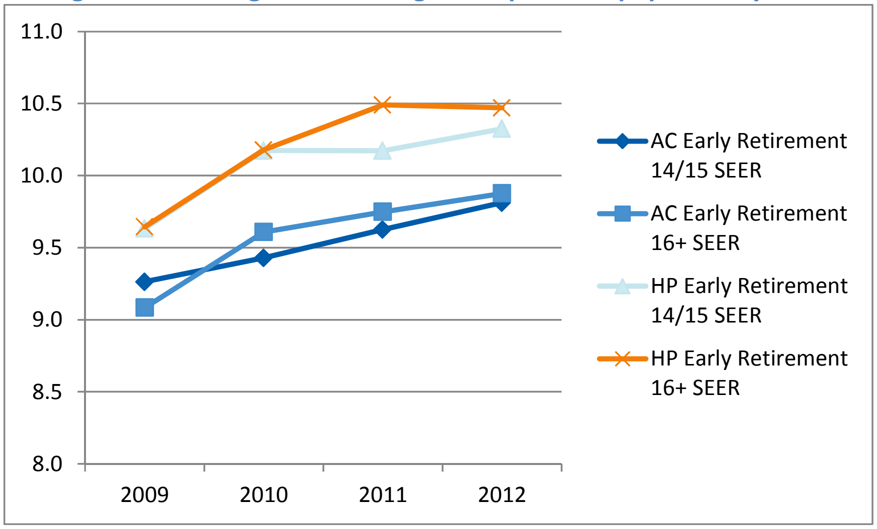


Figure 28. Average SEER Ratings of Replaced Equipment by Year



Recommendations

Drawing upon the preceding findings, Cadmus offers the following recommendations:

- The program implementer and DP&L should adjust *ex ante* per-unit savings to reflect estimates calculated in this evaluation. As rounding issues had a significant impact on the *ex ante* savings compared to adjusted gross savings realization rates, especially for demand savings, Cadmus will supply more granular level of detail to CSG moving forward.
- While Cadmus found the program not cost-effective based on the TRC cost-test, it continues to provide high levels of savings and experiences strong customer uptake. We recommend DP&L continue to implement the program in 2013 and beyond.
- DP&L should continue to offer the ECM as a measure offering in future program years. The measure had participation, reasonable savings, and TRC and UCT cost-tests indicate it is cost-effective.

Residential HVAC Diagnostic & Tune-Up Program

Program Design Changes

Due to limited uptake among contractors and customers in the 2010 and 2011 program years, DP&L and the program implementer, CSG, chose to change the residential HVAC Diagnostic & Tune-Up program design and measure offerings.

The 2012 residential HVAC Diagnostic & Tune-Up program offered a checklist-based HVAC tune-up, a design differing from the previous program in that the former version required more thorough—but time-consuming—test-in and test-out steps. Under the 2012 program, participant contractors conducted a series of required tests and adjustments designed to achieve energy savings for most cooling equipment. To ensure quality work, contractors were required to use quality, correctly calibrated tools, and CSG conducted follow-up verification site visits for a sample of completed projects.

Due to consistently lower-than-expected program uptake and evaluated energy-savings and demand reductions, DP&L plans to ramp down and discontinue the residential HVAC Diagnostic & Tune-Up program in 2013, directing funds to other, cost-effective programs.

Evaluation Overview

Cadmus' evaluation of the 2012 residential HVAC Diagnostic & Tune-Up program followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 52 identifies key researchable evaluation questions.

Table 52. Key Researchable Questions

Researchable Question	Activity to Support Question
What were the gross electric savings and demand reductions?	• Analysis of participant billing data. • Draft Ohio TRM calculation and assumption review. • Program database review.
Is this program cost-effective?	• Cost-effectiveness tests.

Detailed Evaluation Findings

The following key findings relate to the impact evaluation:

- The program achieved 983,335 kwh in energy savings and 156.3 kW in demand reduction. Compared to claimed *ex ante* claimed savings, the program produced realization rates of 90% for energy savings, and 83% for demand savings. Compared to filed goals, the program achieved realization rates of 33% for energy savings, and 6% for demand savings, primarily due to lower-than-expected UES and per-unit demand reduction estimates.

Table 53. Residential HVAC Diagnostic & Tune-Up Discount Program Claimed and Achieved Energy Savings

Measure	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	kWh	kW	kWh	kW	kWh	kW	Precision*
Central AC	668,024	156.44	669,591	157.13	426,924	132.10	±0.001%
Air-Source Heat Pump	427,056	31.25	427,071	31.21	556,411	24.20	±0.025%
Total**	**1,095,080**	**187.70**	**1,096,662**	**188.34**	**983,335**	**156.30**	**±0.010%**

* Precision at 90% confidence.
** Values in table may not sum to 100% exactly due to rounding.

- Following the redesign in 2012, the residential HVAC Diagnostic & Tune-Up program achieved a dramatic increase in participation in both the central AC and air-source heat-pump measure categories.
- When the residential HVAC Diagnostic & Tune-Up program is suspended in 2013, DP&L will have offered an incentive for residential HVAC tune-up services for four years. To ensure customers and contractors understand the transition, DP&L conducted program outreach explaining the rationale for the decision and directing stakeholders and customers to other DP&L program offerings.

Evaluation Data Collection Methods

Cadmus used the approaches detailed below in evaluating the 2012 program.

Impact Evaluation Methodology and Findings

Following the approach outlined in the 2012 evaluation plan, Cadmus originally attempted to validate energy savings and demand reductions for the residential HVAC Diagnostic & Tune-Up program using *in situ* meter data collected through an evaluation of a similar residential HVAC tune-up program implemented by another Midwestern utility. However, a review of the Midwestern utility's program tracking data found insufficient data on the services performed for each tune-up to accurately match metered data to DP&L program participants. Therefore, Cadmus implemented the revised evaluation approach detailed below.

Princeton Scorekeeping Method (PRISM) Analysis of Participant Billing Data and Draft Ohio TRM Assumptions

In January 2013, Cadmus conducted a PRISM analysis of billing for program participants. PRISM is a statistical procedure used to produce a weather-adjusted index of energy consumption, and provides results in terms of base-load versus heating consumption and base-load versus cooling consumption, based on a selected reference temperature. We applied a 5% energy-saving estimate from the draft Ohio TRM to these usage estimates to calculate a UES for each equipment type (central ACs and air-source heat pumps).

The PRISM analysis approach proved advantageous over a traditional billing analysis due to insufficient post-period data and because incented tune-ups experienced low savings compared to other natural variations in customers' bills, likely resulting in estimates with unacceptably low precision levels.

Though Cadmus considered all 2012 program participants for the analysis, we removed a limited number of accounts (287 out of 4,738)[25] that had very low cooling usage, model problems, or insufficient billing data. Analysis only included pre-period consumption data (i.e., customer usage prior to the equipment tune-up).

From NOAA weather stations, we obtained daily weather data corresponding to program participant ZIP codes. The daily weather data allowed us to determine the base 65 reference temperature HDDs and CDDs; we then matched participant billing data to the nearest weather station by ZIP code, and matched each monthly billing period to the associated base 65 heating and CDDs.

The total number of tune-up performed in 2012 was 5,135. However, 39 tune-ups did not pass all required program checks. Therefore, DP&L did not include these measures in *ex ante* claimed savings. Similarly, Cadmus did not include these measures in verified or adjusted gross savings. Table 54 provides additional detail.

Table 54. Count of Tune-Up Services Performed and Successfully Completed

Measure	Tune-Up Services Performed	Tune-Up Successfully Completed	Difference
Central AC	4,258	4,228	30
Air-Source Heat Pump	877	868	9
Total	**5,135**	**5,096**	**39**

Cadmus applied UES estimates, identified through the PRISM analysis, to the program population, thus deriving adjusted gross savings for both equipment types. Table 55 provides the results.

Table 55. Adjusted Gross Energy Savings from PRISM Analysis of Participant Billing Data and Draft Ohio TRM Assumptions

Measure	2012				
	Participating Units	Total Cooling Usage (PRISM)	Total Heating Usage (PRISM)	Average UES Estimate (kWh)*	Total Annual Adjusted Gross kWh Savings
Central AC	4,228	2,020	0	101	426,924
Air-Source Heat Pump	868	2,244	10,576	641	556,411
Total	**5,096**	**4,264**	**10,576**		**983,335**

* Total cooling and heating usage multiplied by 5% (TRM deemed savings estimate).

Draft Ohio TRM Calculations

Cadmus deferred to the draft Ohio TRM when calculating adjusted gross demand reductions for the residential HVAC Diagnostic & Tune-Up program. We applied draft Ohio TRM energy savings equations and assumptions to 2012 program participants, resulting in the per-unit demand reductions provided in Table 56.

[25] Several customers received tune-ups for more than one system.

Table 56. Adjusted Gross Per-Unit Demand Reduction from Draft Ohio TRM Calculations

Measure	2012		
	Participating Units	Average UES Estimate (kW)	Total Annual Verified Gross kW Reduction
Central AC	4,228	0.03	132.10
Air-Source Heat Pump	868	0.03	24.20
Total	**5,096**		**156.30**

When calculating energy savings and demand reductions, Cadmus adhered to all savings equations and assumptions articulated in the draft Ohio TRM, with the exceptions detailed below.

Central AC

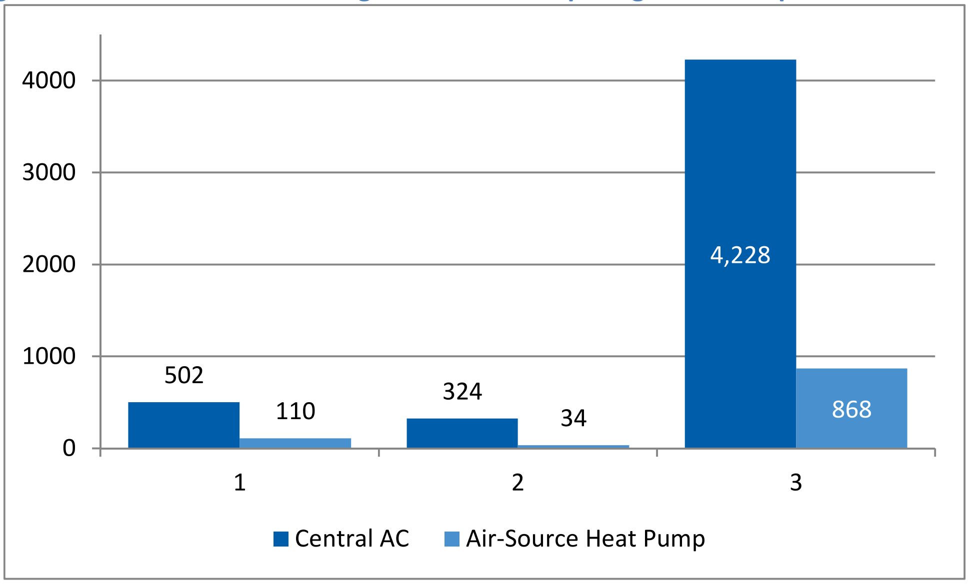
- The draft Ohio TRM indicates that, where available, actual installation data (e.g., replaced unit size and SEER rating) should be used instead of draft Ohio TRM assumptions. Though the participant database contained all necessary data to calculate energy and demand savings, the following fields had missing entries or contained erroneous values:
  - System size entries for 47 central ACs;
  - System size entries for five air-source heat pumps;
  - System SEER for 177 central ACs;
  - System SEER for 33 air-source heat pump measures; and
  - System HSFP for 70 air-source heat pump measures.

When calculating savings for these measures, Cadmus used average size, SEER, and HSFP values from the same equipment category as proxies.

Program Participation

In the first two years of implementation, DP&L residential HVAC tune-up programs experienced appreciably lower customer uptake than anticipated. However, following the redesign in 2012 the residential HVAC Diagnostic & Tune-Up program achieved a dramatic increase in participation in both the central AC and air-source heat-pump measure categories. From discussions with DP&L, we understand that this trend may reflect a high level of participation among homeowners with existing maintenance contracts that were eligible for a program rebate, rather than strong customer interest in this type of measure offering. Figure 29 provides additional detail.

Figure 29. Residential HVAC Diagnostic & Tune-Up Program Participation 2010–2012



Recommendations

Drawn from the preceding findings, Cadmus offers the following recommendations:

- Due to consistently low TRC and UCT cost-effectiveness findings for DP&L residential HVAC tune-up programs, Cadmus supports DP&L's decision to suspend residential HVAC Diagnostic & Tune-Up program implementation in 2013.

Residential Energy Education (Be E^3 Smart) Program

Evaluation Overview

Cadmus' evaluation of the 2012 residential Be E^3 Smart program followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 57 identifies key researchable evaluation questions.

Table 57. Key Researchable Questions

Researchable Question	Activity Used to Address Question
How many schools, teachers, and students participated in the program?	• Review of database and documentation.
What are the program's gross energy and demand impacts?	• Analysis of student-returned surveys. • Engineering analysis. • Follow-up parent survey.
Which program kit measures proved useful? Which measures proved less useful?	• Stakeholder interviews. • Follow-up parent survey.
How long do participants wait to install measures? What is the removal rate for kit measures?	• Analysis of student-returned surveys. • Follow-up parent survey.
Are parents of children participating in the Be E^3 Smart program more satisfied with DP&L's service? Are they more likely to participate in other programs?	• Analysis of student-returned surveys. • Follow-up parent survey.
What school and teacher participation barriers does the program face? How effectively does the program overcome those barriers?	• Follow-up parent survey. • Stakeholder interviews.
Is this program cost-effective?	• Cost-effectiveness analysis.

Detailed Evaluation Findings

The following key findings relate to the impact and process evaluations.

- The program achieved 4,527,447 kWh in energy savings and 312 kW in demand reductions. Compared against claimed *ex ante* claimed savings, the program had realization rates of 99.6% for energy savings, and 96.7% for demand savings. [26] Table 58 summarizes *ex ante*, verified gross, and adjusted gross savings.

Table 58. Residential Be E^3 Smart Program Claimed and Achieved Energy Savings

Energy Education	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	kWh	kW	kWh	kW	kWh	kW	Precision*
13 Watt CFL	1,295,587	137	1,331,010	141	1,331,010	141	± 7%
LED Night Light	19,109	0	22,430	0	22,430	0	± 14%
Bathroom Faucet Aerator	414,961	26	514,706	32	508,181	29	± 38%
Kitchen Faucet Aerator	1,196,851	75	1,057,754	66	1,141,233	65	± 22%
Efficient Showerhead	1,618,326	85	1,460,230	77	1,524,593	78	± 24%
Total**	**4,544,834**	**323**	**4,386,130**	**316**	**4,527,447**	**312**	**± 15%**

* Precision at 90% confidence.
** Values in table may not sum to 100% exactly due to rounding.

[26] DP&L does not produce goals for the Be E^3 Smart program.

- The transition from a paper take-home Family Home Installation Survey to an online survey led to: improved data quality; less demand on Ohio Energy Project (OEP) staff resources (for data entry); and a comparable survey response rate (75% for the 2012 online survey, compared to 72% for the 2011 paper survey).
- Seventy-seven percent of CFLs were installed within six months to one year after participating in the program. Many CFLs (roughly one-quarter of all CFLs installed) were installed after families completed the family home installation survey. Few families (approximately 2%) removed CFLs after installing them.
- Showerheads and faucet aerators added significant energy savings to the program in 2012. Savings for these measures accounted for roughly 70% of overall program savings due to relatively high saturations of electric water heaters among participants (50%), a large average household size (roughly 4.5 people per home), and for showerheads a low gallons per minute device (1.25 gpm). Homes with children generally have higher-than-average water heating consumption—because the program reaches these homes exclusively, DP&L captured above average energy savings for these measures. Customers reported high satisfaction levels with the program and measures, with 91% of participants reporting they were either *"very satisfied"* or *"somewhat satisfied"* with the program. Only 6% of respondents reported dissatisfaction. Nearly one-half of participants (48%) said their satisfaction with DP&L increased due to participating in the program.

Evaluation Data Collection Methods

Program Database Review

The program relied on responses from a student take-home survey (the Family Home Installation Survey) to estimate the number of measures installed from kits provided through OEP. After presenting the energy education lesson, teachers provided students with instructions on how to complete an online survey, and encouraged them to take the survey after one to two weeks.

Through the survey, students reported how many measures they installed from the kit, and if they adopted recommended behavioral changes (such as adjusting thermostat settings) after receiving the kits. The survey also collected basic household and demographic information, such as: heating and cooling system types, family size, and type of home (e.g., single-family, multifamily). The survey realized a 75% response rate, with 6,898 of the participating 9,226 families completing the online survey.

Follow-up Parent Telephone Survey

To evaluate measure installation lags and persistence, Cadmus fielded a follow-up phone survey with a sample of 54 parents of participating students. Completed in October 2012, the survey occurred six months to one year after students completed the online Family Home Installation Survey. In addition to measure installation, the follow-up survey included questions addressing parents' experiences and satisfaction with the program, and general household demographics. Cadmus developed the survey and sample, which RDD implemented. Table 59 shows phone survey diagnostics.

Table 59. Phone Survey Diagnostics

	Quantity
Total participants	9,226
Eligible participants in call list	141
Screened out due to change in occupancy or bad phone number	36
Completed surveys	54
Response Rate (RR1)	52.4%
Cooperation Rate (COOP1)	64.3%
Refusal Rate (REF1)	15.5%
Contact Rate (CON1)	81.6%
Sample size goal	70

Cadmus selected a sample from the population of participants who completed the online Family Installation Survey and offered their phone numbers as contacts for a follow-up survey. One-hundred and forty-one (141) families provided their phone numbers for the follow-up survey. Of these, Cadmus completed 54 surveys. Though falling short of the targeted 70 surveys, most estimates from the survey achieved 10% precision and 90% confidence. The report notes values that do not meet this 90/10 criteria.

Stakeholder Interviews

Cadmus interviewed program staff at DP&L and OEP. Interviews covered program changes, specifically: the incorporation of efficient aerators and showerheads; and the transition to the online Family Home Installation Survey. Cadmus also participated in informal discussions with OEP regarding implementation of the online survey.

Impact Evaluation Methodology and Findings

Cadmus calculated *ex ante* claimed savings using a range of sources, primarily relying on the draft Ohio TRM, but also including engineering algorithms from other Cadmus evaluation work.

Verified gross savings used the same algorithms and inputs as *ex ante* savings, with one exception—verified gross savings reflected installation rates collected from the follow-up parent surveys. The following section describes the methods and findings from Cadmus adjusted gross savings calculations. Table 60 summarizes the components of adjusted gross savings.

Table 60. Adjusted Gross Savings

Measure	Units Distributed	Installation Rate	Percent Electric*	Per - Unit Savings		Adjusted Gross Savings	
				Energy (kWh)	Demand (kW)	Energy (kWh)	Demand (kW)
13 Watt CFL	36,904	77%	100%	47	0.005	1,331,010	141
LED Night Light	9,226	18%	100%	14	0.000	22,430	0
Efficient Bathroom Faucet Aerator	18,452	47%	50%	119	0.007	508,181	29
Efficient Kitchen Faucet Aerator	9,226	55%	50%	453	0.026	1,141,233	65

Measure	Units Distributed	Installation Rate	Percent Electric*	Per - Unit Savings		Adjusted Gross Savings	
				Energy (kWh)	Demand (kW)	Energy (kWh)	Demand (kW)
Efficient Showerhead	9,226	55%	50%	605	0.031	1,524,593	78
					Total	**4,527,447**	**312**

*For aerators and showerheads, this represents the saturation of electric water heaters, as indicated by OEP's Family Home Installation survey.

Cadmus calculated adjusted gross savings by multiplying the total number of units installed by the share of units applying to electric end uses, and by the per-unit savings, to determine adjusted gross savings for each measure.

Measure Installation Rates

Follow-Up Survey (ISR)

Cadmus' adjusted gross savings and verified gross savings installation rates for CFLs, night lights, aerators, and showerheads, are calculated from the follow-up parent survey. Cadmus surveyed participants six months to one year after they received their kits, asking if the measures remained installed. By surveying participants several months after receiving the measures, Cadmus captured installations occurring after participants completed the Family Home Installation survey. In addition, the phone survey captured: measure persistence; and participants who removed a measure after initially installing it. The ISR captured both of these adjustments.

Table 61 compares installation rates calculated from the family home installation survey and from the follow-up parent survey. [27]

Table 61. Comparison of ISRs from Online Family Survey and Follow-Up Phone Survey

Measure	Family Home Installation Survey Installation Rate*	Follow-Up Parent Survey Installation Rate (n = 54)	Precision at 90% Confidence
CFLs	64%	87%	± 7.6%
LED Night Light	17%	20%	± 9.0%
Bathroom Faucet Aerators	32%	53%	± 11.2%
Kitchen Faucet Aerator	53%	62%	± 10.9%
Efficient Showerhead	49%	62%	± 10.9%

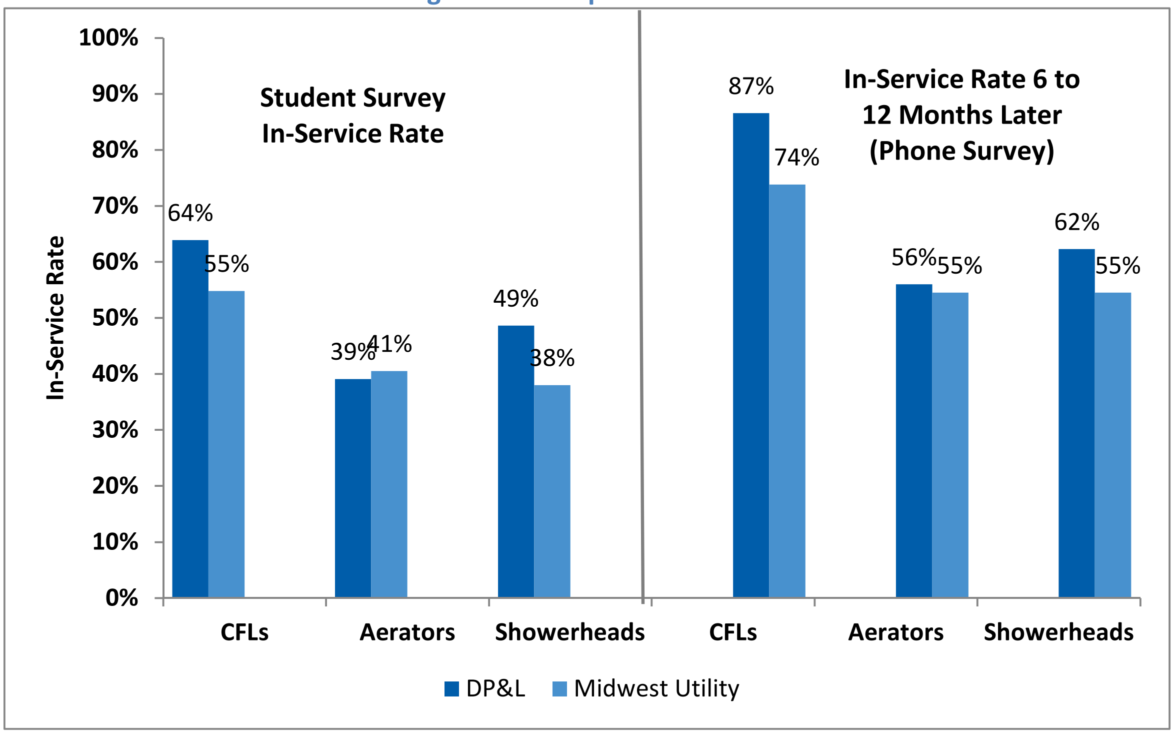
*This installation rate was not used in the calculation of *ex ante* savings. *Ex ante* savings incorporate two adjustments: 1) a "nonrespondent" adjustment for participants not completing the family home installation survey (described below); and 2) an adjustment for an expected increase in the ISR, based on the difference between follow-up survey and student survey ISRs found on an evaluation of another school-based energy education program.

Across all measures, Cadmus observed higher ISRs from the follow-up phone surveys than the online Family Home Installation surveys. ISRs increased the most for CFLs and bathroom faucet aerators, which

[27] Cadmus did not incorporate spillover into the in-service rate calculation to avoid double counting savings claimed by the residential lighting program.

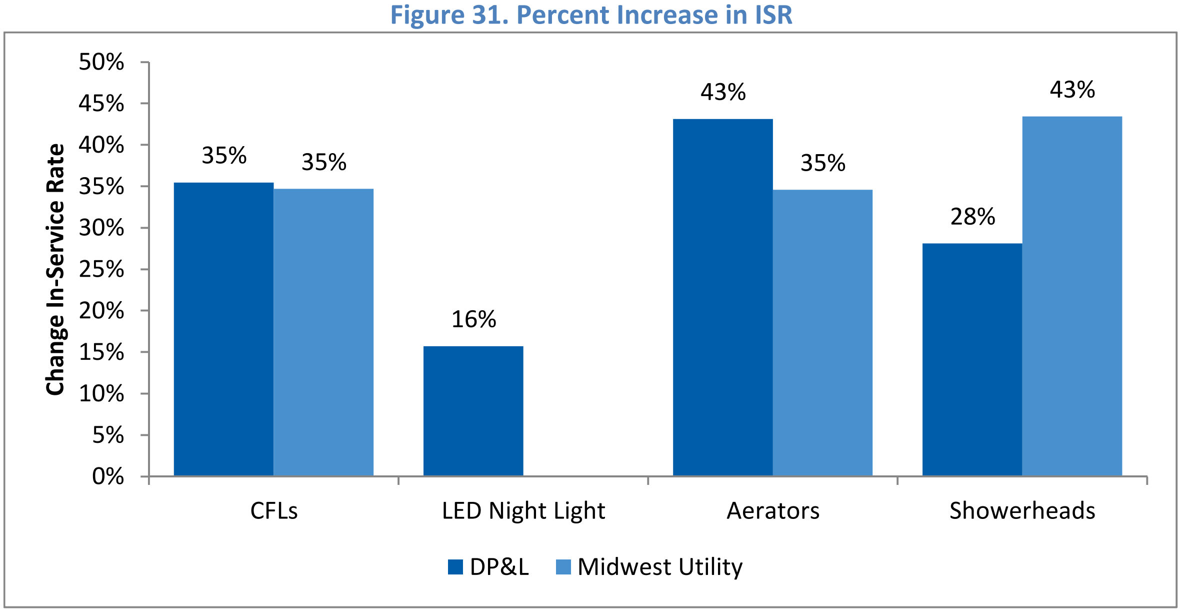
rose 35% and 64%, respectively. LED night lights, kitchen faucet aerators, and efficient showerheads exhibited much more modest increases—a change in installation rates consistent with findings from an evaluation of a similar program implemented by a Midwest utility. Figure 31 shows the percentage increase in the ISR.

Figure 30. Comparison of ISRs



*Midwest utility school-based education program only provided one faucet aerator. In this figure, DP&L's aerator ISR derives from a weighted average of bathroom and kitchen faucet aerator ISRs.

Figure 31. Percent Increase in ISR



CFLs exhibited a nearly identical ISR increase (35%). DP&L increased the showerhead ISR less than the Midwest utilities (a 28% increase, compared to 43%). This may be attributed to DP&L's higher initial installation rate (49% compared to 38%). The studies had similar final installation rates (62% for DP&L, compared to 55% for the Midwest utility), which indicates roughly 40% of customers participants will never install the showerhead, regardless of the time given.

Non-Respondent Adjustment

Calculating an ISR required corrections for bias inherent in the student survey. Specifically, students completing and returning the survey more likely installed CFLs than those failing to complete the survey. Further, it did not prove practical to verify whether nonrespondents received or installed the measure. Therefore, we assumed nonrespondents installed kit measures at rate equal to 50% of respondents. In other words, we assumed one-half of nonrespondents did not install the measures, and the other half of nonrespondents installed the measures at a rate equal to respondents.

As the follow-up parent survey sample drew from customers responding to the Family Home Installation survey, Cadmus made the nonrespondent adjustment to the ISR calculated from the phone survey. Table 62 shows final ISRs after adjusting for nonresponse to the Family Home Installation Survey.

Table 62. Nonrespondent Installation Rate Adjustment

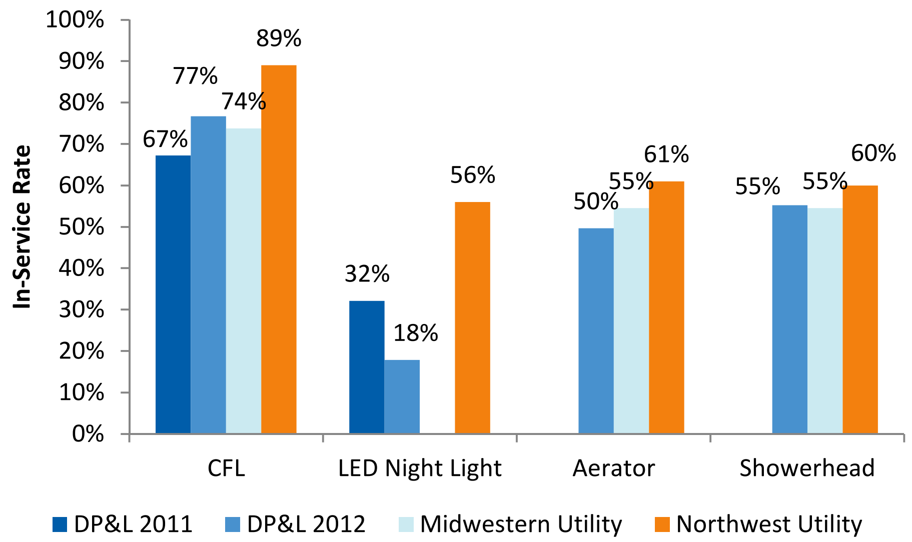
Measure	Unadjusted In-Service Rate	In-Service Rate Adjusted for Nonrespondents
CFL	87%	77%
LED Night Light	20%	18%
Bathroom Aerator	53%	47%
Kitchen Aerator	62%	55%
Showerhead	62%	55%

Benchmarking Installation Rates

Cadmus compared ISRs for each measure to ISRs from the 2011 evaluation[28] and to results from evaluations of similar utility-sponsored programs. Figure 32 presents the installation rates.

[28] Cofer, Albee, et al. 2012. *2011 Evaluation, Measurement, and Verification Report*

Figure 32. ISR Comparison



The BE E^3 Smart program's overall CFL installation rate increased from 67% in the 2011 evaluation to 77% in current evaluation, an increase that is statistically significant at the 1% confidence level. Cadmus' 77% ISR fell between those reported by utilities sponsoring similar programs: a Midwestern utility reported participants installed 74% of CFLs, and a Northwest utility reported participants installed 89% of CFLs. DP&L likely has a lower ISR than the Northwest utility due to that company's energy-efficiency kits contained a single CFL.

The LED night light ISR dropped from 32% in DP&L's 2011 evaluation to 18% in the 2012 evaluation. In the 2012 evaluation, Cadmus observed a lower proportion of participants reported replacing an existing incandescent night light with the efficient night light. While 86% of participants reported installing an LED night light, many said the night light did not replace an existing night light, and instead went into an empty socket.

As 2012 marks the first year OEP included showerheads and aerators in the measure kit, Cadmus cannot compare 2011 evaluation ISRs. However, DP&L's ISRs for showerheads and aerators align with ISRs for similar programs offered by other utilities. DP&L's average aerator has a 50% ISR, compared to 55% and 61% for similar programs offered in the Midwest and Northwest. Compared to these other programs, DP&L offers more aerators (three rather than two). Offering more units generally decreases the ISR for the measure.

TRM Deemed Savings Review

Cadmus reviewed TRM-deemed savings algorithms and inputs for each kit measure. The following sections describes deemed savings used in Cadmus' adjusted gross calculations.

CFLs

Our methodology for determining CFL adjusted gross savings used the following savings calculations outlined in the draft Ohio TRM.

Energy:

$$\Delta kWh = \frac{\Delta Watts * ISR * HOURS * WHFe}{1{,}000}$$

Demand:

$$\Delta kW = \frac{\Delta Watts * ISR * HOURS * WHFd * CF}{1{,}000}$$

Table 63 shows inputs and assumptions for the 13W CFL calculation.

Table 63. CFL Energy and Demand Savings Calculation

Input	Assumption	Source / Notes
Δ Watts	42.3	Draft Ohio TRM. Calculated as bulb wattage multiplied by a delta watts multiplier of 3.25
In-Service Rate (ISR)	77%	Be E3 Family Installation Survey
HOURS	1,040	Draft Ohio TRM
WHFe	1.07	Draft Ohio TRM
WHFd	1.07	Draft Ohio TRM, draft Ohio TRM Joint Objections and Comments
Summer Peak CF	0.11	Draft Ohio TRM

Cadmus estimated installation of 28,310 13 watt CFLs, leading to savings of 1,331,010 kWh, and summer coincident peak savings of 141 kW.

LED Night Lights

The LED night light savings calculation used the following algorithm, provided in an early version of the draft Ohio TRM:[29]

$$\Delta kWh = \frac{ISR * (Demand_{base} - Demand_{LED}) * HOURS}{1{,}000}$$

Table 64 shows inputs and assumptions into the LED night light savings calculation.

Table 64. LED Night Light Deemed Savings Calculation Inputs

Input	Assumption	Source/Notes
$Demand_{base}$ (watts)	5	Draft Ohio TRM, typical C7 lamp
$Demand_{LED}$ (watts)	0.33	Draft Ohio TRM
ISR	18%	Family Installation Survey
Hours	2,920	Draft Ohio TRM, on 8hrs/day 365 days/yr.

[29] Ohio Electric Utilities. 2009. *Technical Reference Manual for Ohio Senate Bill 221 Energy Efficiency and Conservation Program and 09-512-GE-UNC.*

Cadmus estimated installation of 1,645 LED night lights, with adjusted gross energy savings of 22,430 kWh. LED night lights do not produce demand savings because the hours of operation are not coincident with DP&L's peak.

Bathroom Faucet Aerator

Cadmus' method for determining savings for bathroom faucet aerators follows below, with Figure 33 showing the algorithm used to calculate adjusted gross bathroom faucet aerator savings.

Figure 33. Aerator Savings Algorithm

$$Electric\ Savings = (GPM_{Base} - GPM_{Low}) * \frac{People}{Home} * \frac{min}{day} * \frac{days}{year} * \frac{1}{\frac{F}{home}} * 8.33 * (T_{FT} - T_{MAINS}) * \frac{1}{1{,}000{,}000} * \frac{1}{EF} * \frac{1}{0.003412}$$

Table 65 shows inputs used to calculate bathroom faucet aerator savings. Cadmus updated draft Ohio TRM assumptions for the average number of people per household, using self-reported household sizes from the program's Family Home Installation Survey. Cadmus also updated assumptions on the minutes of use per person per day, and assumed the temperature of water used by the faucet, based on a water metering study Cadmus conducted for Consumers Energy and DTE Energy in Michigan.[30]

Table 65. Bathroom Faucet Aerator Savings Calculation Inputs

Variable	Variable Definition	Bathroom Faucet Aerator	Kitchen Faucet Aerator	Source
GPMBASE	Gallons per minute of baseline faucet	2.2	2.2	Cadmus Water Metering Study
GPMLOW	Gallons per minute of low-flow faucet	1	1.5	Bathroom Sink Aerator 1.0 GPM Niagara N3210N, Kitchen Sink Aerator 1.5 GPM Niagara N3115
#people	Average number of people per household	4.47	4.47	DP&L OEP Be E3 Smart Family Installation Survey
min/day	Minutes of use per person per day	1.65	4.51	Cadmus Water Metering Study
days/yr.	Days faucet used per year	365	365	Draft Ohio TRM Assumption
F/home	Average number of faucets in the home	1.92	1.00	Dayton Power & Light 2012 Energy Efficiency Potential Study, EIA RECS
8.33	Constant to convert gals to lbs.	8.33	8.33	Adjusted TRM Assumption
1	Constant to convert lbs. and of Water to BTU	1	1	Draft Ohio TRM Assumption
TFT	Assumed temperature of water used faucets	86	93	Cadmus Water Metering Study

30 Michigan Water Meter Study. March, 2013 Power Point presentation to Michigan Evaluation Working Group.

Variable	Variable Definition	Bathroom Faucet Aerator	Kitchen Faucet Aerator	Source
TMAINS	Assumed temperature of water entering house	57.7	57.7	Used Vectren's temperature data for Dayton, OH: For Dayton, Ohio. Averaged monthly water main temperature calculated using the methodology provided in Building America Research Benchmark Definition, updated December 2009. Pg.19-20. http://www.nrel.gov/docs/fy10osti/47246.pdf;
1,000,000	Unit Conversion	1,000,000	1,000,000	
EF		0.98	0.98	Review of AHRI Directory.
0.003412	Btuh to kWh	0.003412	0.003412	Draft Ohio TRM Assumption

Using the above inputs, Cadmus determined bathroom faucet aerators saved 119 kWh/unit annually and kitchen faucet aerators saved 453 kWh/unit annually. Cadmus used the draft Ohio TRM algorithm to calculate peak savings. This equated to 0.0067 kW per bathroom faucet aerator installed and 0.026 kW per kitchen faucet aerator installed. This results in an adjusted gross energy savings of 1,141,233 kWh and 65 kW demand reductions.

Efficient Showerheads

Figure 34 shows Cadmus' algorithm for calculating adjusted gross showerhead savings.

Figure 34. Efficient Showerhead Savings Algorithm

$$Electric\ Savings = (GPM_{Base} - GPM_{Low}) * \frac{People}{Home} * \frac{min}{shower} * \frac{shower}{days} * \frac{days}{year} * \frac{1}{\frac{F}{home}} * 8.33 * (T_{FT} - T_{MAINS}) * \frac{1}{1{,}000{,}000} * \frac{1}{EF} * \frac{1}{0.003412}$$

Table 66 lists inputs and assumptions used for calculating efficient showerhead savings.

Table 66. Efficient Showerhead Savings Calculation Inputs

Variable	Variable Definition	Input	Cadmus Source
GPMBASE	Gallons per minute of baseline faucet	2.5	Minimum federal GPM allowed
GPMLOW	Gallons per minute of low flow faucet	1.25	Showerhead 1.25 GPM Niagara N2912
#people	Average number of people per household	4.47	DP&L OEP Be E3 Smart Family Installation Survey
min/shower	Minutes of use per person per shower	7.83	Cadmus Water Metering Study
days/yr.	Days faucet used per year	365	Draft Ohio TRM Assumption
shower/day	Showers per day	0.61	Cadmus Water Metering Study
F/home	Average number of showers in the home	1.74	Dayton Power & Light 2012 Energy Efficiency Potential Study
8.33	Constant to convert gals to lbs.	8.33	Adjusted TRM Assumption

Variable	Variable Definition	Input	Cadmus Source
1	Constant to convert lbs. and of Water to BTU	1	Draft Ohio TRM Assumption
TFT	Assumed temperature of water used	101	Cadmus Water Metering Study
TMAINS	Assumed temperature of water entering house	57.7	Used Vectren's temperature data for Dayton, OH: For Dayton, Ohio. Averaged monthly water main temperature calculated using the methodology provided in Building America Research Benchmark Definition, updated December 2009. Pg.19-20. http://www.nrel.gov/docs/fy10osti/47246.pdf
1,000,000	Conversion	1,000,000	
EF	0	0.98	Review of AHRI Directory.
0.003412	Btuh to kWh	0.003412	Draft Ohio TRM Assumption

As with efficient aerators, Cadmus used average household sizes from OEP's Family Home Installation survey to inform efficient showerhead savings. Cadmus calculated per-unit annual energy savings of 605 kWh. This results in an adjusted gross energy savings of 1,524,593 kWh and 78 demand reductions.

Cadmus used peak demand savings calculations consistent with the draft Ohio TRM. Peak demand savings equated to 0.031 kW per unit installed.

Process Evaluation Methodology and Findings

Cadmus used the approaches detailed below in evaluating the 2012 program. In 2011, Cadmus conducted interviews with DP&L and OEP program staff, who identified three program objectives:

- **Promote energy education:** DP&L and OEP seek to help students and parents learn about energy issues, including energy efficiency. The program teaches students the fundamentals of energy, including the science, technology, and economics.
- **Save energy:** DP&L and OEP want families to employ what they learn about energy efficiency and conservation. Teachers provide families with energy-saving kits, and present lessons on energy-saving behaviors.
- **Promote customer satisfaction:** The program serves DP&L's goal of promoting corporate social responsibility. In addition to energy education and energy savings, DP&L sponsors the program to increase customer satisfaction

To evaluate how Be E^3 met these objectives, Cadmus fielded a participant survey, reviewed OEP's teacher evaluation materials, and spoke with DP&L and OEP about changes to the 2011–2012 program.

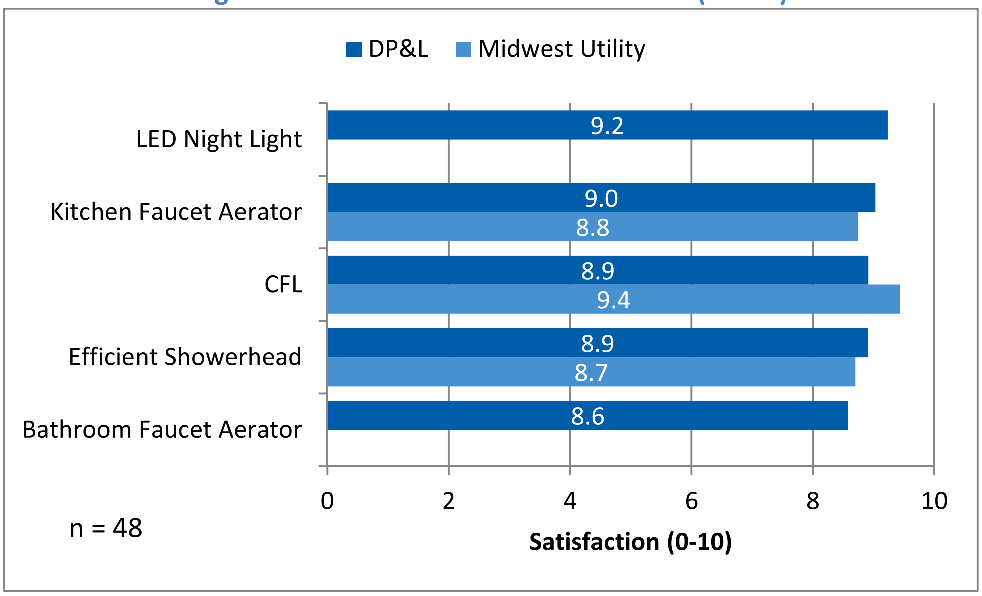
Participant Phone Surveys

To inform the 2012 process evaluation, Cadmus surveyed participants on program satisfaction, awareness, and efficiency. The following section summarizes the survey results.

Participant Satisfaction

Cadmus asked participants about their satisfaction with kit measures and DP&L's service, and their experiences with the program. When asked to rate their satisfaction with each measure on a scale from 0 to 10 with 10 being extremely satisfied, participants consistently rated measures ratings 9 or 10. Figure 35 provides the average satisfaction scores for each kit measure.

Figure 35. Satisfaction with Kit Measures (n = 48)

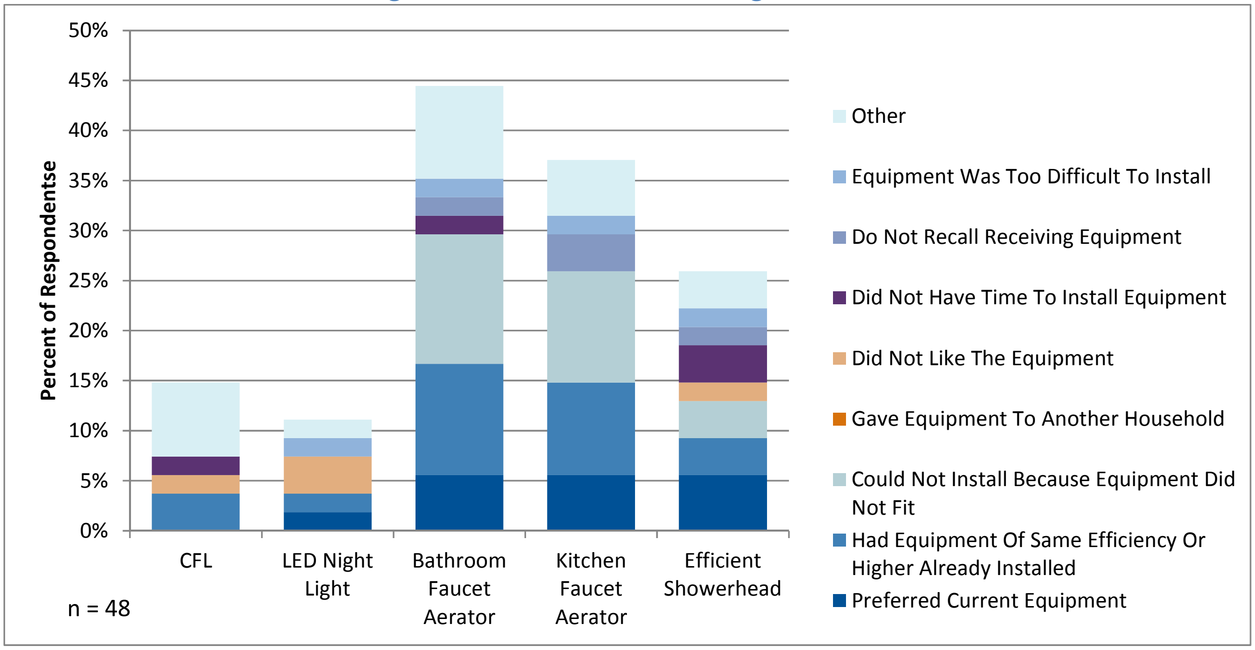


Most participants reported satisfaction with each kit measure. Mean satisfaction ranged from 8.5 for bathroom faucet aerators to 9.2 for LED night lights. Participants dissatisfied with bathroom faucet aerators (7%) said the aerator did not work properly (3.5%) or they did not like the lower flow rate (3.5%). Participants disliking the bathroom faucet aerator flow rate also disliked the kitchen faucet aerator flow rate.

Eleven percent of participants reported dissatisfaction with the efficient showerhead, with reasons including poor performance and equipment malfunctions. Five percent of participants expressed dissatisfaction with CFLs, citing insufficient light output. All participants claimed satisfaction with the LED night light. Overall, participants reported positive dispositions toward measures provided in the kits. Mean satisfaction scores resembled scores from an evaluation of a similar energy education program in the Midwest.

Cadmus asked customers who chose not to install a measure, or installed and later removed a measure, to explain why the measure no longer remained installed. Figure 36 shows survey results.

Figure 36. Reasons Not Installing Measure*

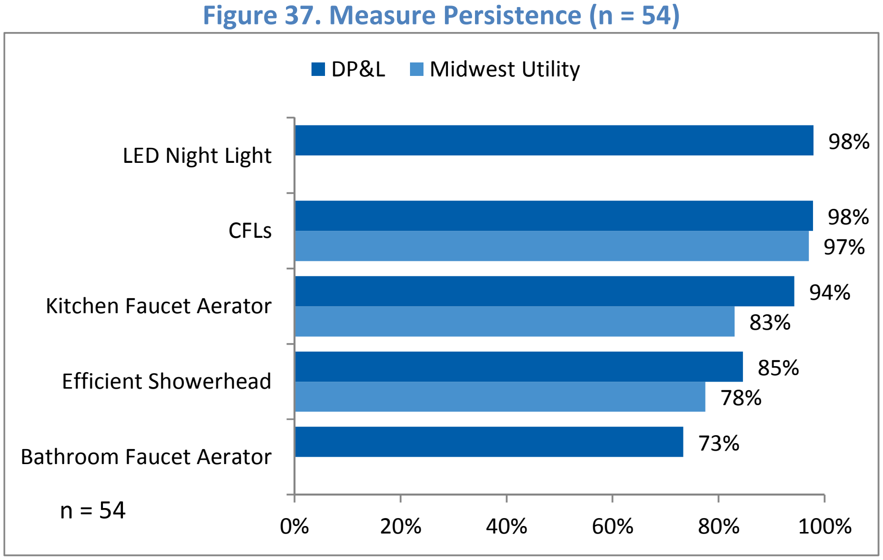


*Question allows for multiple responses. Totals may exceed the percent of participants who currently do not have the measure installed.

As shown, participants most commonly did not install CFLs as they already had a CFL (or a more efficient light bulb) installed (4%). Other frequently mentioned reasons for not installing aerators included: improper fit (13% and 11% for bathroom and kitchen aerators, respectively), or the participant already had installed an efficient aerator (11% and 9%, respectively).

To capture measure persistence, Cadmus asked participants if they installed and then later removed a measure. Figure 37 compares measure persistence in DP&L's Be E^3 Smart program to a similar program sponsored by another Midwest utility.

Figure 37. Measure Persistence (n = 54)

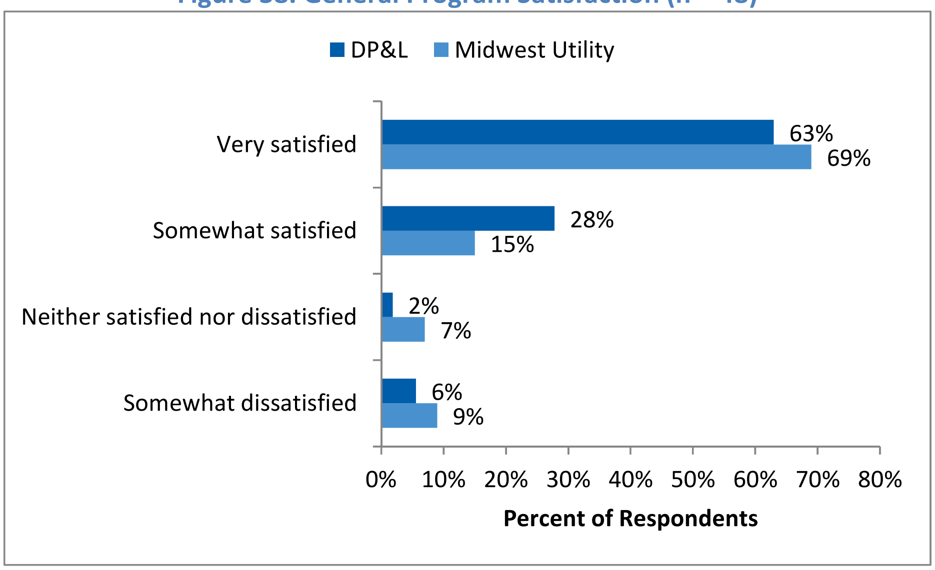


Few customers removed LED night lights, CFLs, or kitchen faucet aerators after installing them. Efficient showerheads and bathroom faucet aerators experienced the highest removal rates (15% and 27%, respectively). Most customers removing these measures expressed unhappiness with the measure's performance or the equipment did not work properly.

The Be E^3 Smart program generally experienced higher measure persistence than a similar program sponsored by a Midwest utility. DP&L's program observed 94% persistence for kitchen faucet aerators, compared to 83% for the other utility's program. DP&L's program also displayed higher efficient showerhead persistence: 85% for DP&L's program, compared to 78% for the Midwest utility.

In addition to measure satisfaction, Cadmus asked participants about their general satisfaction with the program. Figure 38 shows the results. Ninety-two percent (92%) of participants expressed moderate or high satisfaction with the program. Only 6% of participants expressed dissatisfaction. Two dissatisfied customers said their kits did not contain all the measures, and one dissatisfied customer expressed unhappiness with the CFLs' light output. Overall, program satisfaction did not differ significantly from a similar energy education program offered by a Midwest utility.

Figure 38. General Program Satisfaction (n = 48)



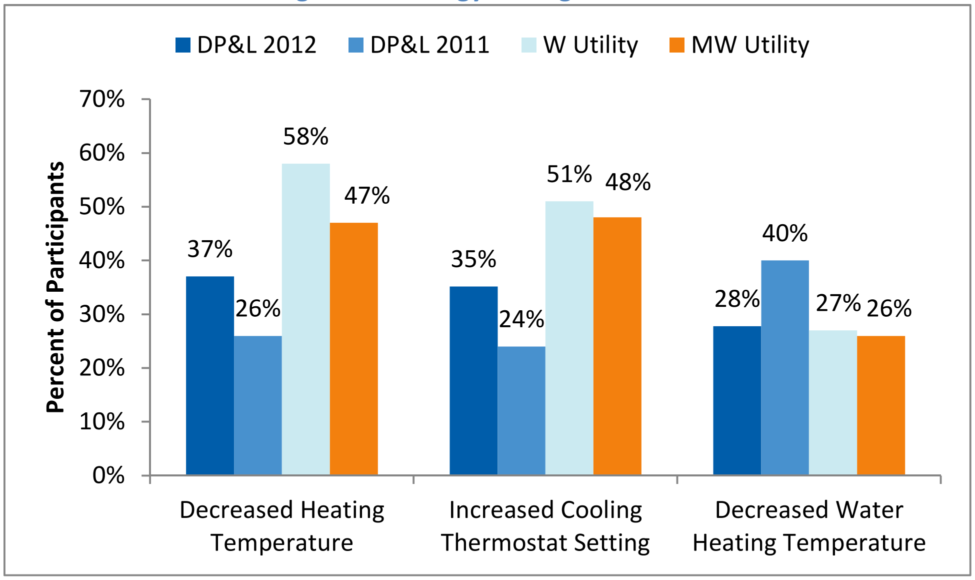
Fifty percent (50%) of participants noticed bill savings since participating in the program. Of these, 63% expressed high satisfaction with the bill savings, and 37% expressed moderately high satisfaction with the bill savings. No customers reported dissatisfaction with bill savings.

Most customers (91%) knew DP&L sponsored the program, and 48% of customers reported greater satisfaction with DP&L due to program participation. Another 48% reported being just as satisfied with DP&L, and 2% reported being less satisfied.

Energy Education

To evaluate the program's effectiveness in promoting energy education, Cadmus asked participants about the energy-saving behaviors they adopted due to program participation. The Be E^3 Smart kit and curriculum included instructions for the family to adjust temperature settings to DOE-recommended settings for several end uses, including heating, cooling, and water heating. Figure 39 summarizes energy-saving behaviors adopted by participants.

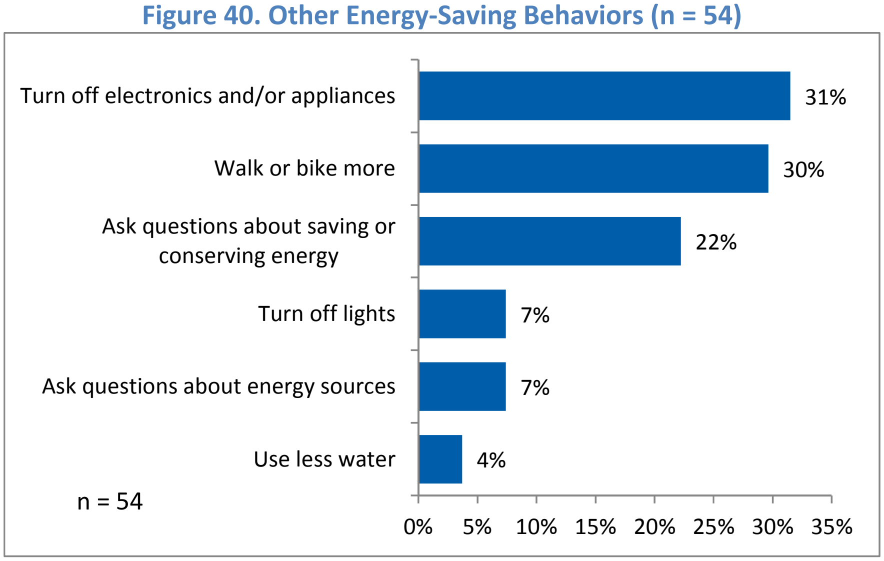
Figure 39. Energy-Saving Behaviors



Compared to 2011 participants, a higher proportion of 2012 participants decreased their thermostat temperature settings for heating, and increased their cooling thermostat settings. Fewer participants changed their HVAC temperature settings compared to participants in similar programs. The proportion of participants decreasing their water heater temperature settings aligns with similar programs. This proportion, however, decreased from 40% in 2011 to 28% in 2012.

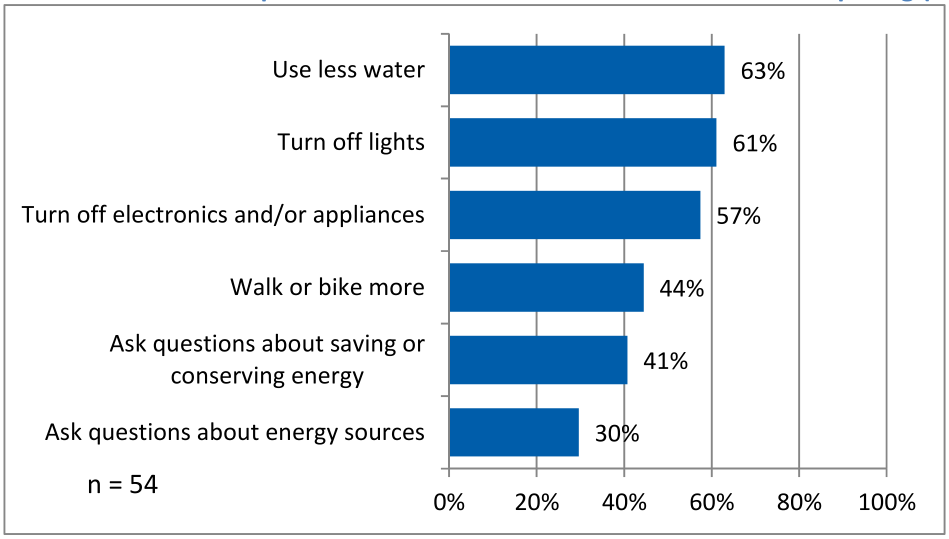
Parents reportedly adopted other energy-savings behaviors since participating in the program, as shown in Figure 40.

Figure 40. Other Energy-Saving Behaviors (n = 54)



Further, since participating in the program, many parents said their child reminded them to adopt energy-saving behaviors, as shown in Figure 41.

Figure 41. Conversation Topics between Children and Parents Since Participating (n = 54)



Over one-half (63%) of participating children reminded their parents to use less water, turn off lights (61%), or turn off electronics and/or appliances (57%). Following their child's participation, 72% of parents said their family talked about saving energy at least once a week.

Stakeholder Interviews

During the 2011–2012 school year, Cadmus interviewed DP&L and OEP program staff about program goals, data tracking, barriers, and quality assurance and control (QA/QC). General findings from these interviews were incorporated into the 2011 evaluation (for the 2010–2011 school year). However, Cadmus and program staff discussed two major program changes that did not apply to 2011 (and therefore were not included in the 2011 process evaluation): the introduction of water-saving measures (faucet aerators and efficient showerheads); and the transition from a paper take-home Family Installation Survey to an online survey (as previously discussed).

Online Family Home Installation Survey

For the 2011 program, OEP implemented a family home installation survey on paper. OEP program staff reported collecting and entering data from over 6,000 surveys diverted resources from program planning and implementation. To resolve this, OEP designed an online family installation survey to streamline data collection and reporting. After students took home energy-saving kits, they were asked to complete an online survey, using a unique log-in for their class. Students also received a paper survey, and could complete this instead, returning it to their teachers for entry into the online tool.

Prior to implementation, Cadmus tested the online tool and reviewed the underlying database. Consistent with industry best-practices, the tool incorporated proper survey and logic, restricted responses through data validation, and produced data outputs for easy summary and analysis.

Overall, the online survey yielded a slightly higher response rate than the paper survey, with 75% of participants completing the online survey in 2012, compared to the 72% of participants in 2011. OEP noted the online survey reduced time required for data collection and entry. In addition, Cadmus observed improved data quality with the online survey.

Recommendations

Drawn from the preceding findings, Cadmus offers the following recommendations:

- **Continue to fund aerator and showerhead measures provided in the Be E^3 Smart kits**. Given the relatively high saturation of electric water heaters in the Dayton area (50%), and large household sizes for participants, DP&L realized significant savings from these measures. Collectively, these measures accounted for 70% of program savings.
- **Revisit the inclusion of LED night light measures in kits**. Night lights only contribute 0.4% to program savings, and only 18 of 54 telephone survey respondents reported replaced an existing incandescent night light with the LED night light. Night lights did not provide peak demand savings, and many participants reportedly installed these measures in open sockets. However, participants did report high levels of satisfaction with this measure and persistence was also high.
- **Explore different models of efficient bathroom faucet aerators.** Of participants initially installing a bathroom faucet aerator, 27% eventually removed it. These participants cited malfunctioning devices and improper fits as reasons for removal, an unsurprising result, given the variety of bathroom faucet fixtures on the market. OEP may benefit, however, from researching models offering improved fits.

Nonresidential Prescriptive Rebate Program

The nonresidential Prescriptive Rebate Program (called the Rapid Rebates Program in customer-facing material) provides incentives to customers for purchases and installation of high-efficiency equipment in commercial and industrial facilities. The program covers technologies such as: energy-efficient lighting, HVAC, motors, drives, and compressed air measures.

The following sections describe the evaluation approach, detailed findings, and conclusions and recommendations for the nonresidential Prescriptive Rebate Program.

Evaluation Overview

Cadmus' evaluation of the 2012 nonresidential Prescriptive Rebate Program followed researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 67 identifies key researchable evaluation questions.

Table 67. Key Researchable Questions

Researchable Question	Activity Used to Address Question
How do draft Ohio TRM deemed savings compare with validated program savings?	• Site visits. • Engineering analysis. • Database review.
What were the program's gross electric savings and demand reductions?	• Engineering analysis. • Database review.
Is this program cost-effective?	• Cost-effectiveness analysis.

For the past two years, Cadmus has conducted telephone surveys with randomly selected samples of DP&L's program population (stratified by measure category). These surveys examined process issues (e.g., how participants became aware of the program and their program experiences) and initial satisfaction levels. Survey results did not change significantly from year to year. There have not been significant program design or implementation changes, therefore Cadmus did not perform customer telephone surveys in 2012.

Detailed Evaluation Findings

Key findings from the impact evaluation include the following:

- The program achieved 67,301,629 kWh in savings and 14,620 kW in demand reduction. Compared to claimed *ex ante* claimed savings, the program experienced realization rates of 94% for energy savings, and 106% for demand savings.

Table 68. Nonresidential Prescriptive Rebate Program Claimed and Achieved Energy Savings

Measure	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	Gross kWh	Gross kW	Gross kWh	Gross kW	Gross kWh	Gross kW	Precision*
HVAC	2,314,159	839	2,488,969	945	3,087,297	1,507	17%
Lighting	61,599,206	11,882	60,599,862	12,134	56,144,083	12,339	5%
Motors	6,152,482	795	6,171,427	784	6,492,754	636	24%
Other	1,487,991	215	1,488,280	214	1,577,494	138	0%
Total**	**71,553,838**	**13,731**	**70,748,539**	**14,076**	**67,301,629**	**14,620**	**4.9%**

* Precision at 90% confidence for energy savings.
** Values in table may not sum to 100% exactly due to rounding.

- The program exceeded DP&L's 2012 *ex ante* energy savings goals by 205% and demand reduction goals by 164%. This includes savings contributed from the Residential Lighting program. However, if impacts from the Residential Lighting program were removed, nonresidential Prescriptive Rebate Program would still exceed filed goals of energy savings by 166% and demand reduction by 131%.
- 2012 exhibited an annual kWh realization rate of 94%, slightly less than 2011 evaluation which was near 100%. Lighting projects were the main driver in the lower realization rate where hours of operation were found to be lower than reported. Besides this, Cadmus found minimal discrepancies during on-site verification work, with notable discrepancies isolated to a limited number of projects.
- The DP&L program exhibited realization rates aligned with those from evaluations of similar utility-sponsored prescriptive programs.
- Cadmus transferred an additional 12.6 million kWh savings from the Residential Lighting program to the nonresidential Prescriptive Rebate Program from customers purchasing CFLs at retailers such as hardware and big box stores and installing them in commercial applications. The 2011 Residential Lighting Program participant survey and secondary research indicate that approximately 5% of customers purchasing incented CFL installed them in commercial applications.
- DP&L customer satisfaction appears to remain high. Though surveys were not completed this year, Cadmus engineering staff received positive feedback during on-site inspections with DP&L's customers. Project participation increased throughout the 2009, 2010, 2011, and 2012 program years (331, 622, 736, and 1,268,[31] respectively).

Evaluation Data Collection Methods

Cadmus designed the impact evaluation to verify reported measure installations and to estimate gross energy and demand reductions. We collected impact evaluation data using the following sources:

- The DP&L program tracking database;

[31] This does not account for participants from the residential CFL upstream program.

- Online application forms;
- DP&L pre-and post-audit inspection reports; and
- On-site visits conducted by Cadmus;

As part of the evaluation, Cadmus also reviewed and referenced the draft Ohio TRM and utility Joint Objections and Comments regarding the draft Ohio TRM.

Project and Site Review

Cadmus proposed to evaluate a statistically valid sample of projects, based on a 90% confidence interval with a 10% precision level, through on-site visits. All application materials for projects selected for site visits were thoroughly reviewed by Cadmus engineers.

Cadmus performed three rounds of site visits: in October and December 2012, and in February 2013. The first round consisted of site visits to 36 unique locations (by account number); the second round included site visits to 11 unique locations; and the third round included site visits to 22 unique locations. Several sites fit multiple measure categories. Table 69 shows total projects evaluated through site visits, by project category, for each round.

Table 69. Prescriptive 2012 Site Visit Breakdown by Measure Category—By Project ID*

Measure Category	Number of Site Visits Conducted				Total Number of Reported Projects
	October	December	February	Total	
Large Lighting	8	1	1	10	13
Medium Lighting	7	3	11	21	76
Small Lighting	19	5	14	38	1,001
HVAC	4	2	0	6	74
Motors	9	0	0	9	84
Other	0	0	2	2	20
Total	**47**	**11**	**28**	**86**	**1,268**

* This table represents total projects where each customer account may have >1 project.

To account for the wide range in project sizes, Cadmus divided lighting projects into large, medium, and small subcategories (>500,000 kWh, <500,000 kWh >100,000 kWh, and <100,000 kWh, respectively), based on *ex ante* savings. We included all large lighting projects in the site visit sample, and achieved 10 of the 13 large projects. Cadmus prioritized analysis of large, high-impact projects due to their disproportionate effect on overall program savings. Table 70 provides detail regarding the number of measure types (iterations)[32] for each strata evaluated.

[32] Measure type iterations represent the number of line items within the tracking database where a project may have multiple types of lighting technologies installed.

Table 70. Prescriptive 2012 Project, Measure Type, Site Visit Breakdown by Subcategory—By Project ID *

Measure Category	Program Project Count	Program Measure Type Count	Site Visit Sample Project Count	Site Visit Sample Measure Type Count
Large Lighting >500,000 kWh	13	75	10	58
Medium Lighting <500,000 kWh >100,000	76	333	21	98
Small Lighting <100,000 kWh	1,001	2,302	38	78
HVAC	74	135	6	16
Motors	84	128	9	20
Other	20	26	2	2
Total	**1,268**	**2,999**	**86**	**272**

* This table represents total projects where each customer account may have more than one project.

In addition to the site visits conducted, one HVAC project desk review was performed as part of the evaluation making the total evaluated projects to be 87.

Baseline Assumptions

Baseline assumptions typically involve data obtained on site, and include replaced fixture types and quantities as well as parameters such as original operation hours and temperature set points. Where data could not be obtained on site (such as HVAC equivalent full-load hours or baseline motor efficiency), we used assumptions provided in the draft Ohio TRM.

Impact Evaluation Methodology

Cadmus collected baseline data through interviews with facility staff at each site, and utilized the program implementation and tracking data. We used on-site visits to verify measure installations and to identify changes in operating parameters occurring since measure installation. The on-site data served to inform the savings impact calculations.

Site Verification Visits and Document Review

After selecting projects to verify through on-site verification activities, Cadmus downloaded project documentation from DP&L's administrative Website. In preparation for each site visit, Cadmus reviewed documentation and other relevant program information. The review focused on calculation procedures and energy-savings estimate documentation.

Cadmus also reviewed the DP&L tracking spreadsheet and online application data, comparing entries to original application materials for consistency and accuracy.

On-site visits enabled us to accomplish two primary tasks:

1. Verify the implementation, installation, and characteristics of incented equipment.
2. Collect additional, detailed data (such as ballast factors) needed to calculate energy savings.

Appendix F: Summary of Nonresidential Site Visit Findings provides detailed site visit findings.

Database Tracking Review

In addition to reviewing each on-site project file, we reviewed DP&L's entire final tracking database, examining three tracking spreadsheets containing:

- Participating customers who submitted their applications in 2010 and 2011, but did not complete the project until 2012; and
- All 2012 applications and completed projects.

Part of the review involved combining workbooks into a master spreadsheet. DP&L finalized the year-ending 2012 tracking database, and provided Cadmus with the final database used for the evaluation.

Engineering Analysis and Savings Verification

For each project in the site visit sample, Cadmus performed an engineering analysis using data verified on site, supplemented by project documentation, to validate energy savings and demand reductions.

Procedures used to validate savings depended on the type of measure analyzed, with major measure groups including:

- Lighting measures;
- HVAC measures;
- Motors and Variable Frequency Drives (VFD); and
- Other.

Generally, the review methodology used industry-standard algorithms, the draft Ohio TRM, secondary research, and engineering experience. The following sections describe procedures used to validate savings from the first three measure categories. Calculations for the *"other"* category typically followed algorithms outlined in the draft Ohio TRM.

Lighting Measures

Lighting measures include retrofits of existing fixtures, lamps, and/or ballasts with energy-efficient models as well as lighting control technologies. We generally assumed fixtures operated in the same way (i.e., for the same duration of time) pre- and post-retrofits.

Analyzing lighting fixture measure savings required specific fixture data, including:

1. Wattage before and after the retrofit.
2. Hours of operation before and after the retrofit.
3. Number of fixtures affected by the measure.

Cadmus analyzed savings for occupancy sensors using data that included:

1. Total connected lighting load.
2. Type of space.

3. Facility operating hours.
4. Any operational characteristics identified through the on-site survey.

For calculations, we used wattages reported on applications, unless they deviated significantly from published databases or manufacturers' claims.

During on-site visits, we verified the parameters discussed above, conducting interviews with facility personnel to verify operating hours and to determine locations where measures had been applied. When on site, field engineers collected lamp information (such as actual fixture and ballast details), and performed a fixture count.

For the additional CFL upstream lighting savings, analysis was conducted as part of the Residential Lighting program, and then attributed to the nonresidential Prescriptive Rebate program lighting measure category. Analysis used the draft Ohio TRM to account for differences between sectors. We made adjustments in the HOU, waste heat factors, and demand coincidence factors for small commercial applications.

As the draft Ohio TRM provides a specific baseline for fixtures, based on the high-efficiency replacements for lighting measures, we used, where applicable, baseline wattages found in the draft Ohio TRM for our savings calculations.

HVAC Measures

HVAC measures represent a variety of technologies, including:

- Unitary air conditioners;
- Chillers;
- Ground-source heat pumps;
- Programmable thermostats;
- Energy recovery ventilators;
- Air economizer with enthalpy sensors;
- HVAC VFDs; and
- HVAC occupancy sensors.

We analyzed each measure listed using the draft Ohio TRM as a guide. Cadmus verified HVAC savings through site verification results and through reviews of application materials.

For this evaluation, Cadmus assumed values to quantify loads controlled by the devices, basing these values on the draft Ohio TRM and on our engineering experience. For this analysis, we accepted the draft Ohio TRM values for EFLH, as they had been reviewed by the various evaluation contractors supporting development of the draft Ohio TRM.

Motors and HVAC Variable Frequency Drives

Motor measures included:

- Premium-efficiency motors;
- Air compressors less than 100 HP (load control and variable speed);
- Additional air compressor primary storage; and
- VFDs[33] less than 250 HP.

We analyzed each measure using the methodology defined in the draft Ohio TRM. Cadmus verified motor and VFD gross savings through site-verification results and through reviews of application materials.

For high-efficiency motor replacements, these parameters included:

- Efficiency of the old and new motors;
- Load factors[34]; and
- Usage factors.

When conducting a site visit of a motor project, Cadmus engineers collected information such as nameplates and motor applications (e.g., pump, fan, process). Where applicable, we also verified motor operating hours by interviewing the facility contact. When data could not be obtained, Cadmus estimated these parameters, based on an Internet search of equipment specification data, professional experience, and deemed values from the draft Ohio TRM.

Other Measures

Other measures represent a variety of technologies, including:

- Injection barrel wraps;
- Commercial clothes washers;
- Vending equipment controllers; and
- Window film.

We analyzed each measure using the draft Ohio TRM as a guide. Cadmus verified the savings through site visit results and reviews of application material.

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[33] In some cases, HVAC VFDs were included in this category.

[34] The load factor serves as a critical parameter for air compressor and VFD installations, and often is determined through pre- and post-installation metering. Due to the time and cost involved, however, metering often may not be feasible in prescriptive programs. Therefore, we calculated savings using load factor estimates, based on draft Ohio TRM values and Cadmus' engineering experience.

Calculating Realization Rates

We derived program-level end use savings and demand reductions through realization rates calculated for each major measure type (e.g., HVAC, lighting, motors, and other). Similarly to our sample selection process, we broke lighting measure types into three categories: large, medium, and small lighting projects. This method included:

- Calculating adjusted gross savings for the sample of site visit and desk review projects; 87 site visits and desk reviews.
- Calculating a realization rate, based on claimed *ex ante* and adjusted gross savings, for the total sample within each measure group.
- Applying sample realization rates to the program population for each measure group to calculate total program verified and adjusted gross savings. We divided lighting into the following kWh strata: small (0–100,000); medium (100,000–500,000); and large (500,000 plus). Realization rates, developed for each stratum, could then be applied across that population subgroup.
- Inclusion of 12.6 million kWh from the Residential Lighting program to the nonresidential Prescriptive Rebate program.

Cadmus acknowledges several limitations resulting from this approach. We developed realization rates for all non-lighting measures (e.g., HVAC, motors, and other). Applying realization rates to a heterogeneous population of measures using small samples can present issues. However, lighting measures dominated reported sample savings (95%) and reported program savings (86%). Cadmus determined the size, variability, confidence, and precision associated with the lighting sample provided the most significant influence on overall realization rates, reducing impacts of small sample sizes in other measure groups.

Detailed Impact Findings

Gross Savings Results

Table 71 and Table 72 summarize sample verified and adjusted results by major measure group. The 87 projects sampled within the program consisted of 17,769,885 kWh and 2,573.7 kW *ex ante* savings. Adjusted energy and demand savings resulted in 16,934,959 kWh and 2,911.8 kW, respectively.

Table 71. Sample Reported Gross *Ex ante* and Adjusted Gross Energy Savings

Measure	Number of Projects	*Ex ante* Gross Energy Savings (kWh)	Verified Energy Savings (kWh)	Adjusted Energy Savings (kWh)	Realization Rate**
Large Lighting	10	11,920,404	11,320,922	11,320,922	95%
Medium Lighting	21	4,253,062	3,971,166	3,971,166	93%
Small Lighting	38	725,828	578,235	578,235	80%
HVAC	7	523,244	698,055	698,055	133%
Motors	9	342,541	361,486	361,486	106%
Other	2	4,807	5,096	5,096	106%
Total*	**87**	**17,769,885**	**16,934,959**	**16,934,959**	**N/A****

*May not sum properly due to rounding.
**Program level realization rates weighted by total program size.

Table 72. Sample Reported Gross *Ex ante* and Adjusted Gross Demand Savings

Measure	Number of Projects	*Ex ante* Gross Demand Savings (kW)	Verified Demand Savings (kW)	Adjusted Demand Savings (kW)	Realization Rate**
Large Lighting	10	1,411	1,571	1,571	111%
Medium Lighting	21	799	887	887	111%
Small Lighting	38	172	168	168	98%
HVAC	7	133	238	238	180%
Motors	9	58	46	46	80%
Other	2	2	1	1	64%
Total*	**87**	**2,573.7**	**2,911.8**	**2,911.8**	**N/A****

*May not sum properly due to rounding.
**Program level realization rates weighted by total program size.

A summary follows of the major differences, by measure category, between reported savings and adjusted savings.

Lighting Savings

Lighting projects represented the overwhelming majority of the 2012 nonresidential Prescriptive Rebate program energy savings and demand reduction. Consequently, 80% of Cadmus' site visits focused on lighting projects. Overall on lighting projects, we validated a lower-than-reported realization rate for energy savings, and a higher-than-reported realization rate for demand reductions. For all projects visited, the 2012 energy realization rate for large, medium, and small lighting projects was 91.1%.

For many projects, Cadmus found few or no discrepancies. The primary differences between reported and adjusted values resulted from differences in fixture quantities, fixture types, operating hours, or fixture wattages, verified from manufacturer's specification sheets. For some larger projects, we reduced the facility operating hours, which had the greatest impacts on energy savings.

Other observed discrepancies included:

- Hours of operation presented the largest discrepancy, both over and underestimating many projects. In most cases, discrepancies resulted in ±15% in evaluated savings. More extreme cases, where hours doubled or were reduced by half, resulted in proportional savings increases or reductions.

- Wall- and fixture-mounted occupancy sensor measures represented another variation source. DP&L reported savings based on an estimate for controlled wattages of sensors. While this represented a reasonable estimate overall for occupancy sensor applications, cases occurred where this estimate did not accurately represent site-specific controlled wattages. For several projects, this resulted in realization rates ranging significantly, either much lower or higher than claimed.
- One site installed energy-efficient lighting in a manufacturing facility, originally claiming estimated hours of 8760; however, the site verification found hours of operation to be closer to one-half that.
- We increased demand savings for several projects due to incorrect allocations of summer coincident peak assumptions. The draft Ohio TRM provides coincident peak factors by building type. DP&L assumes an average coincident peak factor for all buildings. As this average did not represent some larger lighting projects, we increased peak demand savings using the appropriate factor from the draft Ohio TRM.
- During the site inspection, Cadmus found one site vacant; therefore, verified HOU were lower than originally claimed. Building staff indicated they expected the space to be occupied within the next year.

HVAC Savings

Similar to findings from the 2011 program evaluation, verification of HVAC projects incented in 2012 resulted in the highest realization rates in the group of sampled projects. For most prescriptive HVAC projects, Cadmus applied the EFLH (942 for cooling and 810 for heating)[35] proposed in the draft Ohio TRM, as these represented reasonable estimates of usage for the region.

Cadmus found no differences in measure quantity from the site visits. However, performance specifications found on site and through our savings analysis identified differences between *ex ante* and adjusted gross savings. Differences identified included:

- Cadmus evaluated three chiller measures at various buildings, finding one installed chiller with a higher installed kW/ton rate than originally estimated, resulting in higher retrofit usage and lower savings.
- Cadmus reviewed two projects—an office building and a fast food restaurant—with outside air economizer enthalpy sensors installed. The draft Ohio TRM assumed no summer peak savings occurred for this measure, since the HVAC unit will run during the peak time. Cadmus adjusted the two projects in accordance with the draft Ohio TRM, resulting in zero demand reductions.

[35] This represents unitary air conditioners and heat pumps. The hours for chiller systems vary by system type and can be found in the Ohio draft TRM, p.147.

- Cadmus evaluated five unitary split AC systems, installed at various locations. Three of the five projects had higher rated efficiencies than reported, resulting in a higher realization rate. In addition, one of the three projects also had more rated capacity than claimed (15 Ton vs. 7.5 Ton), which also increased the overall realization rate.

Motors and HVAC Variable Frequency Drive Savings

Motor savings represent the second-largest measure type, comprising approximately 10% of the nonresidential Prescriptive Rebate program. Cadmus validated a higher-than-reported realization rate for energy savings, and a lower-than-reported realization rate for demand reductions. Cadmus noted the following differences, related to calculation methodologies and specific projects:

- One project installed a VFD on an air compressor. Though a 100HP motor was reported, Cadmus found the motor to be 50HP. However, this motor acted as the baseline unit, running 24 hours per day, which resulted in higher savings than claimed.
- An office building had 15 installed motors and seven installed VFDs, with all verified on site. Some motors had been installed on HVAC equipment and had fewer hours of operation than claimed.
- Cadmus found one project with a lower motor horsepower installed than reported. Additionally, the motors had been installed on the chilled water loop, which has a lower hours of use per year than hot water pump motors, as originally claimed.

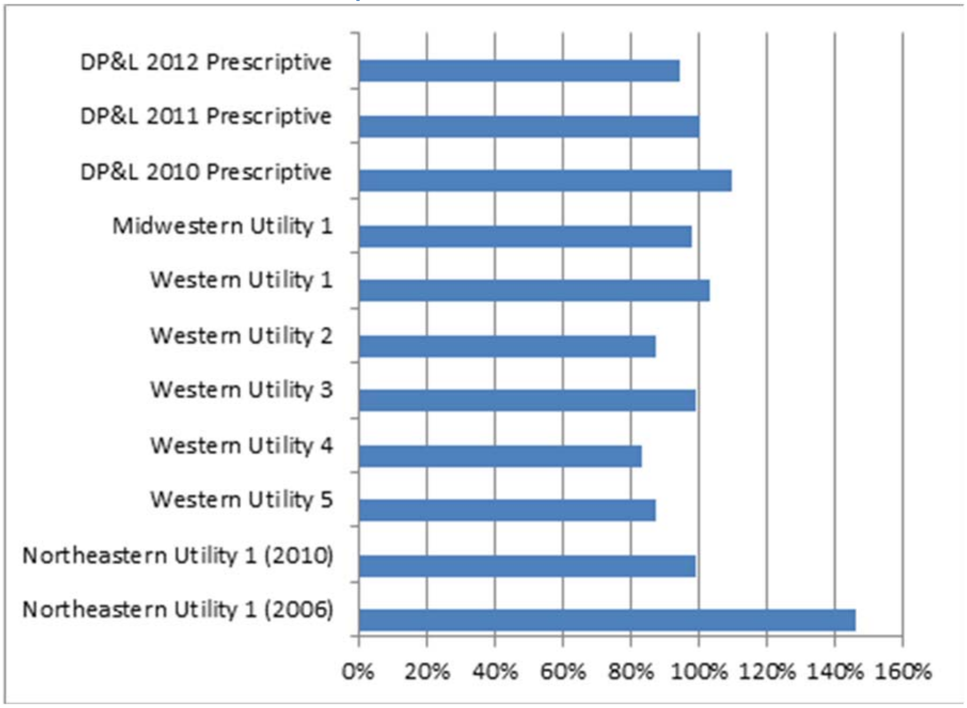
Other Savings

Cadmus verified two projects with incented window film installed. The reported savings appear to be based on an average of savings values from draft Ohio TRM across all building types. Through the site visits conducted, the building types were found to be offices where a specific savings value from the draft Ohio TRM was used. This resulted in higher project kWh savings.

Realization Rate Comparison

Figure 42 compares evaluated energy realization rates for the nonresidential Prescriptive Rebate program to similar utility funded commercial programs from across the country. Though slightly lower than in previous evaluation years, DP&L’s 94.1% overall realization rate still ranks well within other utility variations. When looking at realization rates by measure category, lighting achieved a 91.1% realization rate, while HVAC, motors, and other measure categories all resulted in realization rates greater than 100%.

Figure 42. Nonresidential Prescriptive Program Realization Rate Comparison to Other Utilities*



*Western Utility 5 evaluation realization rates were taken from its overall commercial programs, including custom and prescriptive programs.

Realization rates tend to be driven by the accuracy of a utility's engineering assumptions for its programs. A 100% realization rate would be the best scenario for a program as it indicates energy-savings estimates neither overstate nor understate achievements, making planning for future program years less burdensome for program staff. DP&L's 94% realization rate indicates DP&L has done a good job planning which engineering assumptions to use for program reporting. Furthermore, over the past three years (2010, 2011, and 2012) DP&L has maintained an average realization rate of 100%.

Process Evaluation Methodology and Findings

The process evaluation tasks Cadmus performed for the 2012 program evaluation included conducting telephone interviews with DP&L staff.

Program Design

As shown in Table 73, program participation increased throughout the 2009, 2010, 2011, 2012 program years. Table 74 provides further details on the frequency of installed measure types.

Table 73. Program Participation by Year

Program Year	Number of Individual Customer Projects	Increase From Prior Year
2009	331	0%
2010	622	188%
2011	736	118%
2012	1,268	172%

Table 74. Frequency of Major Measure Types Installed

Measure Type	Frequency			
	2009	2010	2011	2012
Lighting	231	458	539	1,090
HVAC	42	68	79	74
Motors	43	82	88	84
Other	15	14	23	20

Historically, the distribution of nonresidential Prescriptive Rebate program measure offerings has remained consistent, except in 2012, when HVAC, motors, and other measure categories decreased in participation as lighting measures increased by 202%, compared to 2011. The increase in lighting participation is mainly due to DP&L's promotion in lighting incentives offered in 2012. Additional incentives were provided to promote replacements of T12 before the EISA lighting standards went into effect (July 2012).

Reasons for this shift downward for the non-lighting measures might include:

- DP&L increased motor efficiency requirements to meet CEE Enhanced Premium efficiency standards.
- DP&L added a heating-side efficiency requirement for heat pump projects. Previously, the only efficiency requirement addressed electric cooling efficiency.
- DP&L adjusted LED traffic signal HOU to limit energy savings for turn signals measures.

Program Staff Interview

Cadmus interviewed DP&L program staff to identify major changes made to the program between 2011 and 2012. Staff highlighted minimal changes to program marketing, administration, and overall program design. Program marketing remained consistent, with very little change from year to year. DP&L promoted the program using the following mechanisms:

- DP&L's Website;
- Television campaigns;
- Presentations to various community and business groups; and
- Major account representatives working directly with customers.

Similar to 2011, staff cited the DP&L Website/staff and channel partners/contractors as the primary information sources for interested customers.

Program Tracking Database

DP&L utilizes two primary methods to track program participation and savings:

- A Web-based database, where customers or contractors complete applications. Documents such as invoices, audits, and specification sheets can be attached to electronic applications.
- A Microsoft Excel spreadsheet, where DP&L manually transposes data from online applications, with each program year tracked in a separate spreadsheet. Over the course of 2012, DP&L has been developing and testing an online participant tracking database. Starting in program year 2013, DP&L will move from tracking data in both online and Excel databases to an online tracking system only.

Recommendations

Drawing upon the preceding findings, Cadmus offers the following recommendations:

- The program continues to increase participation annually and has surpassed 2012 program impact goals. In addition, there were limited differences between what was claimed and what was actually installed. Outside of the few suggestions below, we recommend the program continue doing what has been working, while acknowledging that it will become more and more difficult to achieve high participation and exceed program goals due to new codes and standards, such as EISA.
    - Lighting measures are the majority of the prescriptive program impacts and with the recent change in lighting standards for fluorescents (EISA standards), it will be important to continue to promote high performance and low-wattage lighting measures. Consider offering bonus incentives for lamp wattages less than program requirements.
    - Consider using rated efficiencies, found in the submitted application documentation, to inform energy savings for HVAC equipment. This year's evaluation found DP&L used a standardized efficiency level when calculating HVAC equipment impacts. This efficiency standardization resulted in lower claimed savings than would have occurred if the application documentation used rated equipment efficiencies.
    - Consider revising and updating demand savings for outside air economizer measures. Cadmus assumed that, since HVAC units would run during peak hours, demand savings would not be achieved for this measure and would follow the savings calculations in the Ohio TRM.

Nonresidential Custom Rebate Program

This chapter describes the evaluation approach, detailed findings, and conclusions and recommendations for the nonresidential Custom Rebate program.

Evaluation Overview

Cadmus' evaluation of the 2012 nonresidential Custom Rebate program followed the researchable questions and evaluation activities outlined in the DP&L 2012 Evaluation, Measurement, and Verification Plans document. Table 75 identifies key researchable evaluation questions.

Table 75. Key Researchable Questions

Researchable Question	Activity
Are DP&L's current verification and implementation procedures following best practices?	• Review verification, analysis, and metering procedures conducted by DP&L and its third-party partners.
Are custom air compressor projects following best practices? A thorough understanding of system efficiencies, monitoring protocols, and analysis methods can improve and expand this program further.	• Review air compressor implementation procedures. • Present best practices to program and implementation staff.
What gross electric savings and demand reductions resulted?	• Engineering analysis. • Database review. • Site visits.
Is this program cost-effective?	• Cost-effectiveness analysis.

For the past two years, Cadmus has conducted telephone surveys with randomly selected samples of DP&L's program population (stratified by measure category). These surveys examined process issues (e.g., how participants become aware of the program and their program experiences) and initial satisfaction levels. Survey results did not change significantly from year to year. There have not been significant program design or implementation changes, therefore Cadmus did not perform customer telephone surveys in 2012.

Detailed Evaluation Findings

The following key findings relate to the impact evaluation.

- The program, as shown in Table 76, had *ex ante* gross savings of 12,992,791 kWh and 2,328 kW, with achieved adjusted annual gross savings of 12,289,185 kWh and demand savings of 1,847 kW. The program achieved an energy-savings realization rate of 95% for energy savings and 79% for demand savings.

Table 76. Nonresidential Custom-Rebate Program Claimed and Achieved Energy Savings

Measure	*Ex Ante* Claimed Savings		Verified Gross Savings		Adjusted Gross Savings		
	Gross kWh	Gross kW	Gross kWh	Gross kW	Gross kWh	Gross kW	Precision*
Custom	10,939,692	1,425	10,806,281	1,374	10,674,227	1,277	6%
Custom NC	2,053,099	903	1,620,239	574	1,614,958	570	19%
Total**	**12,992,791**	**2,328**	**12,426,519**	**1,948**	**12,289,185**	**1,847**	**5.7%**

* Precision at 90% confidence for energy savings.
** Values in table may not exactly sum to 100% due to rounding.

- The program achieved 83% of DP&L's 2012 *ex ante* energy savings goals and 67% of the demand reduction goals. This is likely contributed to the increasing growth in the prescriptive program where the program continues to cover more measures. In addition, the higher incentives for prescriptive lighting for 2012 also may have contributed. It would be expected to see a decline in custom program's participation (86 projects in 2012 and 93 in 2011).
- Similar to 2011 evaluation findings (96%), 2012 exhibited an annual kWh realization rate of 95%, indicating effective measure application and program processes.
- Site audits generally found minor discrepancies, involving lighting fixture quantities and types. Changes in operating hours presented the primary discrepancies for lighting projects.
- A finding from last year's evaluation was that DP&L's independent energy consulting firms' data logging practices had room for improvement. Cadmus found DP&L improved its independent energy consulting firms' post-inspection and data logging practices. We found these firms provided thorough and well-documented installed equipment, spot meter readings, and data logging information.

Evaluation Data Collection Methods

Cadmus selected a sample for on-site verification activities using the nonresidential Custom Rebate program database.

We subdivided custom projects into two group populations according to project type: Custom Rebate and New Construction Rebate (NC). New construction projects include building performance and lighting power density (LPD) [36] reduction projects. Government Energy Audit projects, under the Custom program, were not evaluated in 2012 since there were a small number of projects and no savings are attributed to these audits. All recommended measures from the audit pass through the Rapid Rebates Program and Custom Rebate Program directly.

Cadmus proposed evaluating a statistically valid sample of projects, based on a 90% confidence interval with a 10% precision level, through on-site visits. All application materials for projects selected for on-site verification received a thorough review by a Cadmus engineer.

[36] LPD, expressed in watts per square foot, represents the amount of electrical power (watts) used to provide lighting to an area (square foot).

Project and Site Review

All 30 site visits included a thorough review of application materials for the selected projects. Cadmus selected the site visit sample to achieve the targeted confidence level. The 30 projects visited consisted of 28% of the program's overall reported savings. Out of the 86 custom projects (unique project ID numbers), seven represented relatively large savings levels (greater than 300,000 kWh per year). We included four of these seven projects in our site visit sample, but could only schedule site visits with three. Cadmus conducted a desk review for the two largest projects that were not visited. Removing the two largest projects, however, the 30 projects visited consisted of 54% of the remaining program savings.

Cadmus performed three rounds of site visits, in October and December 2012, and in February 2013. The first round consisted of site visits to five unique locations (by account number); the second consisted of site visits to five unique locations; and the third consisted of site visits to 20 unique locations. Table 77 shows total projects evaluated through site visits, by project category, for each round.

Table 77. Custom 2012 Site Visit Breakdown by Measure Category—By Project ID

Measure Category	Number of Site Visits Conducted				Total Number of Reported Projects
	October	December	February	Total	
Custom	5	0	20	25	80
Custom NC	0	5	0	5	6
Total	**5**	**5**	**20**	**30**	**86**

Baseline Assumptions

Baseline assumptions typically involved data obtained on site, and included replaced fixture types and quantities as well as parameters such as original operation hours, pressure settings, and baseline equipment power draws. In some cases, baseline monitoring was conducted by DP&L's third party engineering firms to obtain baseline consumptions. For these cases, Cadmus verified the operating conditions were still valid on site and used the logged data to inform the baseline conditions. When data could not be obtained on site or project documentation (such as baseline motor efficiencies or fixture wattages), we used assumptions provided in the draft Ohio TRM. For new construction projects, the baseline conditions are based on the 2009 International Building Code which included references to the International Energy Conservation Code and ASHRAE 90.1-2007.

Impact Evaluation Methodology and Findings

Site Verification Visits and Documentation Review

After selecting projects to verify through on-site verification activities, Cadmus downloaded project documentation from DP&L's administrative website. In preparation for each site visit, Cadmus reviewed documentation and other relevant program data. The review focused on calculation procedures and energy-savings estimate documentation.

Cadmus also reviewed the DP&L tracking spreadsheet and online application data, comparing entries to original application materials for consistency and accuracy.

On-site visits enabled us to accomplish four primary tasks:

1. Verify the implementation, installation, and characteristics of incented equipment.
2. Collect additional detailed equipment data (such as ballast factors) needed to calculate energy savings.
3. If applicable, collect available energy management system data to inform the savings analysis.
4. For new construction projects, verified and collect additional building characteristic data to inform the building simulations.

Appendix F provides detailed site-visit findings.

Database Tracking

In addition to reviewing on-site project files, we conducted a thorough review of DP&L's entire final tracking database. The two tracking spreadsheets reviewed contained:

- Participating customers who submitted their applications in 2010 and 2011, but did not complete the projects until 2012; and
- All 2012 applications and completed projects.

Part of the review combined workbooks into a master spreadsheet. DP&L finalized the year-ending 2012 tracking database, which it provided to Cadmus as the final database used for the evaluation.

Engineering Analysis and Savings Verification

Cadmus designed the impact evaluation to verify reported program participation and to estimate gross energy savings and demand reductions. For the impact evaluation, we used data collected through the program tracking database, online application forms, and calculations supplied by third-party vendors.

Cadmus collected baseline data from the program tracking system, reviewing available documentation for all completed projects (e.g., audit reports, application forms, and invoices), and focusing on energy-saving and demand reduction calculation procedures. We reviewed the original analyses used to calculate expected savings, and verified the measures' operating and structural parameters, to the extent possible based on documentation. Below, we note the specific engineering analysis and saving verification methods applied.

By major measure group, Table 78 and Table 79 summarize verified and adjusted results for the sample.[37]

[37] The number of projects sampled includes site visits and desk reviews.

Table 78. Reported Gross *Ex Ante* and Adjusted Gross *Ex Post* Savings for Sampled Projects

Measure	Number of Projects	*Ex Ante* Gross Energy Savings (kWh)	Verified Energy Savings (kWh)	Adjusted Energy Savings (kWh)	Realization Rate
Custom	32	7,846,504	7,713,093	7,713,093	98%
Custom NC	5	2,028,356	1,595,496	1,595,496	79%
Total[*]	**37**	**9,874,860**	**9,308,588**	**9,308,588**	**N/A**[**]

[*] May not sum properly due to rounding.
[**] Program level realization rates are in weighted by total program sizes.

Table 79. Reported Gross *Ex Ante* and Adjusted Gross *Ex Post* Demand Savings for Sampled Projects

Measure	Number of Projects	*Ex Ante* Gross Demand Savings (kW)	Verified Demand Savings (kW)	Adjusted Demand Savings (kW)	Realization Rate
Custom	32	855	804	804	94%
Custom NC	5	894	565	565	63%
Total[*]	**37**	**1,749**	**1,369**	**1,369**	**N/A**[**]

[*] May not sum properly due to rounding.
[**] Program level realization rates are in weighted by total program sizes.

Custom Savings

Lighting

Measures included retrofits of existing fixtures, lamps, and ballasts with energy-efficient models. Typically, these retrofits reduced demand, and we assumed fixture operating hours to be the same, pre- and post-retrofit. Measures involved a variety of project types, including those in which:

- Baseline fixtures differed from the deemed approach;
- The number of removed and installed fixtures differed; or
- The nonresidential Prescriptive Rebate program did not address certain measures (such as linear LEDs).

We reviewed each project’s approved online application for:

- Wattage levels before and after the retrofit;
- Hours of operation before and after the retrofit; and
- The number of fixtures affected by the retrofit.

Cadmus field personnel verified the number of fixtures, and adjusted savings based on operating hours and actual fixture types. These projects provided little if any documentation beyond the application and invoice. Cadmus determined appropriate wattage levels through manufacturer specification sheets, draft Ohio TRM lighting wattage tables, and other published databases.[38]

During our site audits, we found few or no discrepancies in fixture quantities and types, with changes in operating hours presenting the main discrepancy for lighting projects. These discrepancies varied by project, and could increase or decrease project savings.

Air Compressor

Cadmus evaluated one custom air compressor installation, collecting parameters on-site to inform the savings analysis. We also used pre- and post-metered data provided in the project document to confirm baseline and measure conditions. Based on metered data, site visit data, and Cadmus' experience with compressed air systems, project savings slightly reduced due to fewer shifts and fewer hours of operation.

Motors

In 2012, Cadmus performed on-site verification, and reviewed pre- and post-installation metered data and audit reports for four ECM fan retrofit motor projects. No notable discrepancies emerged.

HVAC

Cadmus evaluated one custom HVAC project, TCS Radiant heat bands, installed in a manufacturing facility. DP&L contracted with a third-party engineering firm (Go Sustainable Energy) to audit the measure. The audit included:

- On-site verification;
- Data logging; and
- Calibration to typical meteorological data.

Cadmus's audit report and program documentation review did not find discrepancies.

New Construction Projects

In the 2012 program year, three new construction projects received program incentives and Cadmus performed site visits at all project locations. Each project's energy savings were based on an eQuest or TRACE700 computer simulated model, provided for documentation. The models include findings from DP&L's third-party engineering firms (Heapy Engineering and Go Sustainable) and are reflected in the final as-built model. Prior to conducting a site visit, Cadmus reviewed the major model inputs affecting energy savings. On site, we verified the as-built model's major inputs and/or updated these, based on findings. There were no substantial differences identified between the as-built model, report findings from either of the third-party engineering firms, and the verification site visits. Cadmus concludes Heapy Engineering and Go Sustainable had appropriately modeled and estimated the savings with the best available data at that time. Through our evaluation, we also use billing data obtained from each site to

[38] See: Including the California *2009 Table of Standard Fixture Wattages*: http://www.sce.com/business/ems/customized-solutions/procedures-manual-archives.htm

align the as-built model, more accurately reflecting energy usage.[39] As best fit possible, the model's monthly consumption was aligned to the monthly billing usage which was achieved by adjusting equipment schedules, process or base loads, and equipment characteristics. Cadmus has the benefit of billing data to refine the energy models where the third-party engineering firms were limited to predict the actual kWh and kW usage. Cadmus found two projects exhibited higher energy savings than reported, while the third exhibited fewer savings. In one case, demand reductions proved greater than originally claimed based on the billing data and on-site data collected.

The largest savings project (1.2 million kWh) resulted in a 52% realization rate for energy and 42% for demand, based on the billing data provided for the site. Actual utility bills indicate the building used less lighting and air conditioning in the summer than originally anticipated. The original model was adjusted to account for this overestimate of occupancy and systems operation for the summer months. While the overall percent savings remained relatively unchanged, the nominal savings were reduced since the schedules impact both the base case and the as-built model. The alignment of the energy model to the billing data resulted in the lower realization rate. As the largest saver, this reduced the overall new construction realization rate for energy to 79%.

New Construction Lighting Power Density Savings

The LPD reduction for interior lighting projects required thorough, room-by-room audits of lighting systems. The watts-reduced value, derived from LPD in watts per square foot, was calculated as savings for new lighting, as obtained from baseline LPD values listed in the ASHRAE 90.1-2007, Space-by-Space Method, for various building types. We collected lamp wattage and room square footage for each room type. If Cadmus could not access all rooms at a facility, we compared a sample of rooms to project documentation.

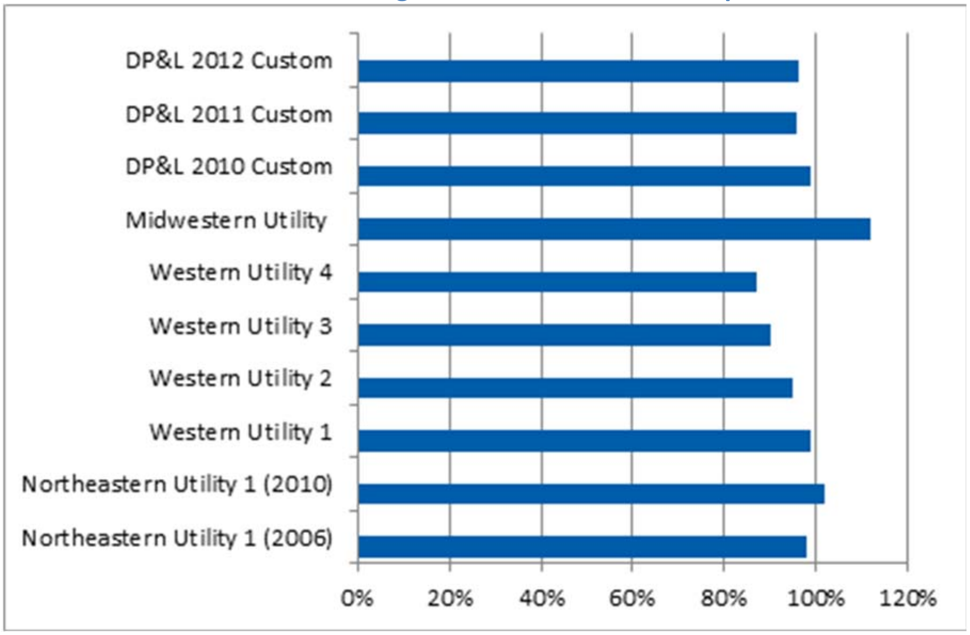
Of three projects, Cadmus could conduct site visits at two, finding only small variances in one project and slightly higher than reported operating hours.

Realization Rate Comparison

Cadmus found evaluated energy realization rates for the nonresidential Custom Rebate program comparable to evaluation findings from other utility-sponsored custom programs across the country (see Figure 43).

[39] Historical monthly billing data was provided by DP&L. The monthly billing data contained at least 12 months of data in all three projects.

Figure 43. Nonresidential Custom Program Realization Rate Comparison to Other Utilities



* Western Utility 5 evaluation realization rates were derived from its overall commercial programs, including custom and prescriptive programs.

DP&L's program exhibits a 95% realization rate. This result is very similar to the 2011 evaluation where program had a 96% realization rate. Realization rates from evaluations of other utility-sponsored custom programs across the country ranged from 87% to 112%, averaging 98%. Realization rates tend to be driven by the accuracy of a utility's engineering assumptions for its programs. For any one program, a 100% realization rate is considered the best scenario, as it indicates energy savings estimates neither overstate nor understate achievements made, reducing program staff's burdens for future program year planning. The 2012 DP&L evaluation results fell within this range.

Process Evaluation Methodology and Findings

Cadmus used the approaches detailed below in evaluating the 2012 program.

Program Design

As shown in Table 80, program participation increased from 2009 through 2011, and slightly decreased in 2012. Table 81 provides greater detail regarding the frequency of measure types installed.

Table 80. Program Participation by Year

Program Year	Number of Individual Custom Projects
2009	20
2010	65
2011	93
2012	86

Table 81. Frequency of Custom Measures

Measure Type	Frequency
Custom	80
Custom NC*	6

*This includes three building performance and three LPD projects

In general, 2012 program measure offerings remained consistent with 2010 and 2011 offerings. DP&L made a limited number of revisions for the 2012 program including:

- DP&L Introduced a joint program with Vectren Energy Delivery of Ohio and the University of Dayton, providing commercial building assessments funded through the custom rebate program. In 2012, 40 customers participated in the audits. DP&L plans to perform 40 audits in 2013 as well.

Compressed Air Training

In February 2013, DP&L provided training for interested program contractors that submitted a compressed air project for a rebate. Held at DP&L's headquarters, the training included approximately 30 contractors as well as DP&L program staff. A Cadmus engineer, providing five hours of training, covered compressed air basics, and helped contractors identify energy-savings opportunities for DP&L's customers.

Site Visit Verification Ride-Along with Auditor

Two engineering companies (Heapy Engineering and Go Sustainable Energy) provide assistance in analyzing and reviewing projects submitted for a custom rebate through the C&I program. This assistance includes custom energy savings analysis for various project types and, in some cases, pre- and post-metering to ensure accuracy of installed equipment.

Each custom project includes a pre- and post-installation site inspection, and a report outlining the details of project parameters and savings. Cadmus employed two tactics in reviewing the work both firms performed for DP&L:

- Cadmus reviewed detailed reports for multiple projects, including those without site visits conducted, to ensure consistency and uniformity between reports.
- Conduct a ride-along post-inspection site visit with both firms to better understand the methodology used for collecting and analyzing energy savings.

For custom projects receiving site visits, Cadmus first reviewed the detailed reports outlining project information and savings calculations. Once on site, we compared detailed energy savings reports and information to operating conditions and equipment specifications found on site. The detailed reports provided an accurate representation of installed projects for both firms. Some reports also provided historical energy data as well as pre and post data-logging to substantiate energy-savings estimates.

One recommendation emerging from report reviews and on-site inspections was to provide greater documentation for custom lighting wattages not found in the draft Ohio TRM standard fixture wattages.

Heapy Engineering Ride-Along Site Visit

Cadmus accompanied Heapy Engineering on a post-installation inspection to determine whether best practices were followed. The project entailed installation of several VFD's on sewage water pumps.

Heapy scheduled the site visit well in advance, and arranged for property operators to be present during the visit. On-site staff were used to better determine hours of operation at the facility. Cadmus observed Heapy Engineering using best practices on site, collecting all relevant information, including model numbers, quantity, and hours of operation and equipment schedules. Additionally, photos taken of the equipment were included in the final site report.

Go Sustainable Energy Ride-Along Site Visit

Cadmus performed a ride-along site visit with Go Sustainable Energy. The project involved installation of quartz and ceramic ovens in a manufacturing facility to increase the overall production rate efficiency by reducing oven heat losses.

Go Sustainable Energy engineers scheduled a visit to install power metering equipment on a newly installed control panel for the ovens. During the installation, Cadmus observed proper safety and use of personal protective equipment, including: safety glasses, fire retardant clothing, steel toe shoes, electrical gloves, and ear protection. Plant engineers and electricians, present during the power metering and equipment installation, answered questions regarding the equipment. Cadmus found Go Sustainable engineers highly knowledgeable and well-trained technicians, who follow all necessary precautions.

Recommendations

Based on the preceding findings, Cadmus offers the following recommendations for program improvements:

- In general, we found documentation and analysis to be sufficient with DP&L's independent energy firms, with typically well-documented site visit reports and impact analyses of site-specific savings. However, it is recommended that the firms provide greater documentation for custom lighting wattages not found in the draft Ohio TRM standard fixture wattages.
- As new lighting requirements come into effect, programmatic implications may emerge for DP&L if new T12 products meet revised efficiency requirements. It remains too early to detemine the implications, but Cadmus recommends continued observation of these product developments.

Cost-Effectiveness

Cost-Benefit Scenarios

The primary method used to determine program and portfolio cost-effectiveness is the TRC test. The TRC derives from the ratio of lifecycle benefits of the portfolio over lifecycle incremental costs. The TRC determines whether energy efficiency proves more cost-effective overall than supplying energy. The TRC does not provide the necessary information to determine whether the portfolio or program is cost-effective from the perspective of an individual program participant, DP&L, or ratepayers. Therefore, Cadmus calculated additional tests, based on the California Standard Practice Manual for the portfolio of programs and for each individual program implemented in 2012. Those tests, in addition to the TRC, are: the Societal Test (SCT), the Utility Cost Test (UCT) (also known and the Program Administrator Cost Test [PAC]), the Ratepayer Impact Measure (RIM), and the Participant Cost Test (PCT).

We did not include non-energy benefits in this analysis; therefore, the SCT is only differentiated from the TRC by the discount rate.

The SCT uses a 10-year Treasury bill (T-bill) rate of 2.68% to discount future benefits.[40] The 10-year T-bill rate used as a discount rate for the SCT recognizes benefits accrue to society in general rather than solely to a utility or participants. Generally, utilities experience high weighted capital costs, reflecting the cost of borrowing money and the associated risk. For society as a whole, the risk level is low or almost nonexistent, making the T-bill rate more appropriate for a total resource perspective.

The UCT is a valuation of the costs and benefits directly accrued by the utility. In some ways, the UCT provides for a more even comparison between demand and supply side resources as they both include the utility cost only.

The RIM, a valuation of program net benefits as perceived by ratepayers, is measured by: electric avoided costs; incentive costs (i.e., utility measure costs); administrative costs associated with the program; and lost revenues (equal to participant energy savings benefits).

Table 82 shows discount rate applied to each benefit-cost test.

Table 82. Discount Rates

Benefit-Cost Test	Discount Rate
TRC	8.95%
SCT	2.68%
UTC	8.95%
RIM	8.95%
PCT	10.00%

[40] The SCT discount rate was updated for the program year 2012: Discount rates of 3.56% and 3.5% were used in 2011 and 2010, respectively.

Program Benefit Components

Benefits counted through the TRC, UTC, RIM, and SCT include:

- The full value of time and seasonally differentiated avoided generation costs;
- Avoided transmission and distribution costs; and
- Avoided capacity costs.

For each energy-efficiency measure included in a program, Cadmus adjusted the hourly (8,760) system-avoided costs by the hourly load shape of the end use affected by the measure, capturing the full value of time and seasonally differentiated impacts of the measure.[41]

Table 83 shows five years of avoided costs estimates starting in 2012.[42]

Table 83. Summary of Avoided Costs

Year	Average Hourly Energy Cost ($/MWh)	Capacity ($/kW)
2012	$31.94	$27.24
2013	$34.13	$7.72
2014	$35.38	$25.07
2015	$36.93	$47.30
2016	$38.75	$51.31

Cadmus used adjusted gross energy and demand savings to perform the benefit-cost calculations. We did not factor non-energy benefits, such as water savings, into the calculation. We did apply line loss—the percentage of energy lost during transmission and distribution—to measure level savings that reflect total savings from the point of generation. Table 84 specifies line-loss assumptions.[43]

Table 84. Line Loss Assumptions Used in Cost-Effectiveness Calculations

Sector	Energy Line Losses	Demand Line Losses
Residential	7.37%	8.37%
Commercial/Industrial	4.06%	5.21%

Program Cost Components

For the analysis' cost component, we considered incremental measure costs or project costs depending on the data available and direct utility costs.

Incremental measure costs are incremental expenses associated with installation of energy-efficiency measures, and ongoing operation and maintenance costs, where applicable. These costs include the

41 As hourly end-use load shapes were unavailable for the DP&L service area, Cadmus developed them using available data from similar regions, adjusting for weather conditions in DP&L's service territory.

42 Appendix H includes a detailed review of the cost-effectiveness analysis inputs.

43 The line losses in Table 84 represent the percentage loss in energy and demand from the point of generation to the meter.

incentive as well as the customer contribution. Cadmus used data provided by DP&L as well as secondary sources to calculate the incremental cost for each measure within each program.

For the nonresidential programs total project costs, not incremental costs, were included in utility tracking databases. Therefore Cadmus made adjustments to the total project costs for these programs.

For the Prescriptive Rebates program, Cadmus relied on the draft Ohio TRM and the Database for Energy Efficient Resources (DEER) database, and other secondary sources to calculate the incremental cost for several measures such as lighting, HVAC units and motors.

For the new construction component of the nonresidential Custom Rebate program, projects costs were not available for one of the three projects. Total project costs for this site were calculated using the average ratio of incentives to project cost for the two sites where projects cost data was available. In terms of measure cost, all three projects were LEED Certified schools. Secondary research confirms that the incremental cost of constructing a LEED Certified school is 1.65% of total project costs[44]. This 1.65% was applied to total project costs for the three sites in order calculate incremental measure costs.

Measure cost data was unavailable for the lighting power density measures in the Custom Rebate program. Therefore, the ratio between total savings and total measure cost for lighting in the Prescriptive Rebates program was used as a proxy to determine measure cost for lighting power density.

For the Self-Directed Mercantile program Cadmus used the total project costs in the cost-effectiveness calculations for the retrofit projects – overall a conservative approach. For the new construction projects within the Self-Directed Mercantile program, Cadmus relied on secondary research to calculate incremental costs. The 1.65% referenced above was applied to LEED Certified schools. For new construction projects that were not schools, secondary research confirms the premium for constructing a green building is 2% of total project costs[45]. Thus Cadmus used this percentage to estimate incremental measure costs for those buildings that were not schools.

Utility costs include any customer payments, and expenses associated with: program development; marketing; delivery; operation; and evaluation, monitoring, and verification (EM&V). Table 85 summarizes DP&L's implementation and administrative costs. All utility costs were provided by DP&L.

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[44] Kats, Gregory. "Greening America's Schools – Costs and Benefits." October 6, 2006. http://www.usgbc.org/ShowFile.aspx?DocumentID=2908

[45] Kats, Gregory, et al. "A Report to California's Sustainable Building Task Force." October 2003. http://www.usgbc.org/Docs/Archive/General/Docs1992.pdf

Table 85. Implementation and Administrative Costs

Cost Category	Level	Description
Implementation Vendor and Marketing Costs	Program Level	Incremental costs associated with performing program implementation tasks, including customer service, application processing, marketing, customer outreach, etc.
Incentive Costs	Program Level	Rebates and incentives paid to customers by DP&L.
Direct Measure Costs	Program Level	Costs associated with paying for program measures, including measures installed through the Low Income Weatherization program.
DP&L Staff Costs	Program Level/ Portfolio Level	Costs to administer energy-efficiency programs, including DP&L's fully-loaded incremental personnel costs. Activities associated with market research outside of EM&V.
External Vendor Evaluations	Portfolio Level	Activities associated with the determination and evaluation of current and potential energy-efficiency programs. Activities include: benefit-cost ratio analysis, impact and process analysis, cost per kWh analysis, customer research, and all other analyses necessary for program evaluation.
Education, Awareness, and Building and Market Transformation	Portfolio Level	Cost to increase awareness of energy efficiency.

Overall Portfolio Cost-Effectiveness Results

Full Portfolio Results

Table 86 summarizes energy savings, demand impacts, and costs for DP&L's entire energy-efficiency portfolio, utilizing adjusted gross savings. The portfolio includes:

- DP&L's six residential sector programs: Lighting, Appliance Recycling, Low-Income Weatherization, Heating and Cooling Rebate, HVAC Diagnostic & Tune-Up, and Be E^3 Smart;
- DP&L's three nonresidential programs: Prescriptive Rebate, Custom Rebate, and Self-Directed Mercantile;
- Portfolio costs for education and awareness; and
- EM&V.

The portfolio passes the TRC test with a benefit-cost ratio of 1.54. All other tests have a benefit-cost ratio above 1.0, except for the RIM test. Table 86 shows benefits, costs, and benefit/cost ratios for each test.

Table 86. DP&L Portfolio

Benefit/Cost Component	2012 Values
Gross Savings (MWh)	179,788
Capacity Savings (kW)	31,144
Total TRC Costs	$44,062,008
Direct Participant Costs	$38,453,792
Direct Utility Costs	$15,053,116
Incentives	$9,444,899
Direct Measure Costs	$804,236
DP&L Staff Costs	$818,932
Implementation Vendor & Marketing	$2,817,822
External Vendor Evaluations	$559,431
Education, Awareness Building & Market Transformation	$607,795

	TRC	*Utility*	*Participant*	*RIM*	*Societal*
Present Value Benefits	$67,899,847	$67,899,847	$163,436,646	$67,899,847	$94,170,567
Present Value Costs	$44,062,008	$15,053,116	$38,453,792	$175,190,076	$44,062,008
Benefit-Cost Ratio	**1.54**	**4.51**	**4.25**	**0.39**	**2.14**

Residential Portfolio Results

Table 87 summarizes energy savings, demand impacts, and costs for DP&L's residential programs. The residential portfolio proves cost-effective overall, with a TRC of 2.12. The Lighting program is the most cost-effective program in the portfolio, with a benefit/cost ratio of 4.86. The HVAC Diagnostic & Tune-Up program and the Heating and Cooling Rebate program did not pass the TRC test as stand-alone programs. Additionally, the Residential Low-income Weatherization program did not pass the TRC test; however, this program provides numerous non-energy benefits, such as better health and safety for low-income customers.

Table 87. Residential Portfolio

Benefit/Cost Component	Lighting	HVAC Diagnostic & Tune-Up	Heating and Cooling Rebate	Appliance Recycling	Low Income Weatherization	Be E^3 Smart	Total
	Program Year 2012						
Gross Savings (MWh)	80,442	983	6,605	2,133	982	4,527	95,674
Capacity Savings (kW)	8,508	156	1,972	338	122	312	11,408
Total TRC Costs	$5,114,073	$745,921	$6,623,688	$342,241	$1,011,008	$197,464	$14,034,394
Direct Participant Costs	$4,540,522	$394,940	$6,031,339	$51,825	$0	$0	$11,018,626
Direct Utility Costs	$3,070,490	$554,821	$1,749,048	$342,241	$1,011,008	$197,464	$6,925,072
Incentives	$2,496,939	$203,840	$1,156,700	$51,825	$0	$0	$3,909,304
Direct Measure Costs	$0	$0	$0	$0	$804,236	$0	$804,236
DP&L Staff Costs	$53,783	$42,113	$41,315	$41,690	$40,005	$5,619	$224,525
Implementation Vendor & Marketing	$519,768	$308,867	$551,034	$248,726	$166,767	$191,845	$1,987,006
TRC							
Present Value Benefits	$24,866,143	$189,356	$2,798,269	$610,399	$322,955	$957,498	$29,744,621
Present Value Costs	$5,114,073	$745,921	$6,623,688	$342,241	$1,011,008	$197,464	$14,034,394
Benefit-Cost Ratio	**4.86**	**0.25**	**0.42**	**1.78**	**0.32**	**4.85**	**2.12**
Utility							
Present Value Benefits	$24,866,143	$189,356	$2,798,269	$610,399	$322,955	$957,498	$29,744,621
Present Value Costs	$3,070,490	$554,821	$1,749,048	$342,241	$1,011,008	$197,464	$6,925,072
Benefit-Cost Ratio	**8.10**	**0.34**	**1.60**	**1.78**	**0.32**	**4.85**	**4.30**
Participant							
Present Value Benefits	$76,488,140	$792,108	$7,442,599	$1,847,599	$914,676	$3,150,769	$90,635,891
Present Value Costs	$4,540,522	$394,940	$6,031,339	$51,825	$0	$0	$11,018,626
Benefit-Cost Ratio	**16.85**	**2.01**	**1.23**	**35.65**	**-**	**-**	**8.23**
RIM							
Present Value Benefits	$24,866,143	$189,356	$2,798,269	$610,399	$322,955	$957,498	$29,744,621
Present Value Costs	$79,566,922	$1,153,445	$8,330,353	$2,190,950	$1,960,563	$3,424,654	$96,626,887
Benefit-Cost Ratio	**0.31**	**0.16**	**0.34**	**0.28**	**0.16**	**0.28**	**0.31**
Societal							
Present Value Benefits	$31,667,256	$213,606	$4,213,755	$752,771	$442,643	$1,142,634	$38,432,666
Present Value Costs	$5,114,073	$745,921	$6,623,688	$342,241	$1,011,008	$197,464	$14,034,394
Benefit-Cost Ratio	**6.19**	**0.29**	**0.64**	**2.20**	**0.44**	**5.79**	**2.74**

Nonresidential Portfolio Results

A summary of the energy savings, demand impacts, and costs for DP&L's commercial and industrial programs are reported in Table 88. The nonresidential portfolio is cost-effective overall, with a TRC of 1.33. All programs are cost-effective as well, with each program having a benefit/cost ratio larger than 1.0 for all except the RIM test.

Table 88. Nonresidential Portfolio

Benefit/Cost Component	Program Year 2012 Prescriptive Rebates	Custom Rebate	Self-Directed Mercantile	Total
Gross Savings (MWh)	67,302	12,289	4,523	84,114
Capacity Savings (kW)	14,620	1,847	3,270	19,737
Total TRC Costs	$21,018,821	$5,525,841	$2,196,967	$28,741,629
Direct Participant Costs	$20,357,874	$5,036,201	$2,041,090	$27,435,166
Direct Utility Costs	$4,383,943	$1,657,366	$800,749	$6,842,058
Incentives	$3,722,997	$1,167,726	$644,872	$5,535,595
Direct Measure Costs	$0	$0	$0	$0
DP&L Staff Costs	$256,564	$158,417	$60,666	$475,647
Implementation Vendor & Marketing	$404,382	$331,223	$95,211	$830,816
TRC				
Present Value Benefits	$28,277,776	$6,021,728	$3,855,722	$38,155,226
Present Value Costs	$21,018,821	$5,525,841	$2,196,967	$28,741,629
Benefit-Cost Ratio	**1.35**	**1.09**	**1.76**	**1.33**
Utility				
Present Value Benefits	$28,277,776	$6,021,728	$3,855,722	$38,155,226
Present Value Costs	$4,383,943	$1,657,366	$800,749	$6,842,058
Benefit-Cost Ratio	**6.45**	**3.63**	**4.82**	**5.58**
Participant				
Present Value Benefits	$55,852,597	$12,339,001	$4,609,157	$72,800,755
Present Value Costs	$20,357,874	$5,036,201	$2,041,090	$27,435,166
Benefit-Cost Ratio	**2.74**	**2.45**	**2.26**	**2.65**
RIM				
Present Value Benefits	$28,277,776	$6,021,728	$3,855,722	$38,155,226
Present Value Costs	$58,813,750	$13,445,701	$5,017,752	$77,277,204
Benefit-Cost Ratio	**0.48**	**0.45**	**0.77**	**0.49**
Societal				
Present Value Benefits	$39,916,145	$9,247,401	$6,574,354	$55,737,901
Present Value Costs	$21,018,821	$5,525,841	$2,196,967	$28,741,629
Benefit-Cost Ratio	**1.90**	**1.67**	**2.99**	**1.94**

Appendix A: Measure-Level Savings Table

Program	Measure	Verified Gross Savings		Adjusted Gross Savings	
		kWh	kW	kWh	kW
Residential					
Lighting	CFL	80,865,678	9,672	80,442,456	8,508
Appliance Recycling	Recycled Refrigerator	1,801,470	286	1,698,311	270
	Recycled Freezer	411,255	67	434,608	67
Low-Income	CFM Reduction	33,889	0	33,889	0
	Attic Insulation	59,690	1	59,690	1
	Central AC Replacement	694	1	694	1
	Compact Fluorescent Light Bulbs	325,806	39	339,856	40
	Faucet Aerator	2,842	0	9,982	1
	Foundation Wall Insulation	6,109	0	6,109	0
	Freezer Replacement	60,654	9	60,654	9
	Heat Pump Replacement	3,911	0	3,911	0
	LED 0.5 W Nightlight	295	0	2,234	0
	Water Heater Pipe Insulation	1,602	0	514	0
	Refrigerator Replacement	342,576	52	439,101	68
	Energy-Efficient Showerhead	8,944	1	20,396	1
	Smart Strip Power Outlet	1,130	0	1,130	0
	Wall Insulation	2,641	0	2,641	0
	Water Heater Temperature Setback	339	0	339	0
	Water Heater Wrap	1,180	0	1,180	0
HVAC Rebate	AC Early Retirement 14/15 SEER	1,461,680	803	1,369,486	720
	AC Early Retirement 16+ SEER	841,434	487	785,661	462
	AC New Construction 14/15 SEER	15,870	15	14,907	14
	AC New Construction 16+ SEER	18,144	14	18,921	14
	AC Std Replacement 14/15 SEER	13,800	13	11,883	14
	AC Std Replacement 16+ SEER	9,504	7	11,685	9
	HP Early Retirement 14/15 SEER	1,479,850	260	1,365,168	231
	HP Early Retirement 16+ SEER	1,040,382	254	1,059,623	232
	HP New Construction 14/15 SEER	587,400	151	287,240	88
	HP New Construction 16+ SEER	39,928	11	40,513	11
	HP Std Replacement 14/15 SEER	34,176	9	33,240	9
	HP Std Replacement 16+ SEER	34,224	9	33,263	9
	GSHP Early Retirement 16/18 EER	291,044	33	308,112	17
	GSHP Early Retirement 19+ EER	322,677	45	348,778	27
	GSHP New Construction 16/18 EER	53,889	4	62,046	4
	GSHP New Construction 19+ EER	70,057	6	69,950	6
	GSHP Std Replacement 16/18 EER	4,899	0	5,090	0
	GSHP Std Replacement 19+ EER	21,556	2	21,526	2
	Mini-Split A/C New Construction 16+ SEER	2,184	2	3,390	3
	Mini-Split HP New Construction 14/15 SEER	6,276	0	6,769	0
	Mini-Split HP New Construction 16+ SEER	191,352	14	211,276	23
	Mini-Split HP Replacement 16+ SEER	13,668	1	15,103	2
	ECM Motor on Furnace (with New AC)	321,434	0	324,462	0

Program	Measure	Verified Gross Savings		Adjusted Gross Savings	
		kWh	kW	kWh	kW
	ECM Motor on Furnace (with New HP)	0	0	0	0
	ECM Motor n Furnace	159,264	69	197,003	75
HVAC Tune-Up	Central AC Equipment Tune-Up	669,591	157	426,924	132
	Air-Source Heat Pump Equipment Tune-Up	427,071	31	556,411	24
Be E3 Smart	CFL (four 13W)	1,331,010	141	1,331,010	141
	LED Night Light	22,430	0	22,430	0
	Bathroom Faucet Aerator (2 per kit)	514,706	32	508,181	29
	Kitchen Faucet Aerator	1,057,754	66	1,141,233	65
	Efficient Showerhead	1,460,230	77	1,524,593	78
Nonresidential					
Nonresidential Prescriptive	HVAC	2,488,969	945	3,087,297	1,507
	Lighting	60,599,862	12,134	56,144,083	12,339
	Motors	6,171,427	784	6,492,754	636
	Other	1,488,280	214	1,577,494	138
Nonresidential Custom	Custom	12,426,519	1,948	12,289,185	1,847
Total		**179,623,248**	**28,869**	**175,264,383**	**27,875**

Appendix B: *Ex Ante* Measure-Level Savings

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
Residential						
Lighting	CFL	1,675,469	48	0.006	80,676,682	9,650
Appliance Recycling	Refrigerator Replacement	1,590	1,133	0.180	1,801,470	286
	Freezer Replacement	481	855	0.140	411,255	67
Low-Income*	CFL 7-9 W Candelabra	338	26	0.003	8,700	1
	CFL 9 W Globe	155	29	0.003	4,488	0
	CFL 9-15 W Spiral	4,274	42	0.005	178,771	20
	CFL 15 W Globe	337	48	0.005	16,264	2
	CFL 15 W Or Less Outdoor	103	42	0.005	4,308	0
	CFL 16-20 W Floodlight	38	58	0.006	2,201	0
	CFL 16-20 W Outdoor	117	64	0.007	7,529	1
	CFL 16-20 W Spiral	679	58	0.006	39,324	4
	CFL 3-Way Circle Line	49	67	0.007	3,298	0
	CFL 3-Way Spiral	209	64	0.007	13,449	1
	CFL 21 W Or Above Outdoor	36	47	0.005	1,689	0
	CFL 21 W Or Above Floodlight	6	61	0.007	365	0
	CFL 21 W Or Above Spiral	405	53	0.006	21,650	2
	CFL 3-Way Dimmable Torchiere	16	112	0.012	1,795	0
	LED 0.5 W Nightlight	170	2	0.000	273	0
	Refrigerator Replacement	351	1,251	0.192	439,101	67
	Freezer Replacement	76	1,131	0.175	85,956	13
	Attic Insulation	41	1,073	0.888	44,005	36
	Foundation Wall Insulation	27	97	0.077	2,616	2
	Wall Insulation	1	0	0.000	0	0
	Faucet Aerator	116	26	0.003	3,038	0
	Energy-efficient Showerhead	69	249	0.028	17,195	2
	Central AC Replacement	1	0	0.063	0	0
	Heat Pump Replacement	2	0	0.000	0	0
	CFM Reduction	44	5	0.004	229	0
	Smart Strip Power Outlet	20	0	0.000	0	0
	Water Heater Temperature Setback	4	0	0.000	0	0
	Water Heater Pipe Insulation	5	609	0.070	3,045	0
	Water Heater Wrap	15	79	0.009	1,185	0
HVAC Rebate	AC Early Retirement 14/15 SEER	1,208	1,210	0.665	1,461,680	803
	AC Early Retirement 16+ SEER	627	1,342	0.776	841,434	487
	AC New Construction 14/15 SEER	69	230	0.222	15,870	15
	AC New Construction 16+ SEER	42	432	0.338	18,144	14
	AC Std Replacement 14/15 SEER	60	230	0.222	13,800	13
	AC Std Replacement 16+ SEER	22	432	0.338	9,504	7
	HP Early Retirement 14/15 SEER	425	3,482	0.611	1,479,850	260
	HP Early Retirement 16+ SEER	322	3,231	0.789	1,040,382	254
	HP New Construction 14/15 SEER	550	1,068	0.274	587,400	151
	HP New Construction 16+ SEER	28	1,426	0.384	39,928	11
	HP Std Replacement 14/15 SEER	32	1,068	0.274	34,176	9
	HP Std Replacement 16+ SEER	24	1,426	0.384	34,224	9

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
	GSHP Early Retirement 16/18 EER	52	5,597	0.636	291,044	33
	GSHP Early Retirement 19+ EER	51	6,327	0.879	322,677	45
	GSHP New Construction 16/18 EER	11	4,899	0.356	53,889	4
	GSHP New Construction 19+ EER	13	5,389	0.480	70,057	6
	GSHP Std Replacement 16/18 EER	1	4,899	0.356	4,899	0
	GSHP Std Replacement 19+ EER	4	5,389	0.480	21,556	2
	Mini-Split A/C New Construction 16+ SEER	13	168	0.171	2,184	2
	Mini-Split HP New Construction 14/15 SEER	3	2,092	0.110	6,276	0
	Mini-Split HP New Construction 16+ SEER	84	2,278	0.171	191,352	14
	Mini-Split HP Replacement 16+ SEER	6	2,278	0.171	13,668	1
	ECM Motor on Furnace (with New AC)	929	346	0.000	321,434	0
	ECM Motor on Furnace (with New HP)	23	0	0.000	0	0
	ECM Motor n Furnace	288	553	0.240	159,264	69
HVAC Tune-Up	Central AC Equipment Tune-Up	4,228	158	0.037	668,024	156
	Air-Source Heat Pump Equipment Tune-Up	868	492	0.036	427,056	31
Be E3 Smart	13W CFLs (4 Bulbs in each kit)	28,310	46	0.005	1,295,587	137
	Nightlights (1 in each kit)	1,645	12	0.000	19,109	0
	Bathroom Faucet Aerators (2 in each kit)	8,641	48	0.003	414,961	26
	Kitchen Faucet Aerators (1 in each kit)	5,092	235	0.015	1,196,851	75
	Efficient Showerheads (1 in each kit)	5,092	318	0.017	1,618,326	85
Nonresidential						
Nonresidential Prescriptive: HVAC	Air cooled chiller - any size	15	46,884	21.160	703,257	317
	Air source heat pump < 65,000 BTUH (split)	10	306	0.119	3,060	1
	Energy recovery ventilation > 450 CFM	3	73,643	0.000	220,930	0
	Ground Water-Source Heat Pumps (Open Loop) < 135,000 BTUH	4	318	0.290	1,271	1
	HVAC occupancy sensor	1	78	0.061	78	0
	Outside air economizer with two enthalpy sensors	9	2,182	0.600	19,635	5
	Programmable setback thermostat	1	0	0.000	0	0
	Unitary and split system A/C 65,000 - 135,000 BTUH (5.4-11.25 tons)	23	1,014	0.797	23,331	18
	Unitary and split system A/C < 65,000 BTUH (<5.4 tons)	21	773	0.610	16,226	13
	Unitary and split system A/C > 760,000 BTUH (>63.33 tons)	1	16,825	13.217	16,825	13
	Unitary and split system A/C 136,000 - 240,000 BTUH (11.33-20 tons)	10	3,670	2.883	36,703	29
	Unitary and split system A/C 241,000	7	4,093	3.215	28,649	23

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
	- 760,000 BTUH (20-63.33 tons)					
	Variable frequency drive up to 250 HP	21	15,231	4.445	319,844	93
	Water cooled chiller > 300 tons	3	286,128	95.582	858,383	287
	Water cooled chiller 150-300 tons	1	35,322	17.300	35,322	17
	Water source heat pump <240,000 BTUH @ 85 degrees FLWT	5	6,129	4.176	30,645	21
Nonresidential Prescriptive: Lighting	#Low-watt T8 4-foot 1 lamp fixture replacing T12	4	1,182	0.340	4,727	1
	#Low-watt T8 4-foot 1 lamp fixture replacing T8	1	615	0.237	615	0
	#Low-watt T8 4-foot 2 lamp fixture replacing T12	22	1,209	0.337	26,600	7
	#Low-watt T8 4-foot 2 lamp fixture replacing T8	5	1,034	0.334	5,169	2
	#Low-watt T8 4-foot 3 lamp fixture replacing T12	1	2,767	0.791	2,767	1
	#Low-watt T8 4-foot 3 lamp fixture replacing T8	1	2,278	0.878	2,278	1
	#Low-watt T8 4-foot 4 lamp fixture replacing T12	11	6,899	1.878	75,884	21
	#Low-watt T8 4-foot 4 lamp fixture replacing T8	1	2,460	0.949	2,460	1
	Central lighting control	3	7,829	0.000	23,488	0
	CFL pin-based fixture	8	4,099	2.353	32,793	19
	CFL Res Lighting Savings Moved to Commercial	1	12,647,206	2987.000	12,647,206	2,987
	CFL screw-in bulb > 32W replacing incandescent	8	13,836	4.250	110,687	34
	CFL screw-in bulb up to 32W replacing incandescent	85	11,794	2.617	1,002,518	222
	Delamping HID	24	23,451	4.803	562,824	115
	Delamping T12 (# linear feet)	214	31,896	7.316	6,825,690	1,566
	Delamping T8 (# linear feet)	14	27,258	4.892	381,613	68
	Dimmable ballast for use with daylight sensors	1	2,143	0.661	2,143	1
	Fixture-mounted daylight sensor	2	255	0.099	510	0
	Fixture-mounted occupancy sensor	25	48,409	1.373	1,210,232	34
	LED case lighting sensor controls	4	1,245	0.000	4,979	0
	LED lighting in reach-in freezer/cooler case	45	11,135	1.740	501,082	78
	LED or electroluminescent exit sign	81	885	0.109	71,679	9
	LED or Induction (8,760 operating hours) replacing 175 W or less	2	7,798	0.745	15,596	1
	LED or Induction (8,760 operating hours) replacing 176W to 250W	3	3,854	0.440	11,563	1
	LED or Induction (operating hours < 8,760) replacing 175W or less	82	2,734	0.000	224,161	0
	LED or Induction (operating hours <	31	4,819	0.000	149,382	0

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
	8,760) replacing 176W to 250W					
	LED or Induction (operating hours < 8,760) replacing 251W to 400W	35	11,912	0.000	416,929	0
	LED pedestrian walk/don't walk sign	2	36,897	2.022	73,794	4
	LED recessed downlight luminaires up to 18 watts or screw-in base lamps	115	29,291	6.283	3,368,430	723
	LED traffic signal - green	2	38,971	4.449	77,943	9
	LED traffic signal - red	2	49,874	5.693	99,747	11
	Low-watt T8 4-foot 1 lamp fixture replacing T12	27	2,596	0.588	70,086	16
	Low-watt T8 4-foot 1 lamp fixture replacing T12*	17	3,718	0.526	63,213	9
	Low-watt T8 4-foot 1 lamp fixture replacing T8	5	262	0.049	1,308	0
	Low-watt T8 4-foot 2 lamp fixture replacing T12	123	7,071	1.666	869,755	205
	Low-watt T8 4-foot 2 lamp fixture replacing T12*	73	11,121	2.053	811,838	150
	Low-watt T8 4-foot 2 lamp fixture replacing T8	11	13,257	2.275	145,832	25
	Low-watt T8 4-foot 2 lamp fixture replacing T8*	1	3,982	1.389	3,982	1
	Low-watt T8 4-foot 3 lamp fixture replacing T12	27	15,768	4.070	425,723	110
	Low-watt T8 4-foot 3 lamp fixture replacing T12*	12	13,103	3.603	157,236	43
	Low-watt T8 4-foot 3 lamp fixture replacing T8	8	15,349	2.869	122,791	23
	Low-watt T8 4-foot 3 lamp fixture replacing T8*	1	1,763	0.615	1,763	1
	Low-watt T8 4-foot 4 lamp fixture replacing T12	153	16,135	3.344	2,468,647	512
	Low-watt T8 4-foot 4 lamp fixture replacing T12*	87	12,971	3.286	1,128,483	286
	Low-watt T8 4-foot 4 lamp fixture replacing T8	16	9,934	2.041	158,936	33
	Low-watt T8 4-foot 4 lamp fixture replacing T8*	1	194	0.047	194	0
	NewT8 (BF < 0.78) 4-foot 1 lamp fixture replacing T12	2	1,497	0.377	2,995	1
	NewT8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	11	1,499	0.271	16,486	3
	NewT8 (BF < 0.78) 4-foot 2 lamp fixture replacing T8	1	219	0.048	219	0
	NewT8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	14	1,517	0.373	21,234	5
	NewT8 (BF < 0.78) 4-foot 4 lamp fixture replacing T8	1	456	0.141	456	0

CADMUS

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
	Relamping 25 watt or less	24	15,391	3.270	369,393	78
	Relamping 28 watt	29	4,873	1.106	141,307	32
	Remote-mounted daylight sensor	2	1,818	0.533	3,637	1
	Switching controls for multilevel lighting	1	25,629	5.030	25,629	5
	T5 2 lamp fixture replacing T12	3	325	0.059	974	0
	T5 3 lamp fixture replacing T12	2	2,129	0.569	4,257	1
	T5 high-output 1 lamp fixture replacing T12	1	4,374	0.801	4,374	1
	T5 high-output 2 lamp fixture replacing T12	1	399	0.123	399	0
	T5 high-output high-bay 10 lamp fixture replacing HID	6	147,061	17.972	882,365	108
	T5 high-output high-bay 2 lamp fixture replacing HID	6	19,290	3.057	115,742	18
	T5 high-output high-bay 3 lamp fixture replacing HID	2	50,247	5.057	100,493	10
	T5 high-output high-bay 4 lamp fixture replacing HID	17	64,305	9.780	1,093,183	166
	T5 high-output high-bay 6 lamp fixture replacing HID	27	48,062	5.716	1,297,682	154
	T5 high-output high-bay 8 lamp fixture replacing HID	1	61,519	8.064	61,519	8
	T8 (BF < 0.78) 4-foot 1 lamp fixture replacing T12	20	2,423	0.411	48,451	8
	T8 (BF < 0.78) 4-foot 1 lamp fixture replacing T12*	8	1,912	0.340	15,299	3
	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	177	4,523	1.086	800,572	192
	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12*	59	1,752	0.521	103,382	31
	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T8	4	3,034	0.289	12,134	1
	T8 (BF < 0.78) 4-foot 3 lamp fixture replacing T12	18	10,779	2.445	194,027	44
	T8 (BF < 0.78) 4-foot 3 lamp fixture replacing T12*	13	3,262	0.931	42,410	12
	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	228	10,544	2.140	2,404,100	488
	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12*	57	5,763	1.306	328,493	74
	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T8	5	2,820	0.610	14,102	3
	T8 4 foot 2 lamp replacing T12 HO only	19	7,555	1.062	143,537	20
	T8 4 foot 3 lamp replacing T12 HO only	2	44,155	7.379	88,310	15
	T8 4 foot 4 lamp replacing T12 HO	62	25,559	5.301	1,584,658	329

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
	only					
	T8 4 foot 4 lamp replacing T12 HO only*	9	45,892	10.054	413,024	90
	T8 4-foot 1 lamp fixture replacing T12	8	4,878	0.885	39,021	7
	T8 4-foot 2 lamp fixture replacing T12	60	2,806	0.545	168,380	33
	T8 4-foot 3 lamp fixture replacing T12	9	20,452	3.647	184,070	33
	T8 4-foot 4 lamp fixture replacing T12	33	6,949	1.055	229,315	35
	T8 4-foot 4 lamp fixture replacing T12*	2	2,823	0.309	5,647	1
	T8 high-bay 4-foot 2 lamp fixture replacing HID	2	34,336	5.509	68,673	11
	T8 high-bay 4-foot 3 lamp fixture replacing HID	1	11,452	2.535	11,452	3
	T8 high-bay 4-foot 4 lamp fixture replacing HID	33	41,201	7.011	1,359,638	231
	T8 high-bay 4-foot 6 lamp fixture replacing HID	159	80,393	13.055	12,782,504	2,076
	T8 high-bay 4-foot 8 lamp fixture replacing HID	13	13,303	2.918	172,933	38
	T8 high-output 8-foot 1 lamp fixture replacing T12 HO only	2	22,166	5.130	44,332	10
	T8 high-output 8-foot 2 lamp fixture replacing T12 HO only	34	13,247	3.240	450,397	110
	Vending equipment controller	2	2,418	0.000	4,836	0
	Wall or Ceiling-mounted occupancy sensor	124	11,112	0.491	1,377,892	61
Nonresidential Prescriptive: Motors, Drives & Compressed Air	Additional primary storage required	1	7,488	1.000	7,488	1
	Air compressor 1 - 100 HP Load/No Load	4	5,040	0.472	20,159	2
	Air compressor 1 - 100 HP Variable Speed	23	68,677	4.565	1,579,567	105
	NEMA premium efficiency motor 100HP	2	6,709	0.308	13,417	1
	NEMA premium efficiency motor 10HP	4	1,877	0.128	7,508	1
	NEMA premium efficiency motor 150HP	1	5,902	0.280	5,902	0
	NEMA premium efficiency motor 15HP	7	3,385	0.205	23,692	1
	NEMA premium efficiency motor 200HP	1	2,951	0.374	2,951	0
	NEMA premium efficiency motor 20HP	3	4,161	0.268	12,484	1
	NEMA premium efficiency motor	1	882	0.118	882	0

Program	Technology	Participation Count	*Ex Ante* Per Unit kWh Impact	*Ex Ante* Per Unit kW Impact	Gross *Ex Ante* kWh Savings	Gross *Ex Ante* kW Savings
	25HP					
	NEMA premium efficiency motor 2HP	1	169	0.015	169	0
	NEMA premium efficiency motor 3HP	1	570	0.025	570	0
	NEMA premium efficiency motor 40HP	1	6,751	0.321	6,751	0
	NEMA premium efficiency motor 5HP	3	485	0.027	1,454	0
	NEMA premium efficiency motor 60HP	2	1,810	0.201	3,621	0
	NEMA premium efficiency motor 7.5HP	2	2,044	0.099	4,087	0
	NEMA premium efficiency motor 75HP	1	2,112	0.161	2,112	0
	Variable frequency drive up to 250 HP	70	63,710	9.741	4,459,669	682
Nonresidential Prescriptive: Other	Barrel wraps	10	139,098	20.491	1,390,977	205
	Commercial clothes washer	1	9,516	2.610	9,516	3
	Vending equipment controller	2	34,655	0.000	69,309	0
	Window film	13	1,399	0.545	18,189	7
Total Nonresidential Prescriptive					**71,553,838**	**13,731**
Nonresidential Custom	Air Compressor	2	328,043	65.100	656,086	130
	Lighting	53	103,386	12.502	5,479,473	663
	Other*	35	137,261	18.062	4,804,133	632
	New Construction	3	469,088	268.990	1,407,263	807
	New Construction - Lighting Power Density	3	215,279	31.899	645,836	96
Total Nonresidential Custom					**12,992,791**	**2,328**

*Participant count for the Low-Income program represents measure count. The exception to this is the insulation and CFM reduction measures where it represents participants. These counts exclude installations where no electric savings can be claimed (e.g. Energy-efficient Showerhead in a home with a gas DWH)

Appendix C: Program-Measures Table

Program	Technology	Participation Count
Residential		
Lighting	Non-specialty CFLs*	$0.56 - $2.25
	Specialty CFLs	$1.00 - $3.00
Appliance Recycling	Recycled Freezer	$25.00
	Recycled Refrigerator	$25.00
Low-Income	Compact Fluorescent Light Bulbs	Cap of $5,000 in measure costs per home. In addition, agencies can charge 15 percent of the admin cost for total installations.
	Photo Cell for Light	
	Refrigerator Replacement	
	Freezer Replacement	
	Insulation (Attic, Wall, and Foundation)	
	Air Sealing / CFM Reduction	
	Energy-efficient Showerhead	
	Faucet Aerator	
	Water Heater Wrap	
	Central AC Replacement	
	Heat Pump Replacement	
	Dryer Replacement	
	Dishwasher Replacement	
	Ductless Mini-Split	
HVAC Rebate	AC Early Retirement 14/15 SEER	$200.00
	AC Early Retirement 16+ SEER	$300.00
	AC New Construction 14/15 SEER	$100.00
	AC New Construction 16+ SEER	$150.00
	AC Std Replacement 14/15 SEER	$100.00
	AC Std Replacement 16+ SEER	$150.00
	HP Early Retirement 14/15 SEER	$400.00
	HP Early Retirement 16+ SEER	$600.00
	HP New Construction 14/15 SEER	$200.00
	HP New Construction 16+ SEER	$300.00
	HP Std Replacement 14/15 SEER	$200.00
	HP Std Replacement 16+ SEER	$300.00
	GSHP Early Retirement 16/18 EER	$1,200.00
	GSHP Early Retirement 19+ EER	$1,600.00
	GSHP New Construction 16/18 EER	$800.00
	GSHP New Construction 19+ EER	$1,200.00
	GSHP Std Replacement 16/18 EER	$800.00
	GSHP Std Replacement 19+ EER	$1,200.00
	Mini-Split A/C New Construction 16+ SEER	$300.00
	Mini-Split HP New Construction 14/15 SEER	$200.00
	Mini-Split HP New Construction 16+ SEER	$300.00
	Mini-Split HP Replacement 16+ SEER	$300.00
	ECM Motor on Furnace (with New AC)	$100.00
	ECM Motor on Furnace (with New HP)	$100.00
	ECM Motor n Furnace	$100.00
HVAC Tune-Up	Central AC Equipment Tune-Up	$40.00
	Air-Source Heat Pump Equipment Tune-Up	
Be E3 Smart	CFLs	Provided at no cost to

Program	Technology	Participation Count
	LED Night Light	customer
	Bathroom Faucet Aerator	
	Kitchen Faucet Aerator	
	Efficient Showerhead	
Nonresidential		
Nonresidential Prescriptive	Low Watt Fluorescent Lighting	$4.50-$30 per fixture
	High Performance Fluorescent Lighting	$1.50-$27 per fixture
	T5 Lighting Replacing T12	$7.50-$19.50 per fixture
	High-Bay and High Output Lighting Replacing HID	$25-$80 per fixture
	T8 Replacing T12 HO	$12-$21 per fixture
	Permanent Lamp Removal (De-lamping)	$1.20-$2.25 per linear foot (Fluorescent) or $0.05 per watt (HID)
	Re-lamping	$1-$1.50 per bulb
	CFL Lighting	$1.50-$4 per bulb (screw in) or $20 per fixture (pin based)
	Sensors and Controls	$15-$60 per sensor or $0.04 per connected watt
	Exterior or Garage HID to LED/Induction Lighting	$50-$200 per fixture
	LED Exit Signs	$10 per sign
	LED Pedestrian Walk/Don't Walk Sign	$50 per sign
	LED Lighting in Reach-in freezer or cooler case	$50 per door
	LED case lighting sensor controls	$10 per sensor
	LED recessed down light luminaries up to 18 watts or screw-in base lamps	$10 per lamp
	LED Traffic Signal — Red or Green	$25 per sign
	Light Tube	$35 per sign
	Packaged Terminal Air Conditioning and Heat Pumps	$50 per unit
	Unitary and Split System Air Conditioning	$200 per unit or $40 per ton
	Air Source Heat Pumps	$400 per unit or $40 per ton
	Ground Water-Source Heat Pumps (Open Loop)	$80 per ton
	Ground-Coupled Heat Pumps (Closed Loop)	$60 per ton
	Air Cooled Chillers	$40 per ton
	Water Cooled Chillers	$40 per ton
	Heat Pump Water Heaters	$1,000-$2,500 per unit
	Thermal Storage	$100.00 per kW shifted
	Variable frequency drives up to 250 HP	$40 per hp
	Outside air economizer using two enthalpy sensors	$250 per unit
	Energy recovery ventilation (ERV) with a minimum of 450 CFM and as part of an electric-powered system	$1 per CFM
	Programmable setback thermostat	$20 per unit
	HVAC occupancy sensor	$30 per unit
	Premium Motors	$10-$25 per hp
	Variable Frequency Drives	$40 per hp

Program	Technology	Participation Count
	Air Compressors	$45-$125 per hp
	Air Compressor Storage Requirements	$1.50 per gallon
	Variable Frequency Drives on Air Compressors	$40 per hp
	Window Film	$2 per square foot
	Vending Equipment Controller	$50 per unit
	Prescriptive Clothes Washer and Electric Dryer	$50 per unit
	Barrel Wraps (for injection molding and extruding applications)	$1 per ton
	Engineered Nozzle	$20 per nozzle
	Plug Load Occupancy Sensor	$20 per sensor
Nonresidential Custom	Lighting	$0.05 per kWh and $50 per kW
	HVAC	$0.10 per kWh and $100 per kW
	Other	$0.08 per kWh and $100 per kW

Appendix D: Energy and Demand Savings Calculation Sources

Program	Measure	Source
Residential		
Residential Lighting	CFLs	Draft Ohio TRM. Joint Utility Comments were used to update the waste heat factor for demand. Adjusted savings use weighted waste heat factors to account for 8% of bulbs installed outside. See Comment 1 below.
Appliance Recycling	Refrigerator	Regression model and participant survey.
	Freezer	Regression model and participant survey.
Low-Income	Compact Fluorescent Light Bulbs	Draft Ohio TRM. Joint Utility Comments were used to update the waste heat factor for demand. Updated with ISR from participant surveys for verified and adjusted gross calculations. See Comment 1 below.
	Attic Insulation	Draft Ohio TRM. When the existing R-value was input as zero, adjustments were made to the database R-values according to the Ohio TRM.
	Refrigerator Replacement	The Joint Utility Comments on the Draft Ohio TRM presented alternative unit energy consumption measures for the existing unit part-use factor and for Energy Star refrigerators. The main assumption they make is that for low-income families, these refrigerators are primary units that are being replaced so they should be modeled as running full time. The adjusted gross calculations use these alternative inputs in the TRM deemed savings formula.
	Freezer Replacement	The calculation for freezer replacement savings is not included in the draft Ohio TRM. The TRM provided an algorithm for freezer early retirement, from which we took the baseline assumption for usage (1,244 kWh). We matched consumption estimates for the efficient freezer by size and type, assuming replacement with an ENERGY STAR® unit. We calculated a weighted average usage estimate for the efficient unit based on the distribution of installations through the program.
	CFM Reduction	Draft Ohio TRM. Savings for CFM reduction were not calculated for cases where the CFM reduction improved more than 30%.
	Energy-efficient Showerhead	Draft Ohio TRM. Adjusted gross calculations were calculated using internal engineering algorithms and 2012 water metering data. See Comment 2 below.
	Faucet Aerator	Draft Ohio TRM. Adjusted gross calculations were calculated using internal engineering algorithms and 2012 water metering data. See Comment 2 below.
	Water Heater Wrap	Draft Ohio TRM. Adjusted gross savings were calculated based on internal engineering algorithms from other evaluations. The algorithm calculates savings primarily from standby losses, leaks and clothes washers and is based on the average amount of hot water used by LIWx

Program	Measure	Source
		participants.
	Central AC Replacement	Draft Ohio TRM.
	Heat Pump Replacement	Draft Ohio TRM.
	Smart Strip Power Outlet	Draft Ohio TRM.
	Water Heater Temperature Setback	Draft Ohio TRM.
	Wall Insulation	Draft Ohio TRM.
	LED 0.5 W Nightlight	Night light ex ante savings were calculated based on Draft Ohio TRM assumptions for CFL lights. Adjusted gross savings were based on internal engineering algorithms from other evaluations and using DP&L wattage and hours of use assumptions.
	Water Heater Pipe Insulation	Draft Ohio TRM. Adjusted gross savings were calculated based on an internal engineering algorithm from other evaluations that is based on the number of people per home in the LIWx program and the temperature of the ground water in Dayton.
	Foundation Wall Insulation	Foundation insulation savings were calculated based on internal engineering algorithms for basement wall and band joist savings used in other evaluations.
HVAC Rebate	AC Early Retirement (all SEERs)	Participant billing analysis, kW calculated using draft Ohio TRM. See comment 5 below.
	AC Std Replacement SEER 14/15	Participant billing analysis, kW calculated using draft Ohio TRM. See comment 5 below.
	AC Std Replacement SEER 16+	kWh and kW calculated using draft Ohio TRM. See comment 5 below.
	AC New Construction (all SEERs)	kWh and kW calculated using draft Ohio TRM. See comment 5 below.
	GSHP Early Retirement/Std/New Construction (all EERs)	kWh and kW calculated using draft Ohio TRM. See comment 5 below.
	HP Early Retirement (all SEERs)	Participant billing analysis, kW calculated using draft Ohio TRM. See comment 5 below.
	HP New Construction and Std Replacement (all SEERs)	kWh and kW calculated using draft Ohio TRM. See comment 5 below.
	Mini-split AC and HP New Construction (all SEERs)	kWh and kW calculated using secondary sources. See comment 6 below.
	ECM	kWh and kW calculated using secondary sources.
HVAC Tune-Up	AC and HP Tune-up	PRISM analysis of participant billing data and draft OH TRM, kW calculated using draft Ohio TRM.
Be E3 Smart	CFLs	Draft Ohio TRM, ISR from participant phone survey.
	LED night lights	Draft Ohio TRM dated October 15, 2009. This was the utility-defined TRM. ISR from participant phone survey.
	Bathroom Faucet Aerator	Draft Ohio TRM. Adjusted gross calculations were calculated using internal engineering algorithms and 2012 water metering data. See Comment 2. ISR from participant phone survey.
	Kitchen Faucet Aerator	Draft Ohio TRM. Adjusted gross calculations were

Program	Measure	Source
		calculated using internal engineering algorithms and 2012 water metering data. See Comment 2. ISR from participant phone survey.
	Efficient Showerhead	Draft Ohio TRM. Adjusted gross calculations were calculated using internal engineering algorithms and 2012 water metering data. See Comment 2. ISR from participant phone survey.
Commercial		
Nonresidential Prescriptive	HVAC	See comment 7 below.
	Lighting	See comment 7 below.
	Motors	See comment 7 below.
	Other	See comment 7 below.
Nonresidential Custom	Lighting	See comment 8 below.
	Other	See comment 9 below.

Comments:

1. We calculated the CFL installation rate based on the telephone survey results (0.96), which we used in place of the draft Ohio TRM's in-service rate input (0.81) in the savings calculation.
2. We used an algorithm that better accounts for DP&L specific variables, such as: number of people per home and the temperature of the ground water. Other variables were taken from a Cadmus water metering study done in 2012 and include: baseline flow rates, length of showers and faucet usage, number of showers taken per day and shower and faucet point of use temperatures.
3. The adjusted gross savings calculation was based on Cadmus engineering calculations. In addition to general water heater efficiency standards, the algorithm accounted for the number of people per household (based on results from the participant survey) and for local weather, resulting in a slightly higher estimated savings than the TRM.
4. The ex ante calculation was based on a Cadmus engineering algorithm used in the 2010 DP&L Residential HVAC evaluation. This algorithm was based on a metering study of single-family homes, reflecting slightly higher square footage assumptions than appropriate for low-income program participants. Adjusted gross savings calculations were based on a more conservative algorithm from the Pennsylvania TRM, using an equipment capacity more suitable for smaller homes.
5. Minor adjustments were made to TRM equations and assumptions. See report section for details.
6. Mini-split savings based on the following reports: http://www.bpa.gov/energy/n/pdf/Monmouth_year_2_FINAL_1007_1019.pdf and http://www.env.state.ma.us/dpu/docs/electric/09-64/12409nstrd2ac.pdf
7. We based our calculations on algorithms outlined in the draft Ohio TRM. We based our baseline conditions on the draft Ohio TRM, except when the site visit indicated a different baseline than deemed by measure type. Cadmus calculated the retrofit equipment wattage and operating parameters through site visit results and product specification sheets.
8. Cadmus calculated baseline and retrofit equipment wattage and operating parameters through site visit results and product specification sheets.
9. DP&L contracted with a third-party engineering firm to conduct pre and post installation metering to calculate energy savings. Cadmus reviewed the engineering reports and made revisions as necessary to evaluate savings.

Appendix E: Billing Analysis Specifications and Model Output

Table 89. AC Early Retirement 14/15 SEER Billing Analysis Model Outputs

Number of Observations Read	101,794				
Number of Observations Used	57,244				
Number of Observations with Missing Values	44,550				
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	3,687,216	1,229,072	10,763	<.0001
Error	57,241	6,536,818	114		
Uncorrected Total	57,244	10,224,034			
Root MSE	11	R-Square	0.361		
Dependent Mean	3.05E-17	Adj R-Sq	0.361		
Coeff Var	3.50E+19				
Parameter Estimates					
Variable	DF	Parameter	Standard Error	t Value	Pr > |t|
avghdd3	1	0.306	0.005	67.780	<.0001
avgcdd3	1	3.016	0.019	159.930	<.0001
postcdd3	1	-1.055	0.018	-59.880	<.0001

Table 90. AC Early Retirement 16+ SEER Billing Analysis Model Outputs

Number of Observations Read	76,936				
Number of Observations Used	43,404				
Number of Observations with Missing Values	33,532				
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2,870,685	956,895	10,199	<.0001
Error	43,401	4,071,936	94		
Uncorrected Total	43,404	6,942,620			
Root MSE	10	R-Square	0.414		
Dependent Mean	1.08E-16	Adj R-Sq	0.413		
Coeff Var	8.94E+18				
Parameter Estimates					
Variable	DF	Parameter	Standard Error	t Value	Pr > |t|
avghdd3	1	0.291	0.005	62.260	<.0001
avgcdd3	1	3.059	0.019	157.560	<.0001
postcdd3	1	-1.197	0.018	-65.650	<.0001

Table 91. HP Early Retirement 14/15 SEER Billing Analysis Model Outputs

Number of Observations Read	41,029				
Number of Observations Used	22,801				
Number of Observations with Missing Values	18,228				
Analysis of Variance					
Source	DF	Sum of	Mean	F Value	Pr > F
Model	4	14,746,558	3,686,639	10,451	<.0001
Error	22,797	8,041,412	353		
Uncorrected Total	22,801	22,787,969			
Root MSE	19	R-Square	0.647		
Dependent Mean	-6.06E-17	Adj R-Sq	0.647		
Coeff Var	-3.10E+19				
Parameter Estimates					
Variable	DF	Parameter	Standard	t Value	Pr > |t|
avghdd3	1	2.466	0.013	182.800	<.0001
avgcdd3	1	3.533	0.054	65.740	<.0001
postcdd3	1	-0.881	0.050	-17.600	<.0001
posthdd3	1	-0.387	0.012	-31.680	<.0001

Table 92. HP Early Retirement 16+ SEER Billing Analysis Model Outputs

Number of Observations Read	25,412				
Number of Observations Used	14,249				
Number of Observations with Missing Values	11,163				
Analysis of Variance					
Source	DF	Sum of	Mean	F Value	Pr > F
Model	4	9,615,825	2,403,956	7,213	<.0001
Error	14,245	4,747,466	333		
Uncorrected Total	14,249	14,363,291			
Root MSE	18	R-Square	0.670		
Dependent Mean	6.59E-16	Adj R-Sq	0.669		
Coeff Var	2.77E+18				
Parameter Estimates					
Variable	DF	Parameter	Standard	t Value	Pr > |t|
avghdd3	1	2.545	0.017	153.150	<.0001
avgcdd3	1	3.707	0.065	57.210	<.0001
postcdd3	1	-0.988	0.061	-16.270	<.0001
posthdd3	1	-0.412	0.015	-27.240	<.0001

Table 93. AC Std Replacement 14/15 SEER Billing Analysis Model Outputs

Number of Observations Read	3,294				
Number of Observations Used	1,909				
Number of Observations with Missing Values	1,385				
Analysis of Variance					
Source	DF	Sum of	Mean	F	Pr > F
Model	3	147,849	49,283	672	<.0001
Error	1,906	139,816	73		
Uncorrected Total	1,909	287,665			
Root MSE	9	R-Square	0.514		
Dependent Mean	-9.68E-17	Adj R-Sq	0.513		
Coeff Var	-8.85E+18				
Parameter Estimates					
Variable	DF	Parameter	Standard	t Value	Pr > |t|
avghdd3	1	0.301	0.020	14.930	<.0001
avgcdd3	1	3.174	0.081	39.050	<.0001
postcdd3	1	-1.066	0.076	-	<.0001

Appendix F: Summary of Nonresidential Site Visit Findings

October 2012 Nonresidential Site Visit Findings

The following companies and project numbers were verified during the October 2012 site visits:

Table 94. October 2012 Nonresidential Site Visit Summary

Company	Project Number
Crown Cork & Seal Co.	34C39282
Tenneco	9AATVU9Z & 918YY2S0
Deck The Walls	RJM0N0DO
Macy's Inc.	BJZ73D6Z
Undercar Specialty Warehouse	TV6CXPA3 & RBGJ6W2B
Spartech Corporation	68B62529
Montgomery County	381B7EE1 & 02001D20
City of Dayton	7RUHBFL5 & 7A233A14
Furniture Man LLC	OORPCJ00
Marshalls Service Station	B56E9A38
Russells Point Village	8LOI1152
Edison State Community College	PARO9QT4 & C2MAATNA & 0RO8460L
Buckeye Harley Davidson	HDA3HYID
Banta Publications/RR Donnelley	8AE6F6EC
Seed Consultants	56274131
Outdoor Concepts DBA Patio Supply	QRQGI6PH & 5W4QL09X
St. Christopher School	ZP5CPM7R
St. Christopher School for Children	3STHOMDT
St. Christopher Church	EFAYOM72
Dayton Phoenix	SM7Q3I1H
Beavercreek City Schools	386B4EBD
Beavercreek City Schools	2D7105F8 & 0CE6C7F1
Cassidy Turley	M1J639IZ & 92ZPJUSK
American Trim	XAV93AOT
PlyGem Inc	HJUWFNWX
International Fiber Corp	MAKFTFRN & CLRR4RC7 & CJL3GXSJ
Bushongs Auto Service	V73O5AVU
Lexis Nexis	651C828B & QNF0Y60G
Walker Jeep	54GOWL6M & 81P3CXYR
Innomark Communication	OQN1DL5Q
Accutech Films Inc.	DZVUUSIQ
H&S Screw Products	4IFAGFPW
Morris Bean & Company	CDA86465
Mercy Memorial Hospital	50DEA3F7
Matt Castrucci	39P53MWD
Creative Extruded	087C5957
Kinney Shoe Corp.	5TKCHR5T
Muffler Brothers	SHUKMDF0

Table 95. Crown Cork & Seal Co. (Project Number: 34C39282)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping T12 (# linear feet)	960	960	0
P-Lighting	Fixture-mounted occupancy sensor	128	128	0
P-Lighting	LED or electroluminescent exit sign	2	2	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	120	120	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	2	2	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	10	10	0
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	79	79	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	261	261	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	13	13	0

Notes: Cadmus toured the entire facility and verified the operation of all fixtures that were reported. Cadmus found the operating hours for the measures located in the office areas of the facility to be 8 a.m. to 6 p.m., Monday through Friday. The original claimed hours were 8,760.

Table 96. Tenneco (Project Number: 9AATVU9Z & 918YY2S0)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping HID	6,400	6,400	0
P-Lighting	Delamping T8 (# linear feet)	896	896	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T8	112	112	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	548	548	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	108	108	0

Notes: The facility has had multiple retrofits done and is still in the process of retrofitting more sections of the building. Cadmus toured the spaces where retrofits have occurred and verified the reported quantity. Based on a conversation with the facility manager, Cadmus further verified the current operating hours matched the reported hours.

Table 97. Deck the Walls (Project Number: RJM0N0DO & 5E1FLVBD)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED recessed down light luminaires up to 18 watts or screw-in base lamps	30	30	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12*	6	6	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12*	15	15	0
P-Lighting	Delamping T12 (# linear feet)	136	120	-16

Notes: Cadmus found significantly more LED bulbs installed than reported, and it is unclear whether these fixtures received a DP&L rebate or were part of these projects. We verified that all lighting fixtures were installed and operating. Cadmus found the hours of operation for the T8 fixtures to be correct. We found that 50% of the LED bulbs operate 24 hours per day, for security purposes, which is about 70% higher than claimed.
We could find evidence only of delamping on measure 2 listed above (T8 (BF < 0.78), 4-foot 4 lamp fixture replacing T12*).
Measure 3 (T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12*) were a 1 for 1 retrofit from T-12, with no delamping.

Table 98. Macy's Inc. (Project Number: BJZ73D6Z)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED recessed down light luminaires up to 18 watts or screw-in base lamps	3,216	3,216	0

Notes: Due to the high quantity of the reported bulbs, Cadmus sampled several sections of the three-floor facility. We found the retrofitted 12 watt and 15 watt LED bulbs as excepted. Go Sustainable also completed a verification memorandum for DP&L and came within 1.5 percent lower than reported quantity. Cadmus is verifying the reported quantity is accurate.

Table 99. Undercar Specialty Warehouse (Project Number: TV6CXPA3 & RBGJ6W2B)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-285 LED 1-lamp linear	285	156	-129
Custom	CUSTOM-95 LED 1-lamp linear	95	108	13
P-Lighting	LED or Induction (operating hours < 8,760) replacing 176W to 250W	4	4	0
P-Lighting	LED or Induction (operating hours < 8,760) replacing 176W to 250W	1	1	0
P-Lighting	LED recessed down light luminaires up to 18 watts or screw-in base lamps	6	6	0

Notes: Cadmus verified all prescriptive lighting measure counts to be correct. The two custom projects were not fully completed at time of site visit. The upstairs warehouse was done but not the basement. The site contact said they are planning on finishing the basement in the coming weeks. We verified the reported hours of operation to be correct. Cadmus plans to follow up with the site contact during the second round of verification site visits to ensure this project was completed in 2012.

Table 100. Spartech Corporation (Project Number: 68B62529)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Fixture-mounted occupancy sensor	345	304	-41
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	45	45	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	10	10	0
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	2	2	0
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	2	2	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	300	259	-41

Notes: Cadmus inspected all the fixtures. A total of 259 T8 high-bay 4-foot 6 lamp fixtures were verified, less than the 300 claimed. All T8 4-lamp and 6-lamp high bay lighting fixtures had occupancy sensors installed. The site contact, however, said they override the occupancy sensor controls during the day and the lights are always on during this time.

Table 101. Montgomery County (Project Number: 381B7EE1 & 02001D20)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-HVAC	Outside air economizer with two enthalpy sensors	2	2	0
P-HVAC	Variable frequency drive up to 250 HP	2	2	0
P-HVAC	Variable frequency drive up to 250 HP	2	2	0
P-Motors	NEMA premium efficiency motor 10HP	2	2	0
P-Motors	NEMA premium efficiency motor 20HP	2	2	0
P-Motors	Variable frequency drive up to 250 HP	2	2	0

Notes: Cadmus confirmed all VFDs and Motors listed on the rebate were installed and operating. We found two of the motors with VFD's were rebated as 7.5HP motors but were installed with 5HP motors.

Table 102. City of Dayton (Project Number: 7RUHBFL5 & 7A233A14)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Motors	NEMA premium efficiency motor 10HP	3	3	0
P-Motors	NEMA premium efficiency motor 15HP	7	7	0
P-Motors	NEMA premium efficiency motor 5HP	1	1	0

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Motors	NEMA premium efficiency motor 60HP	1	1	0
P-Motors	NEMA premium efficiency motor 7.5HP	3	3	0
P-Motors	Variable frequency drive up to 250 HP	1	1	0
P-Motors	Variable frequency drive up to 250 HP	4	4	0
P-Motors	Variable frequency drive up to 250 HP	2	2	0
Custom	CUSTOM- disconnect (7) 90 W incandescent	7	7	0
Custom	CUSTOM- replace (179) 150 W HPS with 2L	179	179	0
Custom	CUSTOM- replace (67) 150 W HPS with 2L	67	67	0
Custom	CUSTOM- replace (3) 150 W HPS with 42w CFL fixture	3	3	0
Custom	CUSTOM- replace (24) 150 W HPS with 84w CFL fixture	24	24	0
Custom	CUSTOM- replace (5) 100 W MV with 26w CFL fixture	5	5	0
Custom	CUSTOM- replace (5) 150 W HPS with 80w induction	5	5	0
Custom	CUSTOM- replace (17) 100 MV w/ 2-lamp Fl	17	17	0

Notes: Cadmus was able to visually verify all rebated motors and the majority of the rebated VFDs installed throughout the facility. We could not verify 4 VFDs installed on 4 escalators because the VFDs were installed in a location without immediate access onsite. We did confirm through the contactor that the 4 VFDs were installed. Cadmus did a walk-through of the parking garage where the custom lighting project was completed and verified the fixture types. We verified reported quantity is correct for the custom lighting measures.

Table 103. Furniture Man LLC (Project Number: OORPCJ00)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	85	79	-6
P-Lighting	Delamping T12 (# linear feet)	680	0	-680

Notes: Cadmus verified (79) T8 4-foot 2 lamp fixtures installed, this is slightly less than reported. The fixtures replaced were determined to be a one-to-one change out and confirmed with onsite staff. Cadmus could not find evidence of de-lamping T12 fixtures. Cadmus also found a T12 4-foot 2 lamp fixture that was not replaced in the basement.
The reported hours of operation are correct based confirmation of store hours with the site visit contact.

Table 104. Marshalls Service Station (Project Number: B56E9A38)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	27	27	0

Notes: Cadmus verified all reported lighting fixtures were installed and operating. We verified that the hours of operation match the reported estimates.

Table 105. Russell's Point Village (Project Number: 8LOI1152)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping T12 (# linear feet)	1,772	1,772	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	242	242	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	54	54	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	3	3	0

Notes: Cadmus verified all lighting measures installed as part of the project.

Table 106. Edison State Community College (Project Number: PARO9QT4 & C2MAATNA & 0RO8460L)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Motors	Variable frequency drive up to 250 HP	1	1	0
P-Motors	Variable frequency drive up to 250 HP	2	2	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	109	109	0

Notes: Cadmus verified the installation of all VFDs reported. Each VFD is installed on a HVAC supply fan supplying conditioned air to classrooms and an auditorium. Cadmus verified the installation of occupancy sensors in each classroom of the building. The occupancy sensors are also tied to the HVAC system, meaning when the classroom is not occupied the space temperature set points are changed.

Table 107. Buckeye Harley Davidson (Project Number: HDA3HYID)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping HID	9,160	9,160	0
P-Lighting	T8 high-bay 4-foot 3 lamp fixture replacing HID	37	37	0
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	94	89	-5
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	1	0	-1
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	8	8	0

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 8 lamp fixture replacing HID	15	15	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	3	3	0

Notes: Cadmus performed a full building audit and counted each light fixture. Cadmus verified the majority of the reported lighting measures installed. Cadmus only found 89 of the 94 reported T8 4-foot 4 lamp fixtures installed. Cadmus also could not find one T8 4-foot 6 lamp fixture that was reported as installed.

Table 108. Seed Consultants (Project Number: 56274131)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	7	7	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	253	252	-1

Notes: Cadmus verified 7 T8 high-bay 4-foot 4 lamp fixtures and 228 T8 high-bay 4-foot 6 lamp fixtures installed at the facility. We verified reported hours of operation are correct. Cadmus spoke to DP&L and the implementer for this project. Upon further discussion and based on the implementers verification of 252 fixtures, it is likely that Cadmus was not shown all the sections in the building associated with this project. Cadmus will accept the originally verified value of 252 6-lamp T8 fixtures, instead of our verified quantity of 228.

Table 109. Outdoor Concepts DBA Patio Supply (Project Number: QRQGI6PH & 5W4QL09X)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	7	0	-7
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	16	16	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	2	2	0
P-Lighting	LED or Induction (8,760 operating hours) replacing 176W to 250W	2	1	-1
P-Lighting	LED or Induction (8,760 operating hours) replacing 176W to 250W	6	6	0

Notes: Cadmus did not find the reported 7 low-watt T8 Fixtures. The site contact showed an area that was originally planned to be retrofitted, but they chose not to pursue this, which is likely where the 7 missing fixtures were to be installed. All induction lighting was installed outside and 7 of the reported 8 induction fixtures were verified. The hours of operation for the induction fixtures installed outside were listed at 24 hours per day; however, the fixtures were off during our site visit and determined to only operate at night.

Table 110. St. Christopher School (Project Number: ZP5CPM7R)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	47	47	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	77	77	0
P-Lighting	Delamping T12 (# linear feet)	64	64	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Table 111. St. Christopher School for Children (Project Number: 3STHOMDT)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	17	17	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	10	10	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	6	6	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping HID	1,200	1,200	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	27	27	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	12	12	0
P-Lighting	Vending equipment controller	2	2	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	2	2	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Table 112. Dayton Phoenix (Project Number: SM7Q3I1H)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	1,537	1,537	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. We found the hours of operation are 20% lower than the reported value. According to the site contact, the facility runs almost 24 hours per day for 6 days a week.

Table 113. Beavercreek City Schools (Project Number: 386B4EBD)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED or electroluminescent exit sign	15	15	0
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	19	19	0
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	6	6 (4 foot 3-lamp)	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	20	20 (4 foot 4-lamp)	0

Notes: Cadmus toured Valley School and verified the count and operation of all fixtures that were reported. We verified different fixture types for measure 3 (4 foot 3-lamp) and measure 4 (4 foot 4-lamp).
The operating hours for the gym, hall ways, and classrooms were 7:15 a.m. to 2:30 p.m. The administrative offices operated one hour longer according to the site visit contact. The operating hours were determined to be less than the claimed hours.

Table 114. Beavercreek City Schools (Project Number: 2D7105F8 & 0CE6C7F1)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	10	10	0
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	18	18	0
P-HVAC	Air cooled chiller - any size	1	1	0
P-HVAC	Variable frequency drive up to 250 HP	1	1	0
P-HVAC	Variable frequency drive up to 250 HP	2	2	0
P-HVAC	Variable frequency drive up to 250 HP	2	2	0

Notes: Cadmus verified reported quantities are correct at Shaw School. The verified operating hours were within 5% of the reported hours

Table 115. Cassidy Turley (Project Number: M1J639IZ & 92ZPJUSK)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-HVAC	Variable frequency drive up to 250 HP	5	5	0
P-HVAC	NEMA premium efficiency motor 15HP	5	5	0

Notes: Cadmus verified the VFD and motor installations claimed. The hours of operation for motors were found to be 30% less than the claimed hours.

Table 116. American Trim (Project Number: XAV93AOT)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Motors	Variable frequency drive up to 250 HP	2	2	0

Notes: Cadmus verified both VFDs were installed. One was running at 60% and the other was not running and needs repair, according to the contact on site.

Table 117. PlyGem Inc (Project Number: HJUWFNWX)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Fixture-mounted occupancy sensor	1,359	1,345	-14
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	713	708	-5
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	646	637	-9

Notes: Cadmus confirmed all fixtures use individual occupancy sensors. Cadmus toured the facility completely and verified installation. A drawing of the lighting was provided for the count. All of the 6-lamp fixtures and 65% of the 4-lamp fixtures occupancy sensors reduce them to 60%. The other 35% of the 4-lamp fixtures are on/off. All sensors are set at half an hour. The hours of operation were found to be greater than claimed.

Table 118. International Fiber Corp (Project Number: MAKFTFRN & CLRR4RC7 & CJL3GXSJ)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Motors	NEMA premium efficiency motor 5HP	1	1	0
P-Motors	Variable frequency drive up to 250 HP	1	1	0
P-Motors	Variable frequency drive up to 250 HP	1	1	0
P-Motors	NEMA premium efficiency motor 100HP	1	1	0
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	10	10	0

Notes: Cadmus verified all fixtures. We were told that the equipment operates 24/6 with some additional weekends. The plant was down during our visit. Six of the lamps are located in the plant-B lab and the other four are located in the plant-A break-room. The lab lights are on 24/5 and the break-room is on 24/7.

Table 119. Bushongs Auto Service (Project Number: V73O5AVU)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	28	28	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Table 120. Lexis Nexis (Project Number: 651C828B & QNF0Y60G)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM- T-8 replacing T-12 (3 to 2 ballast)	1,772	1,772	0
P-Lighting	Delamping T12 (# linear feet)	8	8	0
P-Lighting	Low-watt T8 4-foot 1 lamp fixture replacing T8	15	15	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T8	194	194	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T8	443	443	0
P-Lighting	Low-watt T8 4-foot 3 lamp fixture replacing T8	39	39	0
P-Lighting	Low-watt T8 4-foot 4 lamp fixture replacing T8	23	23	0

Notes: Cadmus verified installation of new lighting based on sampling various floors in the complex and reviewing layout drawings. There are many areas that were not readily accessible in the time allotted. Based on sample verified and the facility drawings Cadmus found the reported quantity to be correct.

Table 121. Walker Jeep (Project Number: 54GOWL6M & 81P3CXYR)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-Orion 4ft 6 lamp Exterior Fixture, T5 Fluorescent, Replaces 1000 Watt Metal Halide	1	1	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only*	142	142	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Table 122. Innomark Communication (Project Number: OQN1DL5Q)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-replace HID, HO and slim line w/T-5 and T-8 HB	1	1	0

Notes: Cadmus verified the all lighting and occupancy sensors for this project. The hours of operation were found to be close to the claimed hours.

Table 123. Accutech Films Inc. (Project Number: DZVUUSIQ)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4 foot 2 lamp replacing T12 HO only	2	2	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	84	84	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	20	20	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	108	104	-4

Notes: Cadmus verified all the fixtures installed, less four T8 6-lamp high bay fixtures. The hours of operation were found to be greater than the claimed hours.

Table 124. H&S Screw Products (Project Number: 4IFAGFPW)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping T12 (# linear feet)	104	104	0
P-Lighting	Delamping T12 (# linear feet)	128	128	0
P-Lighting	LED or electroluminescent exit sign	8	8	0
P-Lighting	T8 4 foot 2 lamp replacing T12 HO only	1	1	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	26	26	0
P-Lighting	T8 high-output 8-foot 2 lamp fixture replacing T12 HO only	133	133	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Table 125. Morris Bean & Company (Project Number: CDA86465)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Fixture-mounted occupancy sensor	74	74	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	5	5	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	99	97	-2
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	26	29	3
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	542	542	0

Notes: Cadmus walked the facility and verified the majority of reported fixture types were installed. The reported hours of operation were reported to be 24 hours a day, greater than the hours claimed for the project.

Table 126. Mercy Memorial Hospital (Project Number: 50DEA3F7)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	CFL screw-in bulb up to 32W replacing incandescent	7	7	0
P-Lighting	Delamping T12 (# linear feet)	24	24	0
P-Lighting	Delamping T12 (# linear feet)	3,888	3,888	0
P-Lighting	T8 (BF < 0.78) 4-foot 1 lamp fixture replacing T12	4	4	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	770	770	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	75	75	0

Notes: Cadmus verified a sampling of fixtures and was provided layout drawings of the facility. The delamping was verified as a reduction of bulbs per fixtures. There were many more CFL conversions evident. The lamp count based on contractor work lists exceeds the number of fixtures claimed on the rebate. Approximately 102 of the T8 2-lamp fixtures are in rooms that are generally only used between 8 a.m. and 5 p.m. five days per week. Most of the other lighting is on 24/7.

Table 127. Matt Castrucci (Project Number 39P53MWD)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping T12 (# linear feet)	120	120	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	71	71	0
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	30	30	0
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	92	92	0

Notes: Cadmus verified all lamp installations by touring all buildings in the auto mall. The contact was not sure exactly which lights were included in the rebate application. There are many more lights in all categories that were found during the walk through. Hours of operation were found to be 8 a.m. to 9 p.m. six days per week and a few hours on Sundays, which is close to the claimed hours.

Table 128. Creative Extruded (Project Number 087C5957)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Motors	Air compressor 1 - 100 HP Variable Speed	1	1	0

Notes: Cadmus verified the installation of the variable speed compressor. It is a 50hp motor that was running at 33% during the visit. The normal operation is 24/5, greater than the claimed hours.

Table 129. Kinney Shoe Corp (Project Number: 5TKCHR5T)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-HVAC	Unitary and split system a/c*	1	1	0

Notes: Cadmus verified a new unitary and split system A/C unit for the Lady's Foot Locker.

Table 130. Muffler Brothers (Project Number: SHUKMDF0)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Low-watt T8 4-foot 4 lamp fixture replacing T12*	8	8	0
P-Lighting	Low-watt T8 4-foot 4 lamp fixture replacing T12*	7	7	0

Notes: Cadmus verified both measures at two locations. The actual count exceeded the reported quantity at both locations. Cadmus was unsure if these fixtures were associated with either project and therefore, only verified the initial reported quantities.

December 2012 Nonresidential Site Visit Findings

The following companies and project numbers were verified during the December 2012 site visits:

Table 131. December 2012 Nonresidential Site Visit Summary

Company	Project Number
Banta Publications/RR Donnelley	8AE6F6EC
Mad River Local Schools	9EF0A594
Brookdale Senior Living	75EC20C7
AT&T Services, Inc	ADTH2SRM
American Metalworks, Inc.	3FC10108
Bethany Village	C914786C
Chipotle Mexican Grill	HH5LYKT6
South Side Church of Christ	ULR2LDR1
Accu-Grind & Mfg. Co. Inc.	UYGDHIOW
First Church of the Nazarene	YFHUKQXW & ZVAL858C
Triplett	NC-LPD1
Fed Ex Ground Package System	NC-LPD2
Franklin Monroe LSD	NC-1
Dayton Public Schools - Wright Brothers PreK-8	NC-2
Huber Heights City Schools - Kitty Hawk Elementary	NC-3

Table 132. Banta Publications/RR Donnelley. (Project Number: 8AE6F6EC)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	CFL pin-based fixture	1	1	0
P-Lighting	CFL screw-in bulb up to 32W replacing incandescent	42	42	0
P-Lighting	Delamping T12 (# linear feet)	96	96	0
P-Lighting	Delamping T12 (# linear feet)	2,000	2,000	0
P-Lighting	Delamping T8 (# linear feet)	76	76	0
P-Lighting	Fixture-mounted occupancy sensor	35	35	0
P-Lighting	LED or electroluminescent exit sign	3	3	0
P-Lighting	Low-watt T8 4-foot 1 lamp fixture replacing T8	4	4	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	7	7	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T8	3	3	0
P-Lighting	T5 high-output high-bay 2 lamp fixture replacing HID	117	117	0
P-Lighting	T5 high-output high-bay 4 lamp fixture replacing HID	21	21	0
P-Lighting	T5 high-output high-bay 4 lamp fixture replacing HID	117	117	0
P-Lighting	T5 high-output high-bay 4 lamp fixture replacing HID	117	117	0
P-Lighting	T5 high-output high-bay 6 lamp fixture replacing HID	2	2	0
P-Lighting	T5 high-output high-bay 8 lamp fixture replacing HID	15	15	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T8	3	3	0
P-Lighting	T8 4 foot 2 lamp replacing T12 HO only	6	6	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	50	50	0
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	220	220	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	72	72	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	52	52	0

Notes: Cadmus toured the facility and verified the fixture quantities and location of the fixtures installed. The facility was running at higher operating hours than claimed in the project files at the time of the site visit. Cadmus found that the majority of the fixtures were on the same schedule, which typically is 24 hours per day for at least 5 days per week. The facility can be open as much as 24 hours per day, 7 days per week, which was accounted for in the annual operating hours. The savings was found to be slightly greater than claimed.

Table 133. Mad River Local Schools (Project Number: 9EF0A594)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Fixture-mounted occupancy sensor	4	4	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	16	16	0

Notes: The gym has been retrofitted from HID fixtures to T8 high bay 6-lamp fixtures. All fixtures were verified on site as well as the occupancy sensor controls. The claimed hours of operation were approximately 700 hours higher than what was verified on site, which reduced the savings.

Table 134. Brookdale Senior Living (Project Number: 75EC20C7)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	CFL screw-in bulb up to 32W replacing incandescent	1,062	1,014	-48
P-Lighting	LED or electroluminescent exit sign	22	22	0
P-Lighting	T8 (BF < 0.78) 4-foot 1 lamp fixture replacing T12	40	40	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	330	330	0
P-Lighting	T8 (BF < 0.78) 4-foot 3 lamp fixture replacing T12	10	10	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	10	10	0

Notes: Cadmus found the majority of fixtures to be installed and as claimed in the rebate. The CFL screw-in bulbs are installed throughout tenant's rooms which were verified on-site. Since all tenant rooms were not accessible, Cadmus visited a sample of rooms to determine an overall installation rate for the CFLs. Facility staff described which fixtures were originally retrofitted from incandescent to CFLs but also noted that some tenant's did not like the like and had replaced the CFLs with incandescent. Based on the rooms visited, Cadmus estimated that 95% of the originally installed CFLs were still in place.
The hours of operation were found to be slightly higher in some areas and lower in tenant rooms.

Table 135. AT&T Services, Inc. (Project Number: ADTH2SRM)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Wall or ceiling-mounted occupancy sensor	2	2	0

Notes: Cadmus verified that two occupancy sensors were installed and operational. Upon further interview with the site contact said the lights have always been shut off upon leaving the site. This reduced the hours of operation of the facility from 8760 to approximately 3000 hours per year. The two aisles of lights that were controlled by the occupancy sensor were a mix of various T12's and T8 lamps, some of which were burnt out. A lighting inventory was taken of the installed and operating lamps to determine the kW load controlled. The overall savings were slightly reduced based on the reduction of hours.

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	17	17	0

Notes: Cadmus verified the quantity and the hours of operation at the site. The hours of operation were found to be slightly lower than the claimed value. It was also noted that 4 additional fixtures of the same type as rebated were installed, but were not part of the project. The savings for these additional fixtures was not included.

Table 136. American Metalworks, Inc. (Project Number: 3FC10108)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	17	17	0

Notes: Cadmus verified the quantity and the hours of operation at the site. The hours of operation were found to be slightly lower than the claimed value. It was also noted that 4 additional fixtures of the same type as rebated were installed, but were not part of the project. The savings for these additional fixtures was not included.

Table 137. Bethany Village (Project Number: C914786C)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-HVAC	Air cooled chiller - any size	1	1	0
P-HVAC	Air cooled chiller - any size	1	1	0
P-HVAC	Unitary and split system A/C 65,000 - 135,000 BTUH (5.4-11.25 tons)	2	2	0
P-HVAC	Unitary and split system A/C 136,000 - 240,000 BTUH (11.33-20 tons)	2	2	0

Notes: Cadmus verified the equipment installed, efficiency, size and proper operation of both the chillers and the packaged roof top units.

Table 138. Chipotle Mexican Grill (Project Number: HH5LYKT6)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-HVAC	Unitary and split system A/C 65,000 - 135,000 BTUH (5.4-11.25 tons)	1	1	0
P-HVAC	Unitary and split system A/C 65,000 - 135,000 BTUH (5.4-11.25 tons)	1	1	0
P-HVAC	Outside air economizer with two enthalpy sensors	2	2	0

Notes: Cadmus verified the equipment installed, efficiency, size and proper operation of the air economizers for this site.

Table 139. South Side Church of Christ (Project Number: ULR2LDR1)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	71	119	48
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	70	70	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	24	0	-24

Notes: Cadmus toured the facility and did a complete lighting inventory of what was installed in the building. The hours of operation were found to be less than what was claimed in the project. The overall quantity of lamps installed is correct, however, it appears that (48) 2-lamp T8 fixtures were installed instead of the (24) 4-lamp T12 fixtures.

Table 140. Accu-Grind & Mfg. Co. Inc. (Project Number: UYGDHIOW)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	28	28	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	24	24	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	3	3	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	20	20	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	84	84	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	10	10	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	22	22	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	1	1	0
P-Lighting	LED or electroluminescent exit sign	10	10	0
P-Lighting	LED or Induction (operating hours < 8,760) replacing 175W or less	2	2	0
P-Lighting	LED or Induction (operating hours < 8,760) replacing 175W or less	3	2	-1
P-Lighting	Delamping T12 (# linear feet)	1,200	1,200	0
P-Lighting	Delamping HID	4,600	4,600	0

Notes: Cadmus conducted a full lighting audit of the facility and verified the installation and operating hours of all fixtures. The hours of operation for the office fixtures were found to have less than 1% difference than the claimed hours, however, the hours in the shop and manufacturing area were found to be approximately double claimed hours. All fixtures were verified with the exception of (1) exterior induction fixture which was not installed.

Table 141. First Church of the Nazarene (Project Number: YFHUKQXW & ZVAL858C)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	8	8	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	5	5	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	8	8	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	82	82	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	89	89	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	99	99	0

Notes: Cadmus verified all fixtures on site. The claimed hours of operation for the majority of the fixtures is 4380 hours per year which was determined to be significantly higher than the current hours of operation. The day care area of the church is used the most (3400 hours per year) followed by the office (2900 hours per year). The assembly areas are used the least, generally 2 days a week for approximately 12 hours per day. The savings was reduced as a result of lower hours of operation.

Table 142. Triplett (Project Number: NC-LPD1)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
NC-LPD	NC-140,550 sf office, factory, warehouse	1	1	0

Notes: Cadmus conducted a sample of various room types to verify the quantity of fixtures, hours of operation and the lighting power density (LPD) reduction in these spaces. The calculations and measurements originally done by Go Sustainable Energy are correct. The hours of operation were slightly adjusted upwards, which results in an additional savings of roughly 2%.

Table 143. Fed Ex Ground Package System (Project Number: NC-LPD2)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
NC-LPD	NEW CONSTRUCTION - 46,271 sq ft expansion	1	1	0

Notes: Cadmus toured the facility to verify the quantity of fixtures, hours of operation and the lighting power density reductions in the office and warehouse. All fixtures were confirmed and two additional fixtures were installed in the warehouse. The hours of operation were found to be higher than claimed resulting in increased savings.

Table 144. Franklin Monroe LSD (Project Number: NC-1)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
NC	NEW CONSTRUCTION - New K-12 building (122,000 SF)	1	1	0

Notes: Cadmus performed a full building audit. Cadmus verified the major building components in the reported as-designed documentation. Cadmus found the operating schedules with the as-built conditions were different than original documentation. Operating schedules for the summer were found to be lower than originally reported.

Table 145. Dayton Public Schools - Wright Brothers PreK-8 (Project Number: NC-2)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
NC	NEW CONSTRUCTION - Wright Brothers (74,526 SF)	1	1	0

Notes: Cadmus performed a full building audit. Cadmus verified the major building components in the reported as-designed documentation. Cadmus did not find any major differences with the as-built conditions and equipment compared to the original documentation.

Table 146. Huber Heights City Schools - Kitty Hawk Elementary (Project Number: NC-3)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
NC	NEW CONSTRUCTION - Kitty Hawk Elem (79,208 SF, 644 students)	1	1	0

Notes: Cadmus performed a full building audit. Cadmus verified the major building components in the reported as-designed documentation. Cadmus did not find any major differences with the as-built conditions and equipment compared to the original documentation.

February 2013 Nonresidential Site Visit Findings

The following companies and project numbers were verified during the February 2013 site visits:

Table 147. October 2012 Nonresidential Site Visit Summary

Company	Project Number
HEXA AMERICAS, INC.	KEANAMN5
Nissin International Transport	F89EJQO2
Stolle Machinery	K8Z8JNOI & 9MGANHQX
New Tech Plastics Company	UDP1Z457
Troy Board of Education	19230YVL & AZ2UEQWF
Dayton VA Medical Center	6LFYESCJ
Macy's Inc	CH66428E
University of Dayton	C80ED25B & 94DF1FDA
P H International LLC	7MMYNA7L
Yaskawa/Motoman Robotics	EPJA8OJX
Mound Development COS	022DE780
Mound Development OSE	C7003943
C Pathe	4F9593F7
St Francis of Assisi	1FB06471
Watsons of Dayton	6IBGZJED
Naylors furniture	MGJ4L573
Lynchburg Clay School Bus Barn	CRZELD59
Greenfield Research	6RFSM3A2
Zygor Guides	AA527C69
SK Mold & Tool Co.	5N8AM0KO
American Honda	OBDH1QQO
Valmac Industries, Inc.	B12F1CD5 & V6AJ8MI0
School Locker Stocker	5ZRPPUTY
3M Corporation	AL5GKCGO
Kotobuki Reliable Die Casting	A1T6XUC1
Hearth Products Controls	EDIFFO8T
Point Properties, Inc. dba Point Plaza	RB58F6ZR
Mullins Rubber Products Inc	S6QIZ27W & TJJ86T9G & XTO154L4
Aldi	ABAA9B4C & FF46ADD2 & 34B4EB24 & 9A6DA03C

Company	Project Number
Mike-Sells Potato Chip Company	PD3ECRPY
Victoria Theatre Association	B79E93DA
Greve Electrical & Plumbing	TJDROW1H
Kroger	594E80A0 & B9FE3092 & CEEF353E
Fresh Encounters	32FSDP1A
RC Hemm Glass Shops	HVJENJO5
Buckeye Ford Lincoln, LLC	938L0RSB
Greenville Technology Inc.	3NX3M7UI

Table 148. HEXA AMERICAS, INC. (Project Number: KEANAMN5)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	10	10	0

Notes: Cadmus toured the facility and verified the quantities and locations of the fixtures installed. There were more fixtures than claimed for the rebate. The facility operates 24/7.

Table 149. Nissin International Transport (Project Number: F89EJQO2)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	174	173	-1
P-Lighting	Delamping T12 (# linear feet)	1,392	1,392	0

Notes: Cadmus verified 173 fixtures between building #1 and building #2. It is believed that the 1 fixture not seen was in a locked room. Cadmus was told that building #1 operates 14 hours per day 5 days a week and building #2 operates 9 hours a day 5 days per week. The delamping is a result of going from 4 lamp fixtures to 2 lamp fixtures.

Table 150. Stolle Machinery (Project Number: K8Z8JNOI & 9MGANHQX)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Low-watt T8 4-foot 3 lamp fixture replacing T12	57	57	0
P-Lighting	Delamping T12 (# linear feet)	1,028	1,028	0
P-Lighting	Low-watt T8 4-foot 3 lamp fixture replacing T12	71	71	0
P-Lighting	Delamping T12 (# linear feet)	284	284	0

Notes: Cadmus verified an excess of fixtures claimed in both areas. The 57 fixtures are in the Engineering office. The lighting retrofit in this area reduced the layout and number of fixtures justifying the delamping value. The 71 fixtures are in the main office where the fixtures went from 4-lamp to 3 –lamp fixtures. The facility operates 9 hours per day 5 days a week. No photos were allowed.

Table 151. New Tech Plastics Company (Project Number: UDP1Z457)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-T-5 replacing 400,1000 w MH and T12 HO	1	1	0

Notes: This project consisted of replacing (8) 1000 watt MH, (10) 400 watt MH and (27) 8 foot T12 HO. The representative told us the replacements were not one for one. Cadmus verified (47) T5-6 lamp fixtures in the warehouse and the hours of operation were 24/7.

Table 152. Troy Board of Education (Project Number: 19230YVL & AZ2UEQWF)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-replace various fixtures w/various fluorescent	1	1	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	12	12	0

Notes: The custom rebate claim for the maintenance shop is based on eliminating (60) 210 watt fixtures and (5) 460 watt fixtures and replacing these with (4) T8 2 lamp, (10) T8 4 lamp and (4) T8 6 lamp fixtures. Cadmus observed more lamps of each type than claimed. The hours of operation are 10 hours 5 days a week and 11hours 6 days a week in the office and shop respectively. Cadmus verified the other project at Forest School.

Table 153. Dayton VA Medical Center (Project Number: 6LFYESCJ)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4-foot 1 lamp fixture replacing T12	637	637	0
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	1,541	1,541	0
P-Lighting	T8 4-foot 3 lamp fixture replacing T12	731	731	0

Notes: This project was a relamp in a nine story VA Hospital. The contact was not there at the time of the relamp project. Time constraints and inaccessible areas made an exact count not possible. Drawings were provided and lighting counts very verified in accessible areas. Hours of operation vary throughout the hospital because the installation was in patient rooms, waiting rooms, halls, restrooms, offices, specialty rooms, etc.

Table 154. Macy's Inc. (Project Number: CH66428E)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED recessed downlight luminaires up to 18 watts or screw-in base lamps	1,877	1,877	0

Notes: Cadmus verified 97% of this large lighting project. This track lighting is used to illuminate displays on the sales floor. The contact person told Cadmus that the lights are on approximately 13 hours per day, 7 days per week.

Table 155. University of Dayton (Project Number: C80ED25B & 94DF1FDA)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-Remove incandescent -replace w/MH and CFL	1	1	0
P-Lighting	Delamping T12 (# linear feet)	1,488	1,488	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	2	2	0
P-Lighting	Low-watt T8 4-foot 4 lamp fixture replacing T12	50	50	0
P-Lighting	Low-watt T8 4-foot 4 lamp fixture replacing T8	13	13	0
P-Lighting	T8 4 foot 2 lamp replacing T12 HO only	78	78	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	60	60	0

Notes: The custom project claimed the removal of numerous incandescent lights and replacing them with five 42 watt CF pendant lights and two 135 watt MH. The new lights were verified by Cadmus in an assembly area. The hours of operation are estimated at 15/5. Cadmus toured the facility and conducted a sample. While not able to verify exact counts, there are more fixtures than claimed. The hours of operation are 15 hours 5 days a week.

Table 156. P H International LLC (Project Number: 7MMYNA7L)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Fixture-mounted occupancy sensor	272	272	0
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	272	272	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	117	118	-1

Notes: Cadmus verified the quantities and installation of fixtures claimed. The 6-lamp fixtures are in the aisles with occupancy sensors. The hours of operation are 10 hours M-F and some Saturdays.

Table 157. Yaskawa/Motoman Robotics (Project Number: EPJA8OJX)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Other	Window film	1	1	0

Notes: Cadmus verified 17 lobby windows where 3M NV 15 Sun Control film (double coated) was installed. The coating is approximately 1126 square feet.

Table 158. Mound Development COS (Project Number: 022DE780)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED recessed downlight luminaires up to 18 watts or screw-in base lamps	6	6	0
P-Lighting	Low-watt T8 4-foot 1 lamp fixture replacing T12	183	183	0

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	97	97	0
P-Lighting	T8 (BF < 0.78) 4-foot 3 lamp fixture replacing T12	487	487	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	177	177	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	48	48	0

Notes: Cadmus conducted a sample count of some of the larger areas (chosen by Cadmus) in this complex. The quantities and installations were verified. The hours of operation 12 hours M-F with some Saturday and Sunday hours.

Table 159. Mound Development OSE (Project Number: C7003943)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	CFL screw-in bulb up to 32W replacing incandescent	67	67	0
P-Lighting	LED or electroluminescent exit sign	56	56	0
P-Lighting	LED recessed downlight luminaires up to 18 watts or screw-in base lamps	47	47	0
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	22	22	0
P-Lighting	Low-watt T8 4-foot 3 lamp fixture replacing T12	899	899	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	72	72	0
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	24	24	0

Notes: Cadmus conducted a sample count of a large area (chosen by Cadmus). Cadmus verified the claimed amount in the sample area. This building is vacant at this time.

Table 160. C Pathe (Project Number: 4F9593F7)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED or electroluminescent exit sign	1	1	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12	42	42	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	107	107	0
P-Lighting	T8 high-bay 4-foot 4 lamp fixture replacing HID	84	84	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	108	108	0
P-Lighting	Wall or ceiling-mounted occupancy sensor	50	50	0

Notes: Cadmus verified that the quantities claimed were reasonable. The contact person was not sure of the details of the rebate claimed.

Table 161. St Francis of Assisi (Project Number: 1FB06471)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED or Induction (operating hours < 8,760) replacing 251W to 400W	3	3	0

Notes: The project actually replaces four 400 watt lamps with two 39 watt LEDs and one 13 watt LED. The hours of operation are approximately 8 hours 7 days a week.

Table 162. Watsons of Dayton (Project Number: 6IBGZJED)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	CFL screw-in bulb up to 32W replacing incandescent	23	23	0

Notes: Cadmus verified more than the claimed quantity during the site visit. Hours of operation are 10 hours M-F, 8 hours Saturday and 6 hours Sunday.

Table 163. Naylors furniture (Project Number: MGJ4L573)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	148	148	0
P-Lighting	Delamping T12 (# linear feet)	1,408	1,408	0

Notes: Cadmus found this project to be 8 foot lamps not 4 foot lamps. The count was verified and the delamping was the result of removing the bulbs from approximately every other fixture. The hours of operation are 10 hours 6 days a week.

Table 164. Lynchburg Clay School Bus Barn (Project Number: CRZELD59)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Delamping T12 (# linear feet)	352	352	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	14	16	2

Notes: The contact was not sure of the rebate details but was able to show Cadmus the lighting. Cadmus verified more new fixtures than claimed. The hours of operation are 11 hours 5 days a week.

Table 165. Greenfield Research (Project Number: 6RFSM3A2)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-replace (90) T12 8ft w/ (30) 6-lamp	1	1	0

Notes: The rebate claimed replacement of ninety T12 8 foot 2-lamp fixtures with thirty T8 6-lamp fixtures. Cadmus verified many more fixtures than claimed. Hours of operation 11 hours M-F and 5 hours Sat.

Table 166. Zygor Guides (Project Number: AA527C69)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Other	Window film	1	1	0

Notes: Cadmus verified the installation of approximately 681 square feet of window film at this location

Table 167. SK Mold & Tool Co. (Project Number: 5N8AM0KO)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED or electroluminescent exit sign	2	2	0
P-Lighting	T8 (BF < 0.78) 4-foot 4 lamp fixture replacing T12	32	32	0
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	40	40	0

Notes: Cadmus verified the quantities and installation. The office hours of operation are 9 hours 6 days a week and the shop hours of operation are 11 hours 6 days a week.

Table 168. American Honda (Project Number: OBDH1QQO)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-replace 2lamp T-12 Ulamps w/ 3-lamp F17	1	1	0

Notes: This project was for lighting replacement in parts of the office and conference rooms. Cadmus verified the 62 claimed fixtures on site. The hours of operation are 24 hours M-F.

Table 169. Valmac Industries, Inc. (Project Number: B12F1CD5 & V6AJ8MI0)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T5 high-output high-bay 4 lamp fixture replacing HID	10	10	0
P-Lighting	T5 high-output high-bay 4 lamp fixture replacing HID	10	10	0

Notes: Cadmus verified more fixtures than were claimed to be installed. The contact person indicated that they buy 10 at a time and replace as time permits. The hours of operation are 11 hours M-F and 8 hours on Saturday.

Table 170. School Locker Stocker (Project Number: 5ZRPPUTY)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	Low-watt T8 4-foot 2 lamp fixture replacing T12	2	2	0
P-Lighting	Low-watt T8 4-foot 4 lamp fixture replacing T12	17	17	0
P-Lighting	Delamping T12 (# linear feet)	48	48	0

Notes: Cadmus verified the quantity and installation of the fixtures listed. Hours of operation are 9.5 hours M-F and 7 hours Saturday.

Table 171. 3M Corporation (Project Number: AL5GKCGO)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 high-bay 4-foot 6 lamp fixture replacing HID	61	61	0
P-Lighting	T8 (BF < 0.78) 4-foot 3 lamp fixture replacing T12*	46	46	0
P-Lighting	T8 (BF < 0.78) 4-foot 2 lamp fixture replacing T12*	23	23	0
P-Lighting	T8 high-output 8-foot 2 lamp fixture replacing T12 HO only	7	7	0
P-Lighting	Fixture-mounted occupancy sensor	10	10	0
P-Lighting	LED or Induction (operating hours < 8,760) replacing 175W or less	7	7	0
P-Lighting	LED or Induction (operating hours < 8,760) replacing 251W to 400W	1	1	0
P-Lighting	Delamping T12 (# linear feet)	445	445	0

Notes: The contact person toured the facility with Cadmus to verify all fixtures claimed. The 8 foot lamps claimed are actually 2 sets of 4 foot retrofit lamps. Outside lighting is on dusk till dawn, office hours of operation are 10 hours 5 days a week and manufacturing hours of operation are19.5 hours 5 days per week.

Table 172. Kotobuki Reliable Die Casting (Project Number: A1T6XUC1)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-Replaced (39) T12HO Fixtures with (22) T8	22	22	0

Notes: Reported lamp quantity, hours of operation, and specifications are accurate. Lights are installed in the machine shop area.

Table 173. Hearth Products Controls (Project Number: EDIFFO8T)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-replace T-12 with high bay	20	20	0

Notes: (20) fixtures were found to be installed in the warehouse area of the building. The lights are on for 10 hours/day from Monday to Friday (reported: 9 hours/day M-F).

Table 174. Point Properties, Inc. dba Point Plaza (Project Number: RB58F6ZR)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-exterior replacing T12 with T8	43	43	0

Notes: Light fixtures are installed on the perimeter of small strip mall. The verified hours (3276 hours) of operation are found to higher than reported (2920 hours). The fixture quantities are accurate.

Table 175. Mullins Rubber Products Inc. (Project Number: S6QIZ27W & TJJ86T9G & XTO154L4)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	265	240	-25
P-Lighting	T8 4-foot 4 lamp fixture replacing T12			
P-Lighting	T8 4-foot 4 lamp fixture replacing T12			

Notes: Lighting fixtures are installed in several sections of this manufacturing facility. Hours of operation of some sections are different than others. The quantity of lights is less than reported (240 vs 265). Each section of the building has one light on at all times as emergency lighting. Actual hours of operation for the lights were found to be higher than reported.

Table 176. Aldi (Project Number: ABAA9B4C & FF46ADD2 & 34B4EB24 & 9A6DA03C)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-Retrofit of fans ; Store # 26	31	31	0
Custom	CUSTOM-Retrofit of fans ; Store # 17	37	37	0
Custom	CUSTOM-Retrofit of fans ; Store # 20	33	33	0
Custom	CUSTOM-Retrofit of fans ; Store # 42	27	27	0

Notes: Cadmus walked the facility and verified the quantity of installed fans. The number of fans reported and installed matched.

Table 177. Mike-Sells Potato Chip Company (Project Number: PD3ECRPY)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM- Air compressor install	1	1	0

Notes: The new air compressor installed at Mike Potato Sells Chips matches the reported specifications. Cadmus calculated savings based on actual hours of operation deduced from the plant instrument air pressure fluctuations trend data. Savings are calculated separately for peak and non-peak operating loads and then added to calculate total retrofit savings. The reported savings did not take into account that weekday manufacturing schedule is different from weekends. This resulted in a difference between the reported and verified hours of operation during peak and non-peak load conditions.

Table 178. Victoria Theatre Association (Project Number: B79E93DA)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	LED recessed downlight luminaires up to 18 watts or screw-in base lamps	1,272	1,260	12

Notes: The reported lighting fixture quantity, project savings and hours of operation were found to be correct.

Table 179. Greve Electrical & Plumbing (Project Number: TJDR0W1H)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-replace T12 with 6-lamp	4	4	0

Notes: The reported savings, fixture quantity and hours of operation were found to be correct.

Table 180. Kroger (Project Number: 594E80A0 & B9FE3092 & CEEF353E)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM - Retrofit walkin cooler fluorescent lights to LED ; Store # 836	31	31	0
Custom	CUSTOM - Retrofit walkin cooler fluorescent lights to LED; Store # 935	29	29	0
Custom	CUSTOM - Retrofit walkin cooler fluorescent lights to LED; Store # 751	25	25	0

Notes: Cadmus walked the three different stores and verified the reported fixture types were installed. The hours of operation for each store are as per Kroger's project documentation.

Table 181. RC Hemm Glass Shops (Project Number: HVJENJO5)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-320 w replacing 400 w	10	10	0

Notes: The reported fixture quantity and specifications are accurate. The reported hours of operation were found to be slightly lower (reported: 3484 vs. verified: 2678).

Table 182. Fresh Encounters (Project Number: 32FSDP1A)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	4	4	0
P-Lighting	T8 4 foot 4 lamp replacing T12 HO only	223	219	-4
P-Lighting	T8 4-foot 2 lamp fixture replacing T12	1	1	0
P-Lighting	T8 4-foot 4 lamp fixture replacing T12	4	4	0

Notes: The reported hours of operation and fixture specifications are correct. The number of fixtures in the main store area were slightly different (reported: 223 vs verified: 219) from reported quantity.

Table 183. Buckeye Ford Lincoln, LLC (Project Number: 938L0RSB)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM: Replacing existing T12 and Metal Halide lighting with new high bay T8 lighting	11	11	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Table 184. Greenville Technology Inc. (Project Number: 3NX3M7UI)

Measure Type	Reported Measure	Reported Quantity	Verified Quantity	Difference
Custom	CUSTOM-Use of TCS Radiant heater bands	1	1	0

Notes: Cadmus walked the facility and verified the reported fixture types were installed. The reported hours of operation were found to be correct.

Appendix G: Cost-Effectiveness Analysis Inputs

Utility Assumptions

Utility assumptions apply to all programs and measures, including the assumptions that follow.

Avoided Costs are the full value of time and seasonally differentiated generation, transmission and distribution, and capacity costs. For each energy-efficiency measure included in a program, hourly (8760) system-avoided costs are adjusted by the hourly load shape of the end use affected by the measure, capturing the full value of time and seasonally-differentiated impacts of the measure. Avoided costs, provided by DP&L, were updated for the 2012 program year evaluation.

Line Loss is the percentage of energy lost during transmission and distribution. In DSM Portfolio Pro, both energy and capacity line losses are applied to measure-level savings to reflect total savings from the point of generation. Table 185 presents line loss assumptions for the 2012 Evaluation Measurement and Verification Report.[46]

Table 185. Line Loss Assumptions Used in Cost-Effectiveness Calculations

Sector	Energy Line Losses	Demand Line Losses
Residential	7.37%	8.37%
Commercial/Industrial	4.06%	5.21%

Retail Rates, provided by DP&L, include electric rates for all customer classes eligible for DSM programs. Table 186 provides retail rate assumptions for the 2012 Evaluation Measurement and Verification Report.

Table 186. Line Loss Assumptions Used in Cost-Effectiveness Calculations

Sector	Retail Rate	Escalator
Residential	$0.143	0%
Residential Heating	$0.132	0%
Commercial	$0.106	0%
Industrial	$0.095	0%

Load Shapes show hourly energy use over a year for each end use included in DSM Portfolio Pro. Hourly end-use load shapes were not available for the 2012 cost-effectiveness analysis. Therefore, Cadmus developed load shapes using available data from similar regions, and adjusting for weather conditions in DP&L's service territory.

Discount Rates are used to determine the net present value of benefits for each program.
Table 187 shows the discount rates used in 2012. The TRC, UTC, and RIM test discount rates are based on DP&L's weighted cost of capital; SCT discount rate is based on a 10-year T-bill rate; and the PCT rate

[46] The line losses in Table 185 represent the percentage loss in energy and demand from the point of generation to the meter.

represents a hurdle rate. Cadmus will update discount rates in subsequent years, as new data are provided.

Table 187. Discount Rates

Benefit-Cost Test	Discount Rate
TRC	8.95%
SCT	2.68%
UTC	8.95%
RIM	8.95%
PCT	10.00%

Peak Definitions are used to determine any time or seasonal differentiation between rates and avoided costs. Additionally, to calculate peak load impacts from energy-efficiency measures, end-use load shapes are used to identify the average reduction in demand over the DP&L system's top 100 peak demand hours.

Externalities and Indirect Benefits are additional, non-energy benefits associated with installing energy-efficiency measures. For the 2012 analysis, we did not include non-energy benefits. Unless otherwise requested, we do not plan to include any non-energy benefits for future cost-effectiveness tests.

Program Assumptions

Sectors/Segments identify the customer class to which participants from each program belong. Sectors for DP&L include: residential, commercial, and industrial. Examples of segments used in DSM Portfolio Pro include: single-family, multifamily, small office, large retail, and schools (these are tailored to DP&L's service territory). Sectors and segments dictate which retail rates and load shapes are used during analysis.

Utility Administrative Costs include any expenses associated with: program development; marketing; delivery; operation; and EM&V. These costs are not measure-specific, and are assessed at the program or portfolio level. Costs categories used in the 2012 Evaluation Measurement and Verification Report are shown in Table 188 and will be updated in subsequent cycles.

Table 188. Implementation and Administrative Costs

Cost Category	Level	Description
Implementation Vendor and Marketing Costs	Program Level	Incremental costs associated with performing program implementation tasks, including customer service, application processing, marketing, customer outreach, etc.
Incentive Costs	Program Level	Rebates and incentives paid to customers by DP&L.
Direct Measure Costs	Program Level	Costs associated with paying for program measures, including measures installed through the Low Income Weatherization program.
DP&L Staff Costs	Program Level/ Portfolio Level	Costs to administer energy-efficiency programs, including DP&L's fully-loaded incremental personnel costs. Activities associated with market research outside of EM&V.
External Vendor Evaluations	Portfolio Level	Activities associated with the determination and evaluation of current and potential energy-efficiency programs. Activities include: benefit-cost ratio analysis, impact and process analysis, cost per kWh analysis, customer research, and all other analyses necessary for program evaluation.
Education, Awareness, and Building and Market Transformation	Portfolio Level	Cost to increase awareness of energy efficiency.

Measure Assumptions

Measure Life is used during the calculation of total lifetime benefits for each measure. The life of each measure is based on information from the draft Ohio TRM, program-supported documentation, and secondary research.

End Use is used to assign each measure to a specific load shape. Examples of end uses in DSM Portfolio Pro include water heating, HVAC, and lighting.

Savings are annual kWh savings associated with installation of each energy-efficiency measure. Savings used in DSM Portfolio Pro are the adjusted gross savings.

Incremental Cost is the expense associated with the installation of energy-efficiency measures and ongoing operation and maintenance costs, where applicable. These costs include the entire cost of installing the measure, and do not net out incentive payments to the customer. The incremental cost is based on data provided by DP&L and secondary research.

Incentive Level is the dollar amount of the rebate paid to a customer by DP&L. The incentive amount for each measure is provided by DP&L.

Freeridership is the percent of participants who would have taken the same action/installed the same measure in the program's absence. Cadmus assumed a net-to-gross ratio of 1.0 for the 2012 analysis.

Spillover is the percent of participants who installed additional energy-savings measures without incentives due to their participation in the program. Spillover was not calculated for the 2012 analysis.

Participation is the number of customers who participated in the program or quantity of measures verified by Cadmus.

Appendix H: Distribution of General Population Telephone Survey Call Results

Table 189. Appliance Recycling Participant Telephone Survey Diagnostics

Description	Total
Overall Summary	
Completes	140
Total Sample	1,953
Average Length	8.68
Total Dials	834
Resolved Sample	
Soft Refusal	4
Language Barrier	4
Wrong Number (Dead)	7
Dropped Call (PRONTO JOBS ONLY)	6
Respondent Terminated - Screener Break Off	1
Respondent Terminated - Qualified Break Off	8
(INT24) Q#. Reason for Term	5
(INT25) Q2: EMPLOYMENT DISQUALIFYER	1
Quota Full	1
(INT99) Complete	140
Pronto Operator Intercept	41
Pronto P9 Pronto Misc	10
Time out	1
Unused or Unresolved Sample	
Number of Contacts	1,724
Response Rate (RR1)	**63.3%**
Cooperation Rate (COOP1)	**88.6%**
Refusal Rate (REF1)	**5.9%**
Contact Rate (CON1)	**71.5%**

Table 190. Low-Income Participant Telephone Survey Diagnostics

Description	Total
Overall Summary	
Completes	120
Total Sample	508
Average Length	11.92
Total Dials	717
Resolved Sample	
Soft Refusal	3
Disconnected Number	5
Language Barrier	5
Wrong Number (Dead)	10
Fax Machine / Modem / Pager	1

Description	Total
Dropped Call (PRONTO JOBS ONLY)	1
Respondent Terminated - Qualified Break Off	4
(INT24) Q#. Reason for Term	7
Quota Full	1
(INT99) Complete	120
Pronto Operator Intercept	44
Pronto Fax/Modem/Pager	2
Unused or Unresolved Sample	
Number of Contacts	305
Response Rate (RR1)	**64.9%**
Cooperation Rate (COOP1)	**89.6%**
Refusal Rate (REF1)	**3.8%**
Contact Rate (CON1)	**72.4%**

Table 191. Energy Education (Be E^3 Smart) Participant Telephone Survey Diagnostics

Description	Total
Overall Summary	
Completes	54
Total Sample	141
Average Length	12.34
Total Dials	1,180
Resolved Sample	
Soft Refusal	3
Disconnected Number	28
Business Number	2
Refused	1
Wrong Number (Dead)	6
Fax Machine / Modem / Pager	2
Blocked call - Call screener refusal	1
Dropped Call (PRONTO JOBS ONLY)	10
Respondent Terminated - Screener Break Off	9
Respondent Terminated - Qualified Break Off	3
(INT24) Q#. Reason for Term	13
Complete	54
Pronto Operator Intercept	2
Pronto P9 Pronto Misc	7
Unused or Unresolved Sample	
Number of Contacts	0
Response Rate (RR1)	**52.4%**
Cooperation Rate (COOP1)	**64.3%**
Refusal Rate (REF1)	**15.5%**
Contact Rate (CON1)	**81.6%**

Appendix I: General Population Survey Demographics

The following two tables provide demographic results for three program participant surveys:

- Residential Appliance Recycling program participant;
- Residential Low-Income program participant; and
- Residential School Education (Be E^3 Smart) program participant.

Table 192. Appliance Recycling Program Participant Demographics

Home Characteristics	Appliance Recycling (n=140)
Dwelling Type	
Single-family home, detached	95.6%
Single family home, factory manufactured/modular	0.0%
Single family, mobile home	0.7%
Row House	0.0%
Two or Three family attached residence—traditional structure	0.0%
Apartment (4+ families) - Traditional	1.5%
Condominium---traditional structure	2.2%
Square Footage of Dwelling (Above Ground)	
Less than 1,000 square feet	12.5%
1,001-2,000 square feet	50.8%
2,001-3,000 square feet	28.3%
3,001-4,000 square feet	5.0%
4,001-5,000 square feet	0.8%
Greater than 5,000 square feet	2.5%
Square Footage of Dwelling (Below Ground)	
Less than 1,000 square feet	50.0%
1,001-2,000 square feet	37.0%
2,001-3,000 square feet	9.3%
3,001-4,000 square feet	0.0%
4,001-5,000 square feet	3.7%
Greater than 5,000 square feet	0.0%
Years Home was Constructed	
Before 1960	35.1%
1960-1969	20.6%
1970-1979	19.1%
1980-1989	7.6%
1990-1999	13.0%
2000-2005	3.8%
2006 or later	0.8%
Ownership Type	
Own	94.0%
Rent	6.0%

Table 193. Low-Income Program Participant Demographics

Home Characteristics	Low-Income (n=120)
Dwelling Type	
Single-family home, detached	87.5%
Single family home, factory manufactured/modular	3.3%
Single family, mobile home	5.8%
Row House	0.0%
Two or Three family attached residence—traditional structure	0.0%
Apartment (4+ families) - Traditional	3.3%
Condominium---traditional structure	0.0%
Square Footage of Dwelling (Above Ground)	
Less than 1,000 square feet	27.8%
1,001-2,000 square feet	55.6%
2,001-3,000 square feet	13.9%
3,001-4,000 square feet	1.4%
4,001-5,000 square feet	0.0%
Greater than 5,000 square feet	1.4%
Square Footage of Dwelling (Below Ground)	
Less than 1,000 square feet	67.5%
1,001-2,000 square feet	30.0%
2,001-3,000 square feet	2.5%
3,001-4,000 square feet	0.0%
4,001-5,000 square feet	0.0%
Greater than 5,000 square feet	0.0%
Years Home was Constructed	
Before 1960	59.0%
1960-1969	16.0%
1970-1979	10.0%
1980-1989	6.0%
1990-1999	8.0%
2000-2005	1.0%
2006 or later	0.0%
Ownership Type	
Own	80.0%
Rent	20.0%

Table 194. Energy Education (Be E^3 Smart) Participant Demographics

Home Characteristics	Energy Education (n=54)
Dwelling Type	
Single-family home, detached	56.6%
Single family home, factory manufactured/modular	32.1%
Single family, mobile home	3.8%
Row House	0.0%
Two or Three family attached residence—traditional structure	1.9%
Apartment (4+ families) - Traditional	1.9%
Condominium---traditional structure	3.8%
Square Footage of Dwelling	
Less than 1,000 square feet	9.8%
1,001-2,000 square feet	51.0%
2,001-3,000 square feet	27.5%
3,001-4,000 square feet	7.8%
4,001-5,000 square feet	0.0%
Greater than 5,000 square feet	3.9%
Years Home was Constructed	
Before 1960	26.5%
1960-1969	12.2%
1970-1979	16.3%
1980-1989	14.3%
1990-1999	16.3%
2000-2005	8.2%
2006 or later	6.1%
Ownership Type	
Own	79.2%
Rent	20.8%

Appendix J: Energy and Demand Savings Confidence and Precision

Residential

Cadmus used a multifaceted approach to construct error bounds for final kWh savings estimates due to methods varying across programs, and, in some cases, within individual programs. To determine the level of uncertainty, two types of error were considered: measurement (or modeling) error; and sampling error. Measurement error refers to the uncertainty level around engineering parameters that derived from either simulation or professional judgment. Sampling error refers to uncertainty introduced by the use of sampled data to infer characteristics of the overall population.

For engineering calculations using either simulated or assumed parameters, measurement error was assumed to have a relative precision of ±10%. This accuracy level is regarded as a minimum for results in the evaluation industry, and any results taken from outside evaluations or based on engineering analysis would likely be reliable within these bounds.

An example of this would be the effective full-load hours (EFLH) used in many of the HVAC savings calculations. These values come from simulations conducted by the US Environmental Protection Agency and, as such, have no sampling error. They aren't, however, deterministic (presumably average EFLH deviates from these values). Absent documentation on this level of uncertainty, we assume they are accurate within the industry standard threshold of ±10% relative precision with 90% confidence.

Sampling error was calculated for parameters estimated through some form of sampling. These data included: survey results, meter data, and secondary sources. Sampled data were used in the evaluation of several programs to estimate parameters to be used in per-unit savings calculations (such as installation rates), or in the consumption of specific equipment types (such as in billing analysis).

In some cases, uncertainty of estimates derived from multiple sources. For example, for summed estimates, such as those for total program savings, the root of the sum of the squared standard errors was calculated to estimate the confidence interval:[47]

$$Confidence\ Interval_{\bar{X}+\bar{Y}} = (\bar{X}+\bar{Y}) \pm 1.645 * \sqrt{\left(\frac{s^2{}_{\bar{X}}}{n_{\bar{X}}}\right)+\left(\frac{s^2{}_{\bar{Y}}}{n_{\bar{Y}}}\right)}$$

In some cases, Cadmus multiplied estimates. For example, when evaluating the ARP gross per-unit savings calculations involved combining full-year gross estimates from a regression-based metering analysis, with average annual running times estimated from participant surveys. For these results,

[47] This approach to aggregation errors follows methods outlined in Appendix D from Schiller, Steven et. al. "National Action Plan for Energy Efficiency". Model Energy Efficiency Program Impact Evaluation Guide. 2007. www.epa.gov/eeactionplan.

Cadmus calculated combined standard errors for the final estimates. In cases where the relationship was multiplicative, Cadmus used the following formula:[48]

$$Confidence\ Interval_{\bar{X}*\bar{Y}} = \bar{X} * \bar{Y} \pm 1.645 * \sqrt{\bar{Y}^2\left(\frac{s^2{}_{\bar{X}}}{n_{\bar{X}}}\right) + \bar{X}^2\left(\frac{s^2{}_{\bar{Y}}}{n_{\bar{Y}}}\right) + \left(\frac{s^2{}_{\bar{X}}}{n_{\bar{X}}}\right)\left(\frac{s^2{}_{\bar{Y}}}{n_{\bar{Y}}}\right)}$$

Table 195. Residential Energy Savings Precision

Program	Precision at 90%	Sources of Uncertainty
Lighting	±6%	Participant survey, TRM values
Appliance Recycling	±10%	Regression analysis, TRM values
Low-Income	±9%	TRM values
HVAC Rebate	±2%	Billing analysis, TRM values
HVAC Tune-Up	±0.01%	PRISM analysis of customer billing data
Be E3 Smart	±15%	Family Home Installation survey, TRM values

Nonresidential

For commercial and industrial programs, DP&L provided Cadmus with a project database that included calculated and deemed (*ex ante*) savings values for each nonresidential project. Cadmus performed site visits and engineering desk reviews to calculate adjusted gross savings for a sample of projects. We used these activities to estimate realization rates, which we applied to projects outside the samples to obtain realized savings estimates. We divided projects selected for site visits and desk review samples into Prescriptive and Custom Rebate programs, and performed the analyses separately.

For the Prescriptive Rebate program, we first estimated savings, standard errors, and precision levels by measure type, and then aggregated these results into the program-level savings estimate, standard error, and precision. Since lighting projects spanned an especially wide range of *ex ante* savings values (from 57 kWh to over 3.1 million kWh), we divided prescriptive lighting savings by strata according to the aggregate reported *ex ante* values for each project, then allocated each project to each strata according to the proportional representation across the population. Further, given the heterogeneity in measure-level energy savings for other prescriptive measures beyond lighting, such as HVAC and Motors, Cadmus designed two additional strata to capture the variance for these measures and finally one strata, “Other” , for the remaining prescriptive projects. Table 196 reports the cut points and the distribution of sites for each strata.

[48] Derived from Goodman, Leo, “The Variance of the Product of K Random Variables,” Journal of the American Statistical Association. 1962.

Table 196. C&I Prescriptive Lighting Stratification

Statistic	Small	Medium	Large	Residential Lighting
kWh Range	0 < 100,000 kWh	>100,000 kWh to <500,000 kWh	>500,000 kWh	
Number of Projects	38	21	10	1
Total *ex ante* kWh	726,519	4,252,371	11,920,404	12,647,206

We also separated custom projects into three strata: large custom, small custom, and new construction.

Table 197. Custom Stratification

Statistic	Small	Medium	Large	NC
kWh Range	0 < 100,000 kWh	>100,000 kWh to <1,000,000 kWh	>1,000,000 kWh	NA
Number of Projects	19	6	2	5
Total *ex ante* kWh	302,622	1,357,675	6,186,207	2,028,356

The remaining project types were prescriptive HVAC, prescriptive motors, and prescriptive other, and we treated each of these groups as a single stratum.

Verification samples targeted projects in the large strata. This emphasis reduced uncertainty in overall savings estimates by directly verifying a large proportion of savings. We obtained total savings estimates and precision levels with 90% confidence, as shown in the Table 198, below.

Table 198. Nonresidential Gross Energy Savings, Custom and Prescriptive

Prescriptive Program Savings		Custom Program Savings	
Total Estimated Savings (KWh)	Precision at 90% Confidence	Total Estimated Savings (KWh)	Precision at 90% Confidence
71,553,838	4.7%	12,992,791	6%

Energy savings estimates for individual measure categories are shown below. Precision at the 90% confidence is provided for each estimate. Categories with large kWh savings totals have tighter precision than those with small savings totals. This is because we allocated evaluation resources with the goal of producing efficient program-level estimates.

Table 199. Nonresidential Summary of Energy Savings Precision Estimates

Measure Type	Reported Savings (kWh)	Estimated Savings (KWh)	Realization Rate	Precision at 90% Confidence
Residential Lighting	12,647,206	12,676,833	100%	-
Large Lighting	14,985,825	14,232,182	95%	4%
Medium Lighting	15,721,125	14,675,914	93%	13%
Small Lighting	18,245,049	14,559,154	80%	14%
HVAC	2,314,159	3,087,297	133.41%	16.89%
Motors	6,152,482	6,492,754	105.53%	24.48%
Other	1,487,991	1,577,494	106.02%	0.00%
Large Custom	6,186,207	6,186,207	100.00%	0.00%
Medium Custom	3,308,093	2,920,951	88.30%	21.57%
Small Custom	1445392.16	1567069.46	1.08%	0.04
NC	2,053,099	1,614,958	78.66%	19.11%

EXHIBIT 2

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of The Dayton Power and Light Company's Portfolio Status Report.	))))	Case No. 13-1140-EL-POR

Affidavit of Bryce Nickel

State of Ohio)
) SS:
County of Montgomery)

I, Bryce Nickel, being first duly cautioned and sworn, do hereby swear and affirm the following to the best of my knowledge and belief:

1. I have attained the age of eighteen and have personal knowledge of the matters set forth herein.

2. I am the Senior Vice President of Service Operations for the Dayton Power and Light Company ("DP&L"). As part of my overall responsibilities, I am responsible for ensuring DP&L's compliance with statutorily imposed energy efficiency and peak demand reduction requirements.

3. DP&L has met its statutory benchmarks for energy efficiency and peak demand reduction as set forth in the Portfolio Status Report being filed contemporaneously with this Affidavit.

FURTHER AFFIANT SAYETH NAUGHT.

Bryce Nickel

Sworn to and subscribed in my presence on this 9th day of May, 2013.

Notary Public

JUDI L. SOBECKI
NOTARY PUBLIC, State of Ohio
My Commission Has No Expiration Date
Section 147.03 R.C.

This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

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in

Case No(s). 13-1140-EL-POR

Summary: Notice of the Dayton Power and Light Company's Portfolio Status Report electronically filed by Mr. Tyler A. Teuscher on behalf of The Dayton Power and Light Company